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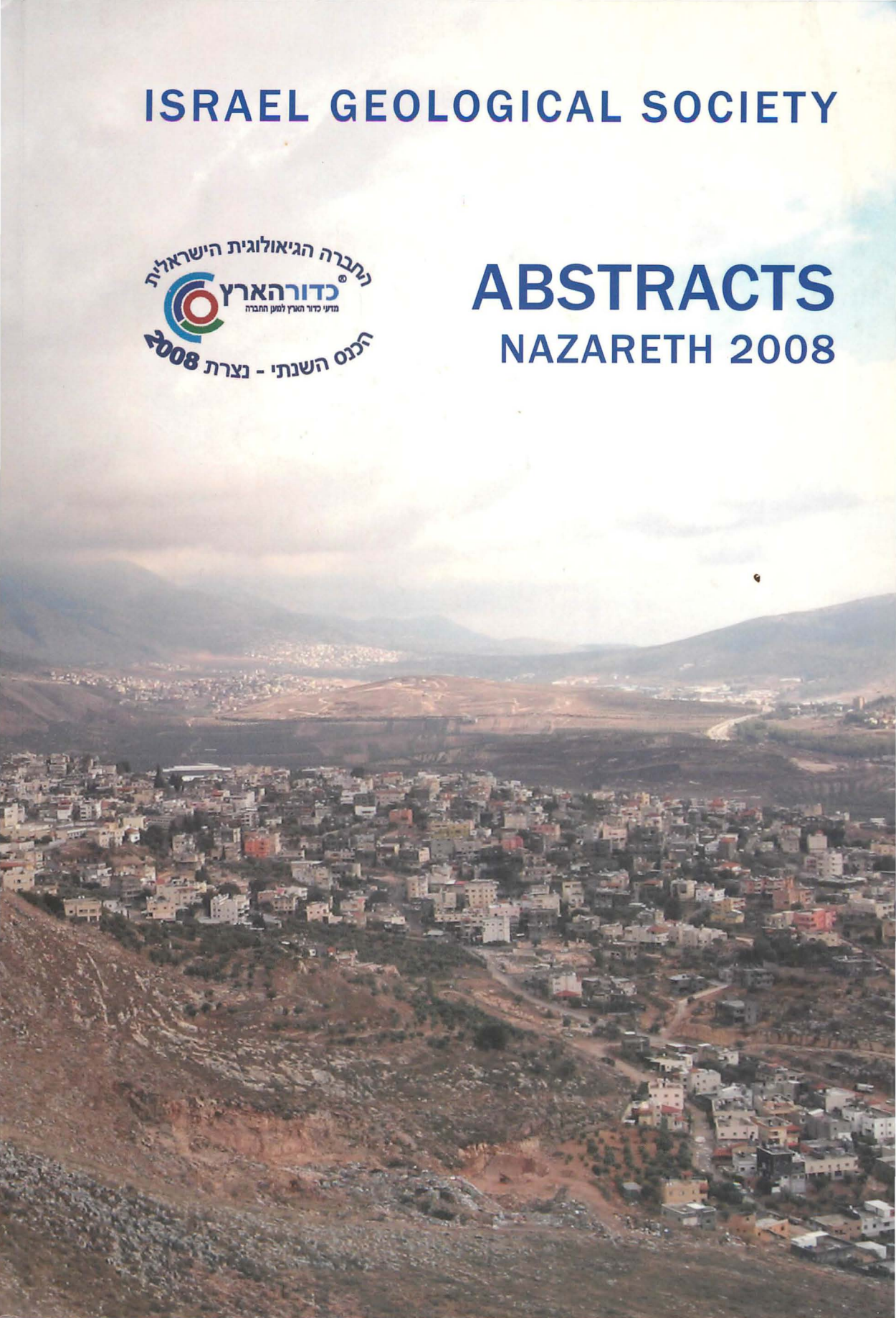

ABSTRACTS

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Yaron Be'eri-Shlevin

Naama Gazit Ya'ari

Navot Morag

Jiwchar Ganor

Itay reznik

Ran Nof

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Reconstruction of subsurface structure and identification of fault by ambient noise measurements in southern part of Zevulun plain

Aksinenko T., Zaslavsky Y., Gorstein M., Kalmanovich M., Giller D., Dan I., Perelman N., Ataev G., Giller V., Livshits I., Shvartsburg A.

Seismology Division, Geophysical Institute of Israel, P.O.Box 182, Lod, Israel

We carried out a series of ambient noise measurements along four SN directed profiles located in the southern part of the Zevulun plain. Total length of profiles is 17.5 km and 80 sites were instrumented for varying periods of time. Horizontal-to-vertical (H/V) spectral ratios (Nakamura's method) from a single ambient noise record are used to define the thickness of sedimentary layers in the context of reconstruction of subsurface structure and identification of the faults.

In our investigation we use the shear wave structures for different sediments obtained in the present and earlier studies. Fixing the shear-wave velocity, it is possible to adjust the thickness of sedimentary layers for matching analytical response functions with experimental spectral ratios.

Our investigation demonstrates that the H/V curves exhibit two clear peaks appearing at different frequencies in accordance with two impedance contrast: one at deeper and other at shallow strata. The corresponding frequencies are interpreted as fundamental (f_0), and other natural (f_1) ones. Frequencies of the first and second peaks in the H/V spectral ratios are used to define the thickness of sediments to reconstruct multi-layer 1-D models.

Sites, where sharp changes in the fundamental frequency and/or change in the shape of the H/V ratio over a short distance are observed, are identified as fault. In some cases the faults defined as a result of geological interpretation of ambient noise measurements, do not coincide with existing geological representations. Our results point to the fact that H/V spectral ratio from ambient noise can be a powerful tool for exploration of sedimentary layer.

Using fluorescent and environmental tracers to investigate ground water recharge processes in carbonate rock ephemeral streams

Arbel Y.[1], Greenbaum N.[1], Lange J.[2], Winter F.[2], Inbar M.[1], Weitenberg L.[1].

1. Department of Geography and Environmental Studies, Haifa University, Israel
2. Hydrology Institute, Freiburg University, Germany.

In a few tracer experiments, fluorescent dyes were inserted on carbonate bed-rock channel of ephemeral stream just before a flood event. The experiments in Nahal Oren were part of a larger study on the recharge to the Mt. Carmel aquifer; the experiment in Nahal Kziv intended to explore the hydraulic connection between a percolation of sewage in a stream pool 6.7km upstream of Ein Ziv and the spring (Magal et al., this issue).

Monitoring at the springs included: water level, EC, temperature, tracers fluorescence intensity and turbidity. Hourly water samples were taken for analyses of major ions.

In Ein Alon – a perched spring in Nahal Oren stream, tracers were inserted to a channel pool 75m upstream of the spring. In the first experiment the tracer (Sodium-Naphtionate) breakthrough curve had few peaks, which followed the major rainspells, and overlap EC and Mg^{+2} fluctuations. The major tracer peak coincided with turbidity peak. In the second experiment (using Uranine), only a single tracer peak was documented as a response to a smaller rainspell, which coincided with the average flow rate (1.3m/hr) as was calculated by *C-peak method.*

In another experiment Sodium-Naphtionate was inserted in the thin alluvial cover over the Dolomite bedrock channel of Nahal Oren near an intensive faulting zone located near a pumping well (Oren 5). Tracer breakthrough had two peaks, which might correspond to flows at different paths typical to karst areas. The maximal effective flow rate 4-6m/hr (in the unsaturated zone) was calculated from the time of channel flow at the site until the tracer arrival time at the water table - a depth of 102m. Hydrograph separation to aquifer pre-event water and runoff water (EMMA with [Cl^-] [$SO4^{-2}$]) indicates 3-4% contribution of runoff transmission losses to the total pumping yields, at the time of tracer breakthrough. The experiment proved the high risk to the Carmel aquifer by pollution in the Oren stream.

Tracer mass flux curve (Uranine concentration x spring discharge) at Ein Ziv had two distinctive peaks. The average flow rate (87m/hr) and dispersion (α_L=28m), as was found by the best fit to the *Single Fissure Dispersion Model* of the first peak breakthrough curve, and the high recovery of the tracer clearly indicate conduit flow of karst aquifer. The second tracer peak coincided with a sharp increase in discharge following a major rainstorm and stream flow, which was interpreted as piston flow response at that conduits' flow system. Following this tracer peak a further increase in discharge resulted in dilution of uranine and TDI concentrations, temperature decrease and turbidity peak; All of those are indicators of event water which infiltrated by quick preferential flows, and were ~40% of spring discharge in this recharge event.

The Latest Cretaceous oil shale sequence in the Negev, Israel: Paleobiological implication inferred from foraminifera

Ashckenazi-Polivoda S. [1, 2], Abramovich S. [1], Schneider-Mor A. [1], Feinstein S. [1], Almogi-Labin A. [2]

1. The Department of Geological and Environmental Sciences, Ben-Gurion University of the Negev
2. The Geological Survey of Israel, Jerusalem

The late Cretaceous organic-rich succession in Israel is part of an extensive high productivity upwelling regime that persisted over ~20 m.y. in the southern margins of the Tethys. Such systems, characterized by high nutrient levels, are often associated with oxygen deficient bottom water and by accumulation of phosphates, porcelanites, cherts and "oil shales" (=organic rich carbonates). The deposition of a ~45 m thick oil shale sequence in the Negev, Israel, indicates a major change in the evolution of the high-productivity regime and reorganization of the marine ecosystem.

Here we propose to reconstruct the paleobiological developments of the Late Cretaceous upwelling system, Negev region, by using high-resolution records of planktic and benthic foraminifera. These allow us to describe in great detail the large and small scale variations during the last phase of the upwelling system activity up to it final demise. We focus on the time interval from top Phosphate Member throughout the Oil Shale (OSM) and up to the base of the Marl Members.

Our new planktic foraminiferal biostratigraphy indicates that the oil shale sequence in the Negev spans only ~1 m.y. from ~70-69 Ma (early Maastrichtian), and reveals high sedimentation rate of ~4 cm/kyr. This high accumulation rate will allow us to identify and characterize in great detail the last phase in the dynamic of this long lasted upwelling system.

Both, planktic and benthic foraminiferal assemblages record major changes at the transitions between the top Phosphate Mbr. and the overlying OSM and between the OSM and the Marl Mbr. The Phosphate Mbr. is characterized by the dominance of specializing buliminids, known to be associated with dysoxic to nearly anoxic conditions at the sea floor. Planktic foraminifera are rarely present in this interval, but abruptly appear in great quantities and high diversity at the base of the OSM. At the same time, the buliminds are replaced by rotaliids, suggesting an increase in bottom water aeration. The intermediate water dwellers, keeled globotruncanids, start to appear shortly above the base of the OSM, supporting our notion that this transition involves a probable deepening and increasing ventilation of the intermediate water. The OSM to Marl Mbr. transition marks another important paleoenvironmental change as indicated by changes in assemblage composition and further increase in planktic foraminiferal abundance and diversity. These changes represent a further increase in bottom water aeration, water column deepening and the probable ending of the enhanced upwelling activity in this region.

Mapping faults by using ambient noise measurements: an example from Afula, Israel

Ataev G., Zaslavsky Y., Gorstein M., Kalmanovich M., Aksinenko T., Giller V., Perelman N., Livshits I., Dan I., Giller D., Shvartsburg A.

Seismology Division, Geophysical Institute of Israel, P.O. Box 182, Lod, Israel

Ambient noise measurements at 330 locations were carried out within the area of the town of Afula and neighboring settlements. Most of the study was conducted in the Afula Depression which is filled with a volcano-sedimentary sequence of Neogene age and young alluvial sediments. Lower Basalt of Miocene age is outcropping at the northeastern part of study area.

The observed H/V spectral ratios indicate the presence of two reflectors: the Lower Basalt that is responsible for the first resonance frequency and the Cover Basalt of Upper Pliocene or the Quaternary conglomerate at the southeastern part of study area which are responsible for a secondary resonance frequency. The spatial distribution of both frequencies and their associated H/V amplitude were mapped.

Results of ambient noise measurements were used for modeling the subsurface. This involved integrating H/V spectral ratio information with available geological, geophysical and borehole data. Parameters of the 1D subsurface models, i.e., soil layers and their associated thicknesses and S-wave velocities were estimated, forming a coherent 3D picture of the subsurface in the area under study.

Based on these results, we constructed three geological cross sections in which we detected faults cutting the basaltic bedrocks of Neogene age and are located concurrently to known deep faults of Cretaceous age. We suggest that those faults were also active in the Neogene when the Afula Depression was formed. We used the H/V spectra of ambient noise to map several new faults that divide the study area into structural blocks at different depths.

The carbon system in the saline groundwater in the Dead Sea area

Avramov N. [1, 2], Sivan O. [1], Lazar B. [3], Levenberg O. [2], Yechieli Y. [2]

1. Department of Geological & Environmental Sciences, Ben Gurion University of the Negev katzavn@bgu.ac.il
2. Geological Survey of Israel, Jerusalem
3. The Institute of Earth Sciences, The Hebrew University, Jerusalem

Dead Sea (DS) level has been decreasing in the last 30 years by 20 meters. As a result, the fresh-saline groundwater interface (FSI) has been moving downward and towards the DS, replacing saline groundwater by fresh groundwater. The drop of the FSI is accompanied by a change in the nature of water/rock interactions processes, among them those having significant environmental impacts, e.g. the "sinkhole" phenomenon. The purpose of this research is to quantify the dynamics and the major geochemical processes of the saline groundwater in this dynamic system, focusing on the carbon species. This is by measuring the chemical composition and the stable and radioactive isotopes in the groundwater of the Arugot wadi alluvial fan at variable distances of the DS shore. The analyzes includes major ions, methane (CH_4), total alkalinity, dissolved inorganic carbon (DIC), $\delta^{13}C$ of the DIC ($\delta^{13}C_{DIC}$), $^{14}C_{DIC}$ and tritium (^3H).

Our preliminary results reveal three water types: springs fresh water and DS brine as two major end-members and En Qedem brine as an intermediate component. The most saline groundwater is very close in chemical composition, DIC (~0.7mmol/KgH_2O) and $^{14}C_{DIC}$ content (~80pmc) to the DS but has much lower $\delta^{13}C_{DIC}$ values (-10‰ PDB as compare to 2.75‰ PDB of the DS). Mass balance of ^{13}C suggests that only a small portion of the DIC that originated from CH_4 oxidation can account for the observed negative $\delta^{13}C_{DIC}$. Indeed, CH_4 was found in most wells sampled in the area. The ^{14}C content of the groundwater brine decreases and its DIC increases at a distance from the DS shoreline. The groundwater brine mixes at the FSI to a salinity of 2,000 to 5,000 mmolCl/KgH_2O . As compared to the groundwater brine close to the DS shore, the ^{14}C values at the interface is lower (~ 40 pmc), the DIC is higher (~2.3 mmol/KgH_2O) and the $\delta^{13}C$ is slightly heavier (~-8‰). This may indicate that the FSI represents mixing with old fresh groundwater that dissolved some $CaCO_3$.

Rifting in Africa: earthquakes, dike intrusion, and violent ash eruptions of the Oldoinyo Lengai carbonatitic volcano, Tanzania, 2007

Baer G. [1], Hamiel Y. [1], Shamir G. [1], Nof R. [1,2]

1. Geological Survey of Israel, 30 Malkhe Yisrael St., Jerusalem 95501, Israel
2. Department of Geological and Environmental Sciences, Ben Gurion University of the Negev, Be'er Sheva 84105, Israel.

An earthquake swarm struck the North Tanzania Divergence, East African Rift over an 11 week period between July and October 2007. It produced approximately 70 M>4 earthquakes (peak magnitude Mw 5.9), and extensive surface deformation, concurrent with eruptions of the nearby carbonatitic Oldoinyo Lengai volcano. The spatial and temporal evolution of the entire deformation event was resolved by Interferometric Synthetic Aperture Radar (InSAR) observations, owing to a particularly favorable acquisition programming of the Envisat and ALOS satellites, and was verified by detailed ground observations. Elastic modeling based on the InSAR measurements clearly distinguishes between normal faulting, which dominated during the first week of the event, intermittent episodes of combined dike propagation and dike-induced faulting during the following month, and a gradual decline in the intensity of deformation over the final weeks. Our models suggest that faulting occurred mainly at the continuations of and parallel to propagating dike segments. Two days after the peak earthquake, eruption began at the nearby carbonatitic Oldoinyo Lengai volcano. A similar temporal association of earthquake swarms followed by major explosive ash eruptions has been observed at Oldoinyo Lengai over the last half century. These observations, along with the very low calculated static stress changes induced by the 2007 earthquake swarm at Lengai, suggest that dynamic stress triggering is a key factor that determines the timing and characteristics of explosive ash eruptions in the Lengai volcano.

Numerical simulation of mechanical layering in sedimentary rock masses: a new hybrid geoDFN-DDA approach

Bakun-Mazor D.[1], Hatzor Y.H. [1], Dershowitz W. [2]

1. Dept. of Geological and Environmental Sciences, Ben-Gurion University of the Negev, Beer-Sheva 84105, Israel.
2. Golder Associates Inc. 18300 NE Union Hill Rd, Redmond, WA 98052 and Dept of Civil and Environmental Engineering, University of Washington, Seattle WA.

Sedimentary rocks exhibit a geological structure known as "mechanical layering" where vertical to sub-vertical joints are bounded by bedding plane boundaries, and a ratio between bed thickness and joint spacing is typically defined. This paper demonstrates the use of geologically based discrete fracture models (geoDFN) which incorporate the "mechanical layering" concept and its integration with the powerful block cutting algorithm (DC) of the numerical discontinuous deformation analysis (DDA) method. As such, we propose a new hybrid geoDFN-DDA approach which can simulate natural and complex geological structures. Once the geoDFN-DDA block mesh is obtained, a more realistic forward modeling of discontinuous deformation can be performed.

The geoDFN-DDA approach begins by generating a three dimensional, mechanically layered fracture pattern. In this study we use FracMan® which allows us to assign different statistical distributions to the different structural parameters and to impose realistic geological constraints of mechanical layering on the generated fracture network. For the purposes of the 2D-DDA analysis, a 2-D trace plane is then cut through the three dimensional discrete fracture network to provide a 2D trace model which can be simulated using DDA. All trace lines generated by DFN on the trace plane of interest are then imported into the DDA line generation and block cutting programs for the computation of the block mesh. In the resulting block mesh all block areas, centroids, and edge coordinates are stored in a format accessible for geomechanical analyses.

This approach is demonstrated for two case studies of the computation of rock mass deformations around underground opening. These case studies provide a comparison of DDA analyses using the previous statistically based DFN approach, and the new geologically based geoDFN approach. For the case studies presented, the stability of the immediate roof above the opening is not dependent on accurate modeling of mechanical layering. However, surface settlements above the underground opening are sensitive to the accurate modeling of mechanical layering geometries.

Late Eocene – Early Oligocene reshaping of the Levant continent-ocean transition

Bar (Farago) O. [1,2], Gvirtzman Z. [1], Feinstein S. [2], Zilberman E. [1]

1. Geological Survey of Israel, 30 Malkhe Israel St., 95501 Jerusalem
2. Department of Geological and Environmental Sciences, Ben Gurion University of the Negev, 84105 Beer Sheva

During the widespread Middle Eocene marine transgression, a large part of Arabia was covered by seawater. Later, the northwestern part of Arabia emerged while subsidence of the Levant basin accelerated. In this study we focus on Late Eocene – Early Oligocene tectonic event which vertically separated those domains and further suggest that this event may be related to the onset of Arabia-Eurasia collision.

Previously, we showed that prominent Late Eocene – Early Oligocene vertical movement significantly reshaped the continental margin of central Israel, by reactivation and emphasis of three structural steps between the Levant basin in the west and Judea mountains plateau in the east. Young reactivation and formation of prominent flexure along the eastern margin of the Levant basin was described also in northern Lebanon. We suggest that the Judea mountain plateau is tectonically, stratigraphically and morphologically the western continuation of the Arabian plateau, which was shaped during the Oligocene, about 10-15 Ma prior to the formation of the Dead Sea Transform. Therefore, the vertical movement described above represents a tectonic event that vertically separated the Levant basin from the Arabian plateau. This general setting wasn't significantly modified during the later breakup of the Arabian plateau by the Dead-Sea Transform, because the lateral motion along the transform did not significantly change the regional isostatic balance except for short wavelength deformation at its immediate vicinity.

Therefore, the current morphology of the Levant margin and the northwestern Arabia was mainly reshaped by a short (ca. 5 Ma) tectonic event in the Late Eocene–Early Oligocene. This event reactivated structural steps and increased the structural difference between the Levant basin floor and the Arabian inland by at least 1.5 km, and probably 2.5-3 km. Unlike the Senonian folding phase of the Syrian Arc deformation, which was mainly characterized by horizontal shortening over many short wavelength folds, this event is characterized by a prominent vertical deformation along few specific lines, which are discontinuously aligned along the northwestern margins of the Arabian plateau. In a wider perspective, this event is contemporaneous with the onset of the Arabia-Eurasia collision along the Bitlis-Zagros suture of the Arabian northern margin, and may be related to it.

Contaminant transport through a thick vadose zone underlying a dairy farm

Baram S. [1], Arnon S. [1], Gross A. [1], Ronen Z. [1], Cohen K. [2], Pankratov I. [2], Dahan O. [1].

1. Department of Environmental Hydrology & Microbiology, Zuckerberg Institute for Water Research, Blaustein Institutes for Desert Research, Ben-Gurion University of the Negev, Sede Boqer Campus, Israel
2. Israel Water Authority

Seepage from a dairy-farm waste lagoon to the underlying aquifer and its impact on groundwater quality were measured in a typical dairy farm in the Be'er Tuvia region. The lithology at the study site consists of an 8-m clay layer overlying sand and calcareous-sand layers. The groundwater table is situated at a depth of 47 m. The distribution of contaminants under the dairy farm was estimated from sediment extractions and pore-water samples. The latter were taken using a vadose-zone monitoring system (VZMS) that was installed to a depth of 30 m. The VZMS includes 10 flexible TDR probes, thermocouples and pore-water-sampling cells at depths of 0.5, 1.4, 2.5, 3.5, 10.5, 15.5, 20.5 and 30.5 m. The VZMS facilitates frequent sampling of pore water, as well as continuous measurements of water content and temperature distribution. Spatial and temporal changes in the water-content profiles following rain events were observed only within the clay layer (down to a depth of 6.5 m). No variations in water content were observed in the deep sandy section of the vadose zone, probably due to near-steady-state flow conditions. The pore water contained high concentrations of nitrate (500-1000 mg/L) and chloride (2000-4000 mg/L), suggesting direct leaching of salts to the groundwater. Chloride and nitrate concentrations in the groundwater underneath the farm were twofold and fivefold, respectively, the regional average. These data show that although the dairy-farm industry is undergoing a major reform, there is still significant risk to groundwater quality from manure leachates that are stored in the vadose zone. Understanding contaminant transport and degradation processes within the vadose-zone sediments will support the development of remediation strategies to minimize the legacy from dairy-farm wastes.

High resolution magnetic measurements at Mount Amram

Bass M. [1,2], Steinitz G. [1], Marco S. [2]

1. Geological Survey of Israel, 30 Malkhe Israel St., Jerusalem 95501, Israel
2. Dept. of Geophysics and Planetary Sciences, Tel Aviv University, Tel Aviv 69978, Israel

An experimental system based on magnetic gradiometry is set (by SNRC, SOI and GSI) at the Geophysical Observatory at Mount Amram with the aim of detecting geodynamic activity near the Dead Sea fault. The observatory, which is located in a tunnel excavated in Precambrian granitic rocks, is used as a geophysical observatory for seismic, radon and long-term magnetic measurements. Structurally the tunnel is excavated in an elevated block along the western margin of the southern Arava Rift west of the Dead Sea Transform (DST). The tunnel is 172 m long north to south and 35 m long east to west. The location of the observatory, and the environment in it, make it a unique place for magnetic observations. The fact that other measurements are carried out in the tunnel, such as radon and seismic measurements, makes it possible to compare geodynamic phenomena observed by different methods.

The SuperGrad (SG) system measures long term magnetic observations using magnetometers that were produced by GEM Systems, Canada. The Super-Magnetic-Gradiometer System is scientifically and technologically unique, being the only gradiometric system that operates in that way in the world. The main aims of this research are to study the abilities of this unique magnetic system, to map and classify the different signals that are observed with such a system and to relate them to different phenomena (geodynamic, anthropogenic, atmospheric etc.).

The SG System comprises of three magnetometers that measure the Earth's total magnetic field at 20 Hz and a DIDD magnetometer (Delta Inclination, Delta Declination) that measures the components of the magnetic field once every 5 seconds. We use each pair of magnetometers as a gradiometer, when using the difference of the total magnetic field from each pair of magnetometers. The small distance between the magnetometers is supposed to eliminate changes in the measured magnetic field due to distant, but the outcome is not as expected. Daily variations are observed in the gradiometer data, and far field variations such as magnetic storms can also be seen in the gradiometer data. A best fitting algorithm (Ginzburg et al., 2004) is used to remove the daily variations and the magnetic storms disturbances in order to examine only the differences in the near field magnetic field. The correction reduced the envelope of the variations of the 3 magnetometers by one order of magnitude at least.

Ginzburg, B., Shirman, B., Steinitz, G., Zafrir, H., 2004, Influence of local field inhomogeneity on the accuracy of precise total magnetic field monitoring: Measurement of Science and Technology, v. 15, p. 2370-2374.

Crustal evolution in the northernmost Arabian-Nubian Shield: a new perspective from the Nd-Hf isotope record

Be'eri-Shlevin Y. [1], Katzir Y [1], Kleinhanns I.C. [2], Blichert-Toft J. [3]

1. Department of Geological and Environmental Sciences, Ben-Gurion University, Beer Sheva, Israel, beeriy@bgu.ac.il
2. GZG – Isotopengeologie, Georg-August Universität, Göttingen, Germany
3. Laboratoire des Sciences de la Terre, Ecole Normale Supérieure, Lyon, France

Whole rock Nd and Hf isotope ratios of batholithic calc-alkaline (CA, ~635-590 Ma) and within-plate alkaline (AL, ~610-580 Ma) magmatic suites co-vary and are systematically spatially zoned within the northernmost Arabian-Nubian Shield (ANS). The radogenic isotope ratios define three NE-SW trending zones within Sinai (Egypt), and southern Israel. The NW zone, which extends from southern Israel (excluding the Timna complex) to the NW margin of the exposed basement in Sinai, is characterized by εNd values between +0.9 and +4.7 and εHf values between +5.1 and +8.5. The SE zone that comprises the southern tip of Sinai has much higher εNd and εHf values of +4.4 to +5.6, and +8.3 to +13.9, respectively. In the geographically intermediate zone the εNd and εHf values are highly variable and overlap the ranges defined for both the NW and SE zones. The NW zone includes the remnants of several Island Arc Complexes (IAC: Elat, Feiran and Sa'al) that developed at 820 to 740 Ma, prior to the onset of the batholithic CA magmatism. Recalculation of εNd values of the older IAC rocks to T=600 Ma reproduces values that are indistinguishable from the εNd of CA and AL rocks of this age (+0.9 to +4.7; average: 2.8±0.9, 1σ). Thus, recycling of material equivalent to that exposed in the older IAC is a viable mechanism to form the CA and AL magmas in the NW zone. In contrast, recycling of such NW IAC material cannot account for the εNd values of the SE zone. The data for the Timna complex is ambiguous and does not fit with its location in the NW zone. The Nd isotope provinciality recorded in Sinai and southern Israel can be extended to Jordan and the Eastern Desert of Egypt. Thus the isotope zoning bears important implications for the sources of magmas in the whole northernmost ANS and allows a testing of the 'mantle plume' origin previously suggested for the ANS (Stein and Goldstein, 1996). Our new data indicate that, in the NW zone, recycling of IAC material, possibly derived from the mantle-plume of Stein and Goldstein (1996), occurred during the period of CA and AL magmatic activity. However, in the SE zone CA and AL magmas were derived from recycling of a different source, which was separated from a "normal" depleted mantle reservoir at 800-900 Ma. Thus, while the mantle plume (Stein and Goldstein, 1996) model successfully explains some important features of the evolution of the northern ANS, its extent both spatially and temporally should be re-evaluated with the new data presented here.

Stein, M. and Goldstein, S., 1996, From plume head to continental lithosphere in the Arabian-Nubian Shield, *Nature*, 382, 773-778.

The Rishon West Canyon in central Israel and its implications on Tertiary drainage systems of the Levant margin

Ben-Gai, Y.

The Geophysical Institute of Israel, POB 182, Lod, 71100.

A proposed gas play in the Rishon West area southeast of Jaffa has been investigated using both old and newly acquired seismic reflection profiles. The combined dataset revealed the existence of succession of late Miocene channels cutting through a few hundred meters of Miocene and older beds and oriented in a WNW direction. The channel is relatively wide under the present coast line and becomes a meandering canyon inland. If the channel is indeed of late Miocene age, than evaporites of the Mavqi'im Formation and volcanic rocks of the National Park Formation may occur and explain the strong intra-channel reflectors. This canyon may be connected to the deep-cutting channel that was observed under the Palmahim Disturbance on the continental shelf and slope.

The Rishon West channel is part of a wide-spread drainage system that prevailed during the late Miocene desiccation of the Mediterranean. The Messinian sea-level fall explains the extent and magnitude of these canyons. Channels of considerable size that have been mapped and drilled in the offshore suggest an Oligo-Miocene system but, in contrast to their suggested onshore extensions, they have not yet indicated long distance transport of coarse clastic material. The growing exploration interest in Oligocene and Miocene reservoirs in the Levant Basin is directly connected with this observation. Existence of considerable reservoir rocks within these channels or surroundings should be supported by a sizeable drainage system onshore. Canyons like Rishon West might have been active earlier and been re-cut and filled later, but may also suggest a limited Oligo-Miocene system and extensive Messinian one. The outcome might be that Oligo-Miocene reservoirs in the basin, if exist, were fed by a different source such as an "ancestral" Nile and not by an eastern Levant Margin system.

Rate and state friction experiments in direct shear.

Biran O. , Hatzor Y.H. , Ziv A.

The Department of Geological and Environmental Sciences, Ben-Gurion University of the Negev, P.O. Box 653,Beer- Sheva,84105.

The slip of solid materials on pre-existing planes is resisted by friction. Many geological and geophysical problems such as slip along faults, detachment of blocks along weakness planes and slope instabilities are governed by friction resistance. Most of our understanding of friction behavior is based on laboratory experiments. According to the classical view of Amonton's law, the coefficient of friction is constant and is equal to the ratio between the shear and the normal stresses, i.e. it is independent of the surface area. More recent friction experiments, however, show that the friction coefficient is not constant, but instead it depends on the logarithm of sliding velocity and contact age (Dieterich 1979). This constitutive relation is commonly referred to as the rate-and-state friction law. To date, rate and state effects were only observed with servo controlled double-shear apparatus. We would like to know whether those results can also be reproduced by the direct shear apparatus that is available to us. At this preliminary stage, we have performed four types of experiments on Timna Granite samples: slide–hold–slide, velocity stepping, normal stress stepping, and direct shear under constant normal stress and shear rate. We will show that we are able to reproduce the results of the rate-and-state friction that were previously obtained with double-shear apparatus. Encouraged by these preliminary results, we plan to perform experiments on additional types of rocks, and to examine the effect of normal stress oscillations during slip.

The risk of flash floods damages to the "peace conduit" (Red Sea- Dead Sea Conduit): A GIS approach

Calvo R. Shirav M.

The Geological Survey of Israel. 30 Malkhe Israel St., Jerusalem

The renewed interest in the construction of a conduit to pipe water from the Elate to the Dead Sea (termed "The Peace Conduit" or "Red-Dead Canal"), has focused public attention mainly on the future and fate of the Dead Sea, i.e., the potential impact on its limnology, geochemistry and biology. However, the path of the proposed conduit along the Arava Valley will initiate a variety of design challenges due to numerous geo-environmental factors: immediate proximity to shallow groundwater resources; flash-flood risks to open/near surface sections of the conduit; a cluster of tectonic related features such as high seismicity, active faults, high amplification potential of the sediments and recent surface displacements.

A comprehensive GIS database has been established during this study in relation to the infrastructure and environmental aspects of the Arava Valley, and will be used as a basis for future updates. The database includes various geological and lithological maps, geomorphologic maps, well logs and associated information, digital elevation models (DEM), maps of potentially active faults, and potential amplification of earthquake vibrations.

Five possible alignments for the future water carrier were studied by the Harza JRV Group. These routes were examined from environmental, technical and economic point of view, and the eastern alternative was recommended as the most favorable. This alignment will include sections which are very close to the surface or are planned as open canals, and will thus be vulnerable to flash floods both during construction and continuous operation.

In order to evaluate the potential hazard from flash-floods to the open/near-surface sections of the proposed canal, a physiographic analysis of the Arava basin was carried out. On the basis of the elevation model, the drainage pattern of the area was computed. The junction points between the open/near-surface sections of the proposed eastern alignments and the watershed layer were identified, and the surface area of the relevant watersheds was calculated.

The volumes of flash floods for every watershed were calculated according to the following parameters: area, elevation and slope distribution, exposed rock units and the average total rainfall on each watershed. The maximum discharge for each watershed was calculated as a function of the watershed area, the lithological units exposed and the height of the conduit above the local stream. The potential risk to the conduit as a result of these maximum discharges was evaluated and categorized into high, medium and low risk, watersheds in the northern part of the Arava all present high risks, those in the central Arava Valley are mainly categorized as medium-low risk, and those in the southern part are classified as presenting a high risk to the Red-Dead Canal.

Dust sources inferred from the spatial grain size distribution of top-soils across the Negev desert

Crouvi O. [1,2] , Amit R. [1], Enzel Y. [2]

1. The Geological Survey of Israel, 30 Malkhe Israel St., Jerusalem, 95501
2. The Institute of Earth Sciences, The Hebrew University, Givat Ram, Jerusalem, 91904

Dust (silt and clay fractions) affect all soils in Israel. Recently we showed that the proximal dust source (coarse silt fraction) of the late Pleistocene loess in the Negev is the Sinai and NW Negev sand dunes. To examine the possibility that this source also supply most of the recent coarse dust in the Negev, we examined the spatial grain size distribution of the top soil (A horizon) across the Negev. These patterns are presumed to reflect present-day and very recent dust deposition. We used >300 records stored in a soil profile database we constructed based on previously published data and on data collected in field surveys during this study. Using Kriging algorithm we interpolated in between grain size data points and generated maps of the spatial distribution of the sand, silt and clay fractions. The results show distinct zoning of grain size fining away from the NW Negev sand sea. Obviously, the sand fraction is highest at the dunes; it gradually decreases with increased distances to north, east and south towards the mapped loess deposits of the northern-central Negev. The distribution of the silt fraction mirrors the distribution of the sand fraction. It is the lowest in the dune area; gradually increase to the north, east and south to the direction of the loess, where it exhibits the highest values. The clay fraction shows the highest values in the SW foothills of the Judean Mountains and in the Arava valley; the lowest fraction of clay is in the sand dunes. The spatial pattern of the clay fraction is more complex than the sand and silt fractions but generally follows the pattern of the silts; it has, however, a better association with the rainfall isohyets. The interpolated maps, together with recent local dust storm analysis and our previous findings from the late Pleistocene loess analyses, strengthen the hypothesis that the sand dunes are the proximal source for the coarse silt fraction in the dust during the late Pleistocene as well as more recently. We suggest that the silt fraction is formed from the sand in the dune area by eolian abrasion of sand grains during local to regional dust storms; these grains are then deposited with distance downwind, mainly through dry deposition. Therefore, maximal values of the silt fraction represent their effective transport distance from the dune fields. On the other hand, the clay and probably the fine silt fractions probably have two sources: (a) the local sand dunes, from which these fractions are transported similar to the silt grains, and (b) distant sources including the Sahara, in which these fractions are transported with long-distance regional dust storms. This distant finer dust is easier to settle by wet deposition and thus partly follows the regional rainfall pattern.

Change in the Negev loess grain size distribution during the Pleistocene indicates sand dunes as the proximal source for coarse (50-60 μm) dust

Crouvi O. [1,2], Amit R. [1], Enzel Y. [2], Porat N. [1], Sandler A. [1]

1. The Geological Survey of Israel, 30 Malkhe Israel St., Jerusalem, 95501
2. The Institute of Earth Sciences, The Hebrew University, Givat Ram, Jerusalem, 91904

Grain size analyses of three hilltop, primary eolian loess sequences in the Negev desert, southern Israel, show bimodal grain size distribution at 50-60 μm and 3-7 μm. Using mineralogy and OSL dates we show that the coarser mode is composed mostly of quartz grains and its relative magnitude increases regionally with time, suggesting a time-transgressive enhancement of the proximal dust source compared to a distal, background contribution of Saharan finer grain dust. The only proximal dust source that can supply large amount of coarse silt quartz grains, in the carbonate terrain of the Negev, is the quartz sand sheets and dunes. These sands advanced into Sinai and the Negev concurrently with the loess accretion during the Late Pleistocene as a result of the exposure of the Mediterranean shelf. We therefore propose that most of the coarse quartz silt grains were formed by eolian abrasion within or at the margins of the advancing sand sea. Additional direct source can be the exposed Mediterranean shelf. This relationship between desert sand seas as a source for proximal coarse dust and desert margin loess deposits is also proposed as the primary model for other worldwide deserts such as Northern Africa (Tunisia), China, and Australia.

Hyperspectral mineralogical mapping of the Arava valley, Timna Valley and Eilat mountains- Preliminary results

Dadon A. [1], Karnieli A. [1], Ben Dor A. [2]

1. Ben-Gurion University
2. University of Tel-Aviv

Starting from the early 1980's *hyperspectral imagery* - HSI (also termed *Imaging Spectrometry*- IS) using airborne sensors has been available and applied mainly for geological applications. The high spectral resolution of the HSI enables the acquisition of images in many narrow contiguous spectral bands, producing detailed spectral reflectance curves for each pixel. This technology enables detection of on surface minerals by their specific spectral absorption features across the 0.4-to 2.5 μm spectral region where the high spectral resolution enables quantitative analysis of every pixel in the image. On November 2000, NASA launched the first hyperspectral space borne system named Earth-Observing-1 (EO-1) Hyperion. Providing for the first time a global hyperspectral view. Observing ground features from space with high spectral resolutions on a regional scale holds great advantages for geological/mineralogical mapping. Several works have been done using the Hyperion data for geological applications. However the present data quality of the sensor permits no accurate analysis as compare to airborne HIS missions. As the data are relatively new the methodologies for analyzing Hyperion data are still under investigation.The current study was conducted in order to explore the Hyperion feasibility to map the geology and mineralogy arena over the Arava and Timna valleys and Eilat mountains. The desert arid area with low vegetation cover and high reflectance and visibility, the geological section from Precambian to recent formations and the variability of the mineral assembledges makes the research area a potentially good site for feasibility study of the Hyperion HIS data. Preliminary results of classified rock formations of the western Arava valley region, Timna Valley and Eilat mountains which will be used for geological and minerological (30 m pixel) thematic mapping are presented.

How the geological structures of the Judea Mountains affect the groundwater flow regime at the Yarqon-Tanninim basin?

Dafny E [1], Burg A. [2], Gvirtzman H. [1]

1. Institute of Earth Sciences, The Hebrew University of Jerusalem, 91904 Jerusalem, Israel
2. Geological Survey of Israel, 95501 Jerusalem, Israel

The Yarqon-Tanninim basin, one of the major groundwater sources in Israel, stretches over a large lowland area at the west of the country and over the central mountainous region, where it is replenished. At the lowland, where the aquifer is confined, groundwater flows north in a gentle gradient, toward the historical outlets at the Yarqon Springs and the Tanninim Springs. Groundwater heads at Beer Sheva in the south, Petah Tiqwa in the central and Menashe and Taninim in the north were 27, 23, 18 and 5m., respectively. Occasionally, at some rainy winters, groundwater piles up at the central part of the confined basin, as observed at the Ayalon and Gezer wells. Consequently, a local water divide is formed and groundwater flows either to the south or to the north. The extent of this periodical groundwater piling was not clearly explained up until now. We found that the periodicaly groundwater pile is formed as a result of the unique groundwater flow field at the Judea Mountains.

The groundwater flow field at the Judea Mountains is controlled by the main geological features, namely Ramalla, Hebron and Ma'on anticlines. Generally, groundwater from neighboring anticlines converges at the synclinal areas in-between (En-Karem and Hebron local basins, respectively) to form a major flow paths, which directed south-westwards, along the synclinal axes. Therefore, most of the recharge at the Judea Mountains reaches the confined zones through two "entrances" – narrow zones, located at the western edge of each syncline: Ajur and Tel Shoket entrences, respectively. At some rainy winters, the heads in the Ajur area rise quickly in response to large quantity of recharge from the Jerusalem area to form a temporal local groundwater divide. Albeit, intensive pumping at the Ajur area conceals the natural mounding, which can only be seen in distant wells (e.g. Gezer and Ayalon wells). On the other hand, groundwater mounding doesn't occur at Tel-Shoket area because: (1) the recharge at Hebron Mountains is much lower than that at the Jerusalem Mountains, and (2) there are several sub-aquifers at the Hebron area which restrain the winter flux before it reaches the confined zone. Groundwater mounding doesn't occur either at the foothills of the Samaria, due to much simple geological structure there.

To verify and quantify the above hypothesis we built a 3D numerical model using FEFLOW. The model simulate groundwater flow at the Judea Group aquifer over the Yarqon-Tanninim basin. It was calibrated for the period of 1987/8 – 2003/4 until agreement was achieved between measured and calculated heads (Dafny et al., 2008). Simulations are successfully modeled the seasonal groundwater fluctuations at the confined part of the aquifer, including the En-Karem – Ajur mound, in agreement with conceptual considerations.

The character and composition of fluid in equilibrium with peridotite in subduction zones: Partial results of lab experiments

Dvir, O., Kessel R.

Institute of Earth Sciences, The Hebrew University of Jerusalem, Jerusalem, 91904

A large part of the subducting lithosphere is built of peridotite rocks. These rocks are rich in hydrous minerals releasing their water during subduction from 50 up to 180 km depth. Water in the mantle enhances rock melting as well as influence melt composition. This melt rises and erupts as volcanoes building the continental crust.

Therefore, the character and composition of fluids in equilibrium with peridotite are essential to understanding the evolution of subduction zone.

Two kinds of fluid exist at upper mantle conditions:

1. A liquid phase – rich in H_2O (40%-100%), the rest is dissolved matter.
2. A melt phase –rich in dissolved matter, containing up to 30% H_2O.

With increasing pressure and temperature the H_2O content in the melt increase as well as the dissolved matter in the liquid until the two fluid phases are indistinguishable and a supercritical phase exists.

So far, little information exists on fluid composition in equilibrium with mantle rocks due to experimental and analytical difficulties. In order to circumvent these problems and to allow direct analysis of fluid composition, we took the following steps:

The use of a diamonds trap to isolate the fluid phase while keeping it in equilibrium with the solid material. The use of the rocking multi anvil to allow complete equilibrium between the fluid and the solid phases. The use of the freezing approach developed by Kessel et al. to prevent the evaporation and fractionation of the lquid phase during opening of the capsule.

Experiments were done between 4 and 6 GPa and 700^0C to 800^0C. First, the liquid phase was analyzed using the Laser ablation – ICP-MS in collaboration with Dr. Thomas Pettke at the University of Bern, Switzerland. The solid phases were analyzed using the electron microprobe in the Institute of Earth Sciences at the Hebrew University of Jerusalem.

Currently, we have results for 4 GPa. Olivine, CPX, OPX, and chlorite are the solid phases at 700°C. Chlorite changes to 10Å at 750°C. Only olivine and CPX exist at 800°C. The liquid phase at 700 and 750°C contains ~80 wt% indicating it is a fluid phase. At 800°C, the liquid phase contain ~50 wt%, indicating a hydrous melt phase. These results imply a solidus between 750 and 800°C at 4 GPa.

The Dead Sea sinkhole hazards – new findings based on the multidisciplinary geophysical study

Ezersky M. [1], Legchenko A. [2], Al-Zoubi A. [3], Camerlynck C. [4]

1. Geophysical Institute of Israel, P.O.Box 182, Lod 71100, Israel
2. IRD-LTHE, BP 53, 38041 Grenoble Cedex 09, France
3. Al-Balqa Applied University, Salt, 19117, Jordan
4. UMR 7619 Sisphe, Université Pierre and Marie Curie, 4 place Jussieu, 75252, Paris Cedex 05, France

1. In the framework of NATO Science for Peace Project SfP 981128 a field study has been performed out (Ezersky et al., 2005). Scientifically, the goal of the study is *to develop an integrated approach for prediction of natural hazards caused by the development of sinkholes in the Dead Sea region of Israel and Jordan through the joint application of hydrogeological and geophysical studies.*

2. Methods: A new approach using geophysical methods for sinkhole hazards assessment at the Dead Sea coastal areas in Israel and Jordan comprises following objectives: (a) Salt mapping in the subsurface using seismic refraction method; (b) the study of hydrogeological conditions using Transient Electromagnetic (TEM) and Magnetic Resonance Sounding (MRS) techniques.

3. Results: (a) The Seismic Refraction technique based on the General Reciprocal Method (GRM) has revealed that the salt outer edge (that is western in Israel and Eastern in Jordan) is a major indicator of the sinkhole hazard. Interpretation of the seismic refraction data acquired in the 11 sites of the western DS coastal area (Israel). Sinkholes as a rule are formed along the salt edge some west in Israel and east in Jordan. Perhaps in some cases faults cross the salt edge complicating the pattern of the sinkhole distribution (Mazor, Hahal Hever). (b) The MRS method allows characterizing aquifers and delineating water filled karst caverns. MRS monitoring was carried out in the sinkhole site. MRS results obtained between November 2005 (first survey) and March 2007 (second survey) reliably revealed that after sinkhole collapse karst voids are filled with unconsolidated rocks worsening the soil hydraulic conductivity in vicinity of the salt edge. Development of new karst voids after sinkhole appearance was not observed. (c) TEM FAST results show slight alternations of the bulk resistivity during some years of study. Soil resistivity in the salt vicinity does note extent 1 testifying that pores are filled with the Dead Sea brine. The resistivity increase is associated rather with lithological changes in the subsurface after sinkhole collapse than with the water salinity changes.

4. Conclusions: Results of our geophysical study allow concluding that sinkholes are developing along the salt edge where consolidate salt material is corrupted by karst caverns. Refill of the karstic cave by the collapsing material worsens the hydraulic conductivity of soil and slows down the salt dissolution. It is likely that karstic caverns are a result of continuous salt dissolution during a few thousands years and not a rapid dissolution during a few tens of years as is suggested by actually accepted model of sinkholes formation.

Acknowledgements

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The characterization and mapping of pollutants in the coastal aquifer Tadiran/Tadirgan Plant Industrial Zone - Hulon

Ferdman M., Kroitoru L.

Ecolog Engineering LTD

High concentrations of Cr and TCE have been detected in several drinking-water wells that penetrate the coastal aquifer in areas adjacent to the Tadiran/Tadirgan Plant (Plant) of the Hulon Industrial Zone. This plant used metallurgic and metal coating processes. These finding resulted in the drinking-water well's closure. Following, the Israel Water Authority (IWA) conducted soil investigations at the Plant area (adjacent to drinking water well Hulon 8) and discovered high concentration of Chromium (Cr), Cadmium (Cd) and Trichloroethylene (TCE). In addition a monitoring well was constructed and revealed high concentration of TCE, Dychloroethylene (DCE), Tetrachloroethene (PCE), Trichloroethane (TCA) in the groundwater under the plant area. In order to characterize, define and assess a remediation approach IWA contracted Ecolog to perform additional site investigation activities that focused on the groundwater underlying the plant. The subject investigation included the installation of four monitoring wells in the water table region (5 m below the water table) of the coastal aquifer under the plant. The soil and water samples were analyzed for trace elements and VOC's. High concentrations of Cr and VOC's were detected in the water samples. The most common pollutant that was found in the groundwater was TCE, with a maximum concentration of 12.56 ppm. The highest concentrations were found beneath the Plant wastewater treatment and storage tanks that are suspected to be a major source for the pollution. This TCE concentration exceeds the Israeli drinking water permitted level for TCE, which is 0.05 ppm. In addition, high concentrations of Tetrachloroethene (PCE) and Trichloroethene (TCA), up to 0.22 and 0.14 ppm, respectively, were found in the sampled groundwater of the monitoring wells. These concentrations also exceed the Israeli drinking water permitted levels for PCE and TCA, which are 0.04 and 0.02 ppm, respectively. The spread of the pollutants and their concentrations under the site is indicative for more than one source.

A lava tube in the southern Hauran, Jordan, and the paleoenvironmental record of its calcite speleothems

Frumkin, A. [1] Bar-Matthews M. [2] Vaks A. [2]

1. Geography Department, Hebrew University, 91905 Jerusalem
2. Geological Survey of Israel, 30 Malkhey Israel Street, 95501 Jerusalem

The 920 m long Khsheifa Cave is one of the longest lava tubes in the the Middle-East. It developed in the Jawa flow basalt, which covers 250 km^2 east and south east of Jawa archeological site, within the "Black Desert" of northeastern Jordan. The basalt is attributed to the mid-Pleistocene Fahda Formation of the Bishriyya Group. The flow direction of the lava within the cave was to the east and than to the north. The flow direction is observed through a ~1% downstream gradient and pahoehoe flow structure in the downstream part of the cave, where partly-congealed lava along the cave floor was folded and twisted into rope-like ridges, dragged forward by the underlying molten lava. This was the final lava flow making use of the previously-formed lava tube. Increasing vesiculation and turbulence changed the flow from pahoehoe to spiny aa-type, bubble-filled ragged surface downstream. Unable to drain out, this final lava has ponded and filled the lava tube up to its ceiling, congealing and closing both downstream distributaries at the furthest north-eastern end of the cave. Aa-type flow is most typical along the downstream portion. Lava benches along the walls of the downstream portion record the position of high-level lava that had occupied the tube prior to the final stage.

Two small entrances lead into the central part of a 920 m-long tube, allowing human entry to both the upstream (in terms of lava flow direction) and downstream portions of the cave. Fluvio-eolian deposits are currently swept into the cave during storm-runoff events, covering partially the bottom of both the upstream and downstream parts of the lava tube. On February 2006 we observed the aftermath of a runoff flood event which entered the western entrance, reaching 100 m in the downstream portion, and 70 m in the upstream portion, along the modern gradient of the washed-in sediments covering the cave bottom. The flood water gradually infiltrated along these two routes, eventually disappearing into the cave bottom.

Calcite speleothems in the lava tube are dated to marine isotopic stage 7 and stage 5/4 transition using the U-Th method. The available evidence indicates general aridity of the Black Desert during most of the mid-late Quaternary, punctuated by short wetter periods, when the Mediterranean cyclones systems intensified and penetrated the north Arabian Desert. These Mediterranean systems had a longer and more intense effect on the desert fringe closer to the Mediterranean and only rarely penetrated the Black Desert of Jawa. The speleothems reported here are the first ones dated to the last 300 ka from the north Arabian Desert. The mid-Holocene, when Jawa city flowrished, as well as most of the late Pleistocene, were too arid for speleothem deposition in Jawa region.

Gypsum saturation degrees in mixtures of Dead Sea brines and seawater

Gal A. [1], Reznik I. [1,2], Ganor J. [1], Gavrieli I. [2]

1. Department of Geological and Environmental Sciences, Ben-Gurion University of the Negev, P. O. Box 653, Beer-Sheva 84105
2. Geological Survey of Israel, 30 Malkhe Israel, Jerusalem, 95501

Experimental work and thermodynamic calculations show that mixing of sulfate-rich Red-Sea water (RS) with Ca-rich Dead-Sea (DS) results in over-saturation with respect to gypsum and consequently to gypsum precipitation. Thermodynamic calculations indicate also that the Dead Sea brine is presently oversaturated with respect to gypsum. It remains to determine if gypsum precipitation that will occur in the Dead Sea following the construction of the "Peace Conduit" from the Red Sea to the Dead Sea, will leave the DS-RS mixtures saturated or oversaturated. This question is particularly important as it may impact the appearance of the DS and its energy balance.

The goals of the present study are thus: 1) determining if the precipitation of gypsum from DS:RS mixtures will leave the brines saturated or over-saturated with respect to gypsum. 2) Examining the accuracy of the calculated degree of saturation with respect to gypsum (DSG) in existing thermodynamic codes for hypersaline brines. The codes considered include the USGS PhreeqC code (Parkhurst and Appelo, 1999) and the code developed by Krumgalz for the Dead Sea (Krumgalz and Millero, 1983). Both codes are based on the Pitzer's approach.

Gypsum seed crystals were introduced into solutions containing different ratios of DS-RS mixtures. A fast change in sulfate concentration occurred following the seeding, and thereafter within less than 24 hours, a steady-state was reached. No further change was observed over the next two months. Thereafter, the solutions were diluted by 6 wt.% creating an under-saturated solution which prompted dissolution of the gypsum crystals present in the solution. Less than 24 hours after the dilution, a second steady-state was reached. No further change was observed over the next month.

DSG values were calculated from the compositions of the solutions at steady states using the two codes. In both, the DSG calculated for the first steady state (following gypsum precipitation) for each of the mixing ratio was identical (within error) to that calculated for the second steady state (following gypsum dissolution). These observations indicate that the solutions from both steady-states attained chemical equilibrium, i.e. saturation. However, the calculated DSG's were not always 1. The code that was based on Krumgaltz's equations was accurate for mixtures containing 30%-50% DS, whereas, PhreeqC was accurate for mixtures containing 50%-100% DS.

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Parkhurst, D. L. and Appelo, C. A. J., 1999, PHREEQC (version 2.14) -A computer program for speciation, batch-reaction, one-dimensional transport, and inverse geochemical calculations *Water-Resources Investigations Report 99-4259*. U.S. Geological Survey

Perchlorate contamination in the vadose zone of Ramat Hasharon. Is immediate action needed?

Gal, H. [1], Weisbrod N. [2], Ronen Z. [2], O. Dahan [2], and R. Nativ [1]

1. Dept. of Soil & Water Sciences, The Hebrew University of Jerusalem, P.O. Box 12, Rehovot 76100
2. Dept. of Environmental Hydrology & Microbiology, Zuckerberg Institute for Water Research, Ben-Gurion University of the Negev, Sede Boqer 84990

Ammonium perchlorate, a primary ingredient in solid rocket and missile fuel, is manufactured at a plant in Ramat Hasharon. As part of the plant's operations, untreated industrial wastewater was disposed of for over 30 years into unlined wastewater ponds and nearby creeks, causing contamination of the unsaturated zone and the groundwater below. Currently, the unlined wastewater ponds are empty and only receive water from rain events. The main objective of this study is to explore the transport mechanisms of perchlorate below the aforementioned treatment ponds.

During four years of study, 69 wells were sampled for perchlorate concentrations in groundwater. The results showed a large perchlorate contamination plume with concentrations of up to 360,000 ppb. The perchlorate mass in the aquifer was assumed to be in the order of 2,000 tons. During the four years monitoring period, the center of the plume moved in the direction of the regional groundwater gradient (concentrations decreased from 180 ppm to 60 ppm below the source and increased down gradient), suggesting no current perchlorate contribution from vadose zone to groundwater.

The 40 meters contaminated soil profile below the ponds was explored with seven boreholes that were drilled and sampled in high resolution below the four former treatment ponds. Analyses of perchlorate, as well as other major ion concentrations, were carried out for each soil sample. Additionally, stable isotopes (18-O and 2-H) along the profiles were analyzed in one of the borehole profiles. One of the major stratigraphic observations is the presence of a clayey layer below one of the ponds (at the depth of 10-19m), with questionable continuation to other ponds. A comparison of two boreholes drilled in one of the treatment ponds at 2005 and 2007 showed a very similar pattern in the concentrations of perchlorate and chloride along the profile below the clay layer. Significant changes were observed above this layer. The perchlorate concentration peak (1,200 mg/kg sediment at 18 meter below surface) as well as the chloride peak (1,300 mg/kg sediment at the same depth) showed no forward movement during that time period (2 years). The isotopic analyses of the soil profile pore water were spread along the evaporation line. The pore water samples can be divided into two separate groups: lighter (depleted) samples in the shallower vadose zone and heavier (enriched) samples in the deep. While the depleted samples represent recent water from precipitation source, the enriched samples represent water from the time when the ponds were active and it shows very low movement rate through the unsaturated zone. The results from the vadose zone support the assumption that currently, despite the very high concentration, perchlorate migration in the contaminated vadose zone is very slow and it is almost stagnant.

Mantle regularity of oil/gas field distributions

Galant Y.

P.O.Box 164, Yokneam-Moshava, 20600, Israel.

Surround volcano Etna now is exploration gas-oil fields Galiano, and gas fields Chizina, Katania and other and oil bearing fields in which oil is associated with volcanogeneous rock is 60 out of general amount of 160 (37,5 per cent).. What factors can influence on genesis and forming oil-gas fields from mantle-magmatic point of view? So, separately, 7 Relativities for oil-gas basins and not productive basins has investigated.

For oil-gas basins 1. Relatively Partial Melting Degree/Age of Rift= 0, 04. 2. Relativity Partial Melting Degree /Roof of Mantle= 0, 3. 3. Relativity Intensity of Magmatic Activity/Period of Magmatic Activity=28, 5. 4. Relativity Intensity of Magmatic Activity/ Age of Rifts =1, 7. 5. Relativity Intensity of Magmatic Activity/ Roof of mantle=9, 5. 6. Relatively Intensity of Magmatic Activity/ Partial Melting Degree=50. 7. Relatively Period of Magmatic Activity/ Roof of Mantle=8, 5.

For not productive basins 1. Relatively Partial Melting Degree / Age of Rift=0, 14. 2. Relativity Partial Melting Degree / Roof of Mantle=0, 18. 3. Relativity Intensity of Magmatic Activity/Period of Magmatic Activity=1, 6. 4. Relativity Intensity of Magmatic Activity/Age of Rifts=1.7. 5. Relativity Intensity of Magmatic Activity/ depth Roof of mantle=2.4. 6. Relatively Intensity of Magmatic Activity/ Partial Melting Degree=6, 3. 7 Relatively Period of Magmatic Activity/ Roof of Mantle=1, 9.

Connection oil-gas basins/ not productive basins: 1. Partial Melting Degree/Age of Rift= 0, 29. 2. Partial Melting Degree /Roof of Mantle=1, 07. 3. Intensity of Magmatic Activity/Period of Magmatic Activity=18. 4. Intensity of Magmatic Activity/ Age of Rifts =1, 0. 5. Intensity of Magmatic Activity/ Roof of mantle=4, 0. 6. Intensity of Magmatic Activity/ Partial Melting Degree=7, 9. 7. Period of Magmatic Activity/ Roof of Mantle=4, 5.

In the oil-gas basins and not productive basins has been found both common and specific features.

Revealed, that asynchronous and high powerful action of Partial Melting Degree, Intensity of Magmatic Activity, Roof of mantle, and high powerful action of Relativity Intensity of Magmatic Activity/Period of Magmatic Activity, and high powerful action of Period Magmatic Activity and less powerful action of Roof of Mantle- is favorable sign of oil/gas forming.

Decline of Carmel coast sites: Neolithic village Atlit-Yam and Caesarea harbor - gradual or catastrophic

Galili E. [1], Salamon A. [2], Zviely D. [3]

1. Israel Antiquities Authority, POB 180, 30350 Atlit, Israel.
2. Geological Survey of Israel, 30 Malkhe Israel St., Jerusalem, 95501, Israel.
3. Recanati Institute for Maritime Studies, University of Haifa, Haifa, 31905, Israel.

The trend to identify natural disasters in the archaeological record was renewed due to the devastating impact of the 2004 tsunami in the Indian Ocean. Archaeological finds are often being use to identify, if not prove, the occurrence of natural disasters such as tsunamis, earthquakes and tectonic displacements. Ancient artifacts and sites can be destroyed and displaced from their original location by various natural and man-made mechanisms. Thus, to avoid misinterpretation, the archaeological evidence should be analyzed with caution. Two case studies of sites along the Carmel coast recently claimed to be destroyed by tsunami events are examined here, particularly since historic tsunamis did hit the Levant.

Atlit-Yam: Pareschi et al. (2007) suggested that a tsunami generated by the Mount Etna landslide some 8,300 years ago destroyed Atlit–Yam, a Neolithic settlement currently submerged. The archaeological, anthropological, faunal, botanical, and sedimentological records from the site do not support the proposed destruction: Site features associated by Pareschi et al. (2007) with the tsunami antedate the proposed tsunami event. There is evidence for occupation after the assumed tsunami. Stone structures, including *in situ* stone Estellae in upright position, the upper part of Well 11, and *in situ* human skeletons were found in good state of preservation. Most human skeletons were found buried in flexed position within formal, prepared graves. No articulated animal skeletons were found. Many animal bones bear cut marks attesting to consumption post slaughtering. No tsunamigenic deposits overlie the surface or features in the site.

Caesarea harbor: The destruction of the Roman harbor of Caesarea was thought to have been caused by a destructive earthquake, active faulting, liquefaction, and in recent studies, also by a tsunami. A re-evaluation of archaeological and geological finds suggests that generally the destruction of the harbor was due to gradual settling of the foundations into the sandy substratum.

A detailed multi disciplinary approach suggests that the two sites declined due to gradual changes rather than a catastrophic tsunami.

Neotethyan Rifting and its Role in Shaping the Levant Basin and Margin

Gardosh M. [1], Garfunkel Z. [2], Druckman Y. [3], Buchbinder B. [3]

1 The Geophysical Institute of Israel, POB 182, Lod, 71100.
2 Institute of Earth Sciences, Hebrew University, Jerusalem, Israel, 91904
3 Geological Survey of Israel, 30 Malkhe Israel St. Jerusalem, 95501

During the time of opening of the Neotethys Ocean the Levant area was affected by several rifting events. Well and seismic data were used to reconstruct the geometry, style and time of formation of the Neotethyan rift structures in the deep subsurface of the Levant onshore and offshore. The reconstruction integrates the results of deep exploration wells and modern, 2D seismic reflection lines, recently acquired in the Levant Basin. It reveals an extensive, graben and horst system controlled by sets of normal faults with vertical offsets in the range of 2-7 kilometers. The largest structure onshore is the Judea Graben that extends in a NE-SW direction along the central part of Israel. Towards the north the graben widens and splits to several segments: the Palmyra Trough in the NE and the Hermon and Asher Basins in the N and NW. The Judea Graben is bounded on the west by series of structural highs: The Gevim, Gaash/Meged and Maanit blocks. The largest structure offshore is the Pleshet Basin that extends to a distance of 50-80 km west of the present-day coastal area. Two NE-SW oriented structural highs are found west of the Pleshet Basin: the Jonah and Leviathan ridges. Neotethyan faulting activity started in the Late Palaeozoic, continued during Middle-Late Triassic and climaxed in the Early-Middle Jurassic. The Levant rifts evolved in a continental to shallow-marine depositional environment on the northern edge of Gondwana; south of the deep-marine Neotethys Ocean. Although some magmatic activity took place there is no evidence for sea-floor spreading and emplacement of oceanic crust either onshore or offshore. The results have two important tectonic implications. First, they show that Neotethyan rifting in the Levant is associated with normal extension in a general, NW-SE direction. An alternative and commonly used model of N-S shear along the Mediterranean coast is unlikely. Second, they suggest that the Levant Basin is underlain by thin and intruded upper continental crust. Thinning may have been partly produced by thermal erosion at the base of the crust, followed by intrusion of mantle material.

The Oligo-Miocene Canyon System on the Levant Slope and its Significance for Hydrocarbon Exploration Offshore Israel

Gardosh M. [1], Druckman Y. [2], Buchbinder B. [2], Calbo R. [2]

1 The Geophysical Institute of Israel, POB 182, Lod, 71100.
2 Geological Survey of Israel, 30 Malkhe Israel St. Jerusalem, 95501

An extensive, westward flowing drainage system that developed during the Oligo-Mioecne along the Levant margin was studied on new sets of marine, seismic reflection data. Three unconformity surfaces of Early Oligocene, Middle Miocene and Late Miocene age were interpreted and correlated to about 40 wells, located onshore and offshore. The seismic data reveal five, vertically stacked canyon systems that extend on the Levant slope up to 70 kilometers westward of the present-day coastline (e.g. Afiq, Ashdod, Caesarea, Atlit and Qishon canyons). Two morphologic patterns are observed, incised valleys that are deeply cut into the underlying Mesozoic strata and un-incised, tributary valleys that are found within Syrian Arc type synclines. Well data indicate that the Oligo-Miocene canyons acted as fairways for submarine, turbidite flows that transported reservoir quality, coarse-grained clastic material from the Levant margin into the basin. In the Ashdod canyon, sands and conglomerates of Oligocene age are found in the Ashdod boreholes on the upper slope and in the Hannah-1 well on the lower slope area. In the Afiq canyon, sands and conglomerates of Miocene age are found in the Nahal Oz-1, Gaza-1, Gad-1 and Nir-1 boreholes on the upper slope area. The source for siliciclastic material during the Oligocene was Nubian sandstone that was exposed further inland; and during the Miocene, the Hazeva and Hordos Formations that were exposed throughout southern and northern Israel. Although several wells were drilled into Oligo-Miocene canyons, considering the high potential for reservoir rocks the system is considered under-explored. An area of prime interest that was not yet tested by drilling is at the mouth of the canyons where basin-floor type, sand lobes and sheets are expected to be found.

Methodology of lithofacies and petrophysical study of the Yarkon-Taninim aquifer

Gendler M.[1], Goldberg I.[1], Fleischer L.[1], Ben-Gai Y.[1], Gvirtzman H.[2], Dafni E.[2], Steinberg J.[2]

1. Geophysical Institute of Israel, POB 182 LOD 71100
2. Institute of Earth Sciences, Hebrew University, Givat Ram, Jerusalem, 91904

Geological, lithofacies and petrophysical analysis of groundwater reservoir is an integral part of groundwater exploration. Recently, a new approach for geological mapping of Yartan aquifers has been proposed (Ben-Gai et al., 2007).

This approach is based on the integration of the geophysical and geological data from a digital database. This technology provides the most effective way for stratigraphic correlation, lithofacies analysis and petrophysical characterization of aquifer.

The basic elements of this methodology are as follows:

- digitization of the geological and geophysical well data
- stratigraphic formation analysis
- lithological reconstruction over an entire section of aquifer including DwR (drilling without return, "blind") intervals
- processing and interpretation of well log data
- estimating petrophysical (lithology, porosity and salinity) properties of aquifer
- detection and correlation of high porosity zones and fractures, caverns and karsts development
- expanded composite logs construction
- lithostratigraphic and geological cross-section construction
- porosity and lithofacies maps construction

The proposed lithological and petrophysical approach combined with other geological and seismic information forms a quantitative aid to groundwater exploration and facilitates more reliable solution of the following problems: subdivision of the aquifers into sub-aquifers, mapping aquifers and aquicludes and estimation of their lateral extent, tracing of lithofacies heterogeneity in aquifers, correlation of highly porous zones and possible fracture and cavern zones, estimation of groundwater salinity, determination of the fresh/saline water interface, estimation of fresh groundwater reserves.

Infrasound Calibration Experiment in Israel: preparation and test explosions

Gitterman Y., Hofstetter R.

Geophysical Institute of Israel, P.O. Box 182, 71100, Lod

The GII Seismology Division started a new project to establish a calibration infrasound dataset for Eastern Mediterranean/Middle East region for improvement of monitoring capabilities of international network infrasound stations. The dataset is intended to characterize the infrasonic propagation in the region: travel times, spectra, amplitudes, depending on source features and atmosphere conditions. To achieve these goals a series of experimental shots on surface will be conducted.

Test explosions of broad yield range and various design will be detonated at the first stage of the project, in different days and seasons, based on several reasons: testing of new infrasound recording systems; yield scaling of signal amplitude/energy; testing of charge design and preparations/conducting logistics for the big explosion; analysis of atmosphere effect on infrasound propagation on different azimuths based on collected meteo-data about wind direction and velocity in different months; validation of safety estimations/conditions for successive increasing charges.

During the explosions numerous portable co-located infrasound and seismic systems will be deployed at near-source (0.1-1 km), local (20 – 350 km) and far-regional distances in neighboring countries (500 – 1500 km), where observations of permanent stations of Israel Seismic Network are also utilized.

Data of first test shots conducted by IDF at Sayarim in September 2007-February 2008 were collected for the project goals. Analysis of signals recorded at seismic and acoustic channels of portable and permanent stations is presented, including charge scaling estimations, and examination of wind direction influence on parameters of infrasound phases.

Results obtained from the test series will be used for elaboration of design and logistics of the main calibration explosion, and selection of the experiment date, considering atmosphere effects on recorded infrasound signals.

Biogeochemical performance of the Hula Nature Reserve system

Golan R. [1,2], Gavrieli I. [2], Markel D. [3], Lazar B. [1]

1. Institute of Earth Sciences, The Hebrew University, Jerusalem 91904, Israel
2. Geological Survey of Israel, Jerusalem 95501, Israel
3. Lake Kinneret & Watershed Monitoring & Management, Water Authority, Israel

The Hula Nature Reserve was proclaimed in 1964, following the drainage in the mid 1950's of the historic Lake Hula. The major goal of the reserve is to maintain and reconstruct the large faunal and floral species diversity which existed in Lake Hula. The water sources supplying the reserve with its distinct ecosystem are of variable quality. Over the last 4 decades and until recently the main water sources were very poor-quality sewage effluents as well as waters that drained from fish pools, with only minor contribution from high quality spring waters. However, since 2006 these sources were mostly replaced by higher quality waters, mainly from the Jordan River (Western Channel) and to a lesser extent from the Einan Spring.

The aim of the present study is to identify and quantify the biogeochemical processes currently operating within the Hula Reserve. Monthly sampling was conducted at 8 stations representing the main reservoirs, water sources and outputs of Hula Reserve. The water samples were analyzed for their major and trace elements, organic C, N, P (the organic and mineralized forms, i.e. PO_4^{-3}, NO_3^-, NH_4^+) and sulfur isotopes in sulfate. Property/property plots and ionic ratios were used to identify and quantify the geochemical processes on the different ions using Cl^- as the conservative parameter. The reactive constituents such as Total-N, Ca^{2+}, alkalinity, and SO_4^{2-} decreased considerably during the water's travel through the Hula system. NO_3^-, the major nitrogen species in the input waters was substantially depleted (by plants photosynthesis) and partly converted into particulate and dissolved organic-N inside the reserve very close to the water entrance. These results indicated that during the study period, Hula Reserve was a net sink for particulate organic nitrogen and $CaCO_3$ that were deposited in the sediments. The diurnal cycle of dissolved oxygen indicates that the lake fluctuates between high super-saturation during late afternoon to anaerobic condition before dawn that facilitates sulfate reduction. Additional evidence for sulfate reduction in the reserve comes from: 1. The SO_4^{2-}/Cl^- ratio within the reserve is always lower than in the input waters (with a minimum in July), a clear indication of sulfate depletion (no gypsum precipitation was identified); and 2. $d^{34}S$ of sulfate is higher in the reserve's output waters than in the inflowing waters, indicating that the "isotopically heavy" sulfate is the residual SO_4^{2-} left after production of "isotopically light" H_2S by sulfate reduction.

The Hula Nature Reserve is a eutrophic system in which the different water bodies response differently to seasonal changes as well as to management strategies. The prevailing conditions therefore pose constrains on the existing ecosystem. We suggest that lowering the water head might lower the extent to which SO_4^{2-} is reduced.

On the issue of various porosity types at Yarkon Taninim carbonate aquifer (from well tests, cores and well logs).

Goldberg I., Gendler M.

Geophysical Institute of Israel, POB 182 LOD 71100

Yartan aquifer is formed mainly by limestone and dolomite layers. These carbonates can be subdivided into two types: tight low porosity rocks (porosity of 1-3%) and porous carbonates. The latter ones are characterized by the composite (mixed) porosity type: porous-cavern-fracture. Since porosity (along with permeability) is a key parameter for groundwater reservoir we have analyzed the role of porosity types in the development of the capacity-filtration properties of the aquifer. Adequate intendment and description of the structure of porous system is critical for understanding and prediction of groundwater supply.

Analysis of the well test data has showed that fresh groundwater inflow is confined mainly to the intervals with matrix and matrix-cavern porosity types. For characterization of layers containing groundwater and capable for its disposal, we used the concept of low porosity threshold. This critical porosity value was later used in the comparison between water discharge data (received from well tests) and apparent thickness of high porosity intervals and revealed regular relationship. We note that most of the well tests located in front of intervals which are represented by clean, porous limestones and dolomites, with no visible fracture developments.

The problem of fracture systems and associated karst development within the Yartan aquifer bounds is crucial. We have formulated criteria to identify possible fracture zones based on well log data. These criteria take into account clean (low shale content) dolomites and limestones. In order to exclude shales and marls, we incorporate resistivity and GR thresholds.

Conserning the significant development of caverns of various dimensions we have carefully analyzed raw well log data and in particular electric resistivity measurements which were run for years throughout Yartan section. We have performed numerical modeling of resistivity log response in a borehole with a variable cavern diameter (assuming all other conditions being the same). Considering the modeling results, we assume that the most probable range of the caverns diameter is 60-150 cm. Thickness of these intervals along the borehole varies from several meters up to tens meters.

Analysis of core measurements revealed certain porosity-permeability trend when porosity of limestones varies from 16-18% to 30-35% and permeability varies from 10 mD to 1000mD. Thus we conclude that under certain circumstances the matrix part of Yartan carbonates can be of good filtration capacity (when the matrix porosity is high enough to provide continuous permeable space).

The use and misuse of surface geophysical methods for determination of hydraulic parameters in the subsurface

Goldman M. [1], Kafri U. [2]

1. Geophysical Institute of Israel, Habaal-Shem-Tov, 6, Lod 71100
2. Geological Survey of Israel, Malchei Israel, 30, Jerusalem 95501

All geophysical methods applied in hydrogeological studies suffer from one common drawback, namely, the quantities they measure are only indirectly related to the desired hydraulic parameters. However, different methods suffer from that problem differently and the correct choice of the geophysical technique and that of the appropriate hydraulic parameter becomes crucial.

The most promising approach is using the methods, which allow inverting measured signals directly to hydraulic parameters, such as water content and transmissivity as in the nuclear magnetic resonance (NMR) method. Examples of both successful and unsuccessful NMR measurements applied to determine different hydraulic parameters of aquifers in Israel and Cyprus are discussed here.

As for conventional geoelectric/geoelectromagnetic methods, they can be greatly improved by a proper choice of the method and/or the hydraulic parameter sought. For example, the use of surface geoelectric/geoelectromagnetic methods to determine the porosity of freshwater saturated aquifers using Archie's equation leads in many cases to significant inaccuracy. This is caused by the uncertainties in determining both fluid and bulk resistivities required for calculating porosity of a rock sequence even in the case of a known rock type. To resolve the uncertainties, a sufficient amount of an independent, mainly borehole information is required. In most cases, such information is hardly available.

At the same time, numerous measurements carried out in different granular clastic aquifers showed that the bulk resistivity of saline water saturated portion of the aquifer is accurately detected by the time domain electromagnetic (TDEM) method without any use of *a priory* information. Therefore, under favorable conditions, the porosity of the saline water saturated portion of the aquifer can be also accurately determined from the Archie's equation by using only geophysical data. The obtained porosity might be projected then to the freshwater saturated portion of the aquifer since it is reasonable to assume that hydraulic properties of the aquifer are essentially

The proposed approach was tested in both granular and carbonate coastal aquifers of Israel saturated with normal seawater as well as with Dead Sea concentrated brines. The cases of granular coastal aquifers exhibit a good agreement between porosities measured in boreholes and those calculated using TDEM resistivities. In the case of carbonate aquifers, the situation is more complicated due to their heterogeneity and much wider range of porosities stemming from their karstic and fractured nature.

On the Stability of Landslides: A Thermo-Poro-Elastic Approach

Goren L. [1], Aharonov E. [1,2]

1. Department of Environmental Sciences and Energy Research, Weizmann Institute of Science, Rehovot 76100, Israel.
2. Institute of Earth Sciences, Hebrew University, Givat Ram, Jerusalem 91904, Israel.

Motion of a large rock mass down a slope can either take the form of an accelerating landslide, or can exhibit self stabilization, where the mass arrests on the same slope over which motion was initiated, after moving only a short distance. In order to understand and determine the parameters that control the stability of the sliding process, a thermo-poro-elastic model is investigated both numerically and analytically. Results demonstrate that the permeability of the sliding mass controls the sliding stability: Low permeabilities lead to accelerating landslides, by allowing high pore pressure to develop and friction to be reduced. High permeabilities lead to rapid arrest by promoting pore pressure reduction and thus high friction. A pore pressure - velocity phase plane is described, divided by a separatrix distinguishing between accelerating and arrested sliding. In this phase plane minute changes in permeability dictate a bifurcation in the dynamics of landslides. It is hypothesized that a third sliding regime observed in nature, creep sliding, can be generated by a sequence of arrested events, where the number of arrested events per unit time dictates the apparent creep velocity.

Towards understanding of soils liquefaction induced by irreversible granular matrix deformation

Goren L. [1], Aharonov E. [1, 2]

1. Department of Environmental Sciences and Energy Research, Weizmann Institute of Science, Rehovot 76100, Israel.
2. Institute of Earth Sciences, Hebrew University, Givat Ram, Jerusalem 91904, Israel.

Soils liquefaction is a catastrophic phenomenon that causes soils to lose their shear strength and behave like fluid. During a liquefaction event, the shear stress exerted by infrastructure foundations cannot be sustained by the soil holding them, and a severe collapse with potentially devastating effect and risk for lives is expected to occur. Liquefaction events are commonly triggered by earthquakes and are associated with measured rise of pore fluid pressure. Thus, liquefaction is postulated as being related to periodic forcing, causing pore pressure to rise and normal effective stress and shear resistance to drop. However, despite its great importance, the physical mechanism by which periodic forcing causes pore pressure rise and soil liquefaction is not understood. An on going study aimed to formulate such an understanding is described. The study intent is to find the parameters and assess the physical conditions and mechanisms that are responsible to soil liquefaction.

An analytical description of pore fluid evolution in response to forcing is formulated. This description is extremely general in the sense that it accounts for non-linear and large scale irreversible matrix deformation. The analytical description and analysis reveals that granular matrix deformation is coupled to pore fluid compression via fluid compressibility and to pore fluid flow via the hydraulic diffusivity of the system. These two effects mediate pore pressure rise. Simple cases of forcing are studied analytically and numerically using a simplified model that solves only for the fluid. An elastic limiting case indicates that elastic, reversible deformation is limited in its ability to cause large enough pore pressure rise to the very top of the rock column. Complex forcing schemes will be studied using a coupled two-level model simulating the mutual effects of granular matrix deformation and pore fluid mechanics. This method is applicable not only for the study of liquefaction but for the general problem of irreversible deformation of fluid saturated granular material.

Analysis of H/V ratio from ambient noise to explain some peculiar features revealed in the Lod Valley and southern Sharon study area

Gorstein M., Zaslavsky Y., Ataev, G., Kalmanovich, M., Perelman, N., Giller V., Livshits I., Shvartsburg A., Giller, D., Dan H.

Seismology Division, Geophysical Institute of Israel, P.O.Box 182, Lod, Israel

Over the years, we have conducted site investigations in several thousands of sites across Israel. These investigations demonstrated the usefulness of using horizontal-to-vertical (H/V) spectra of ambient noise measurements to identify sites with high potential for being vulnerable to amplification effects and characterize the sites with respect to their expected resonance frequencies and the corresponding H/V levels. Systematic ambient noise measurements carried out on a dense grid together with any available geological, geotechnical and geophysical information helps developing a reliable model of the subsurface which is then integrated in the processes of the seismic hazard assessment.

Modelling site effect at refraction survey and borehole locations we have received additional evidences of the fact which have been earlier revealed in Petah Tikva, that the fundamental reflector in the central and western part of Lod Valley & Southern Sharon is associated with limestone and dolomite of the Judea Gr. (Cenomanian age), while the chalky limestone (Turonian age) is a intermediate hard layer.

There are some interesting observations revealed during investigations in the study area. Thus, for instance, we detect a number of anomalies characterized by very specific H/V ratio shape with low amplitude fundamental peak and significantly higher (up to 5 times) second resonance peak localized along border of the western slope of Shomron Mountains anticlinorium and foothills of the Shefela region. As a hypothesis, we suggest model that may explain this observation. However, there is no analytical model based on available geophysical and geological data capable to explain extremely high amplifications (up to 20) obtained throughout measurements in the Airport City. Here we meet a case when site effect is strongly influenced as results of soil structure interaction by the proximity of buildings. This problem occurs very often in a built area, where real free field is difficult to find.

Flood hydrology, flood routing, paleohydrology and the estimation of water resources along the shallow alluvial aquifers of the Kuiseb River, Namibia

Grodek T. [1], Enzel Y. [2], Morin E. [1], Jacoby Y. [1], Dahan O. [3], Benito G. [4], Kulls C. [5], Geller A. [2], Van Langenhove G. [6], Seely M. [7]

1. Department of Geography, The Hebrew University of Jerusalem, Mt. Scopus, Jerusalem, 91905, Israel.
2. Institute of Earth Sciences, The Hebrew University of Jerusalem, Givat Ram, Jerusalem, 91904, Israel
3. Zuckerberg Institute for Water Research, Ben-Gurion University of the Negev, Sde Boqer, 84990, Israel
4. Centro de Ciencias Medioambientales, Consejo Superior de Investigaciones Cienti´ficas, Madrid, Spain
5. Institute of Hydrology, University of Freiburg, Freiburg 79098, Germany
6. Ministry of Agriculture, Water and Forestry, Department of Water Affairs, Hydrology division, Windhoek, Namibia.
7. The Desert Research Foundation of Namibia, 7 Rossini St., Windhoek, Namibia.

Multidisciplinary research in the hyperarid Kuiseb River, Namibia provides the necessary information to determine (a) long-term floods occurrence and aquifer recharge events and (b) flood routing and transmission processes along the river course. Together they assist in estimating water resources along the river.

The only source of water in the hyperarid Namib Desert are flash floods that originate in the higher and wetter elevation headwaters and flow into the desert. The Kuiseb River (15,500 km^2) heads at ~2000 masl where annual rainfall is 250-350 mm/year. During the austral summer local and regional thunderstorms generates flash-floods that attenuats along 300 km through the hyperarid Namib Desert (<10-50 mm/year). Along their arid route the floods first attenuate along the Kuiseb Canyon (160 km) and downstream (along ~140km) they transmit into the channel bed and recharge a series of shallow alluvial aquifers. Only extreme floods are able to cross the entire Namib Desert down to the Atlantic Ocean. By recharging the aquifers, the water availability extended from the days-long floods into seasons and years and are capable of supporting riparian ecosystems and human life including the port town of Walvis Bay (population 65,000). In our study we collected: (a) measured and historical flood records (b) paleoflood data (c) channel morphology characteristics (d) transmission losses and (e) groundwater recharge. Then we constructed and validated flood routing model that include a simple recharge procedure in all alluvial reaches with emphasis on the lowermost reaches. This model allowd the construction of 48-years, continous flood record basred on partial gauged data and to estimate aquifer recharge volumes and and water table levels. Flood frequency analisys combined the differente hydrological data types to present the frequency of differente flood magnitudes and their impact on the aquifers.

Geomorphic indicators and evidence for active tectonics in Kochav Ha-Yarden (northern Israel)

Guralnik B., Shaar R., Livne E., Matmon A.

Institute of Earth Sciences, The Hebrew University, Jerusalem 91904, Israel

Miocene to recent tectonic activity at Kochav ha-Yarden (KHY), a 500m high fault scarp marking the western margin of the Jordan Valley segment of the Dead Sea Rift (DSR), is recorded at the surface by sharp topography, varying stream profiles, and paleomagnetic data. The volcano-sedimentary sequence at KHY comprises of 3 Neogene volcanic units alternating with conglomerates and lake deposits, its uppermost unit being the Pliocene Cover Basalt (CB). Presently, the CB overlies tilted blocks throughout the eastern lower Galilee and dips 10°/210° in KHY. Field observations indicate that the CB did not flow over tilted blocks, rather it was tilted during faulting, thus marking the amount of tilting that occurred since deposition.

In the KHY block, post CB rotation about a horizontal axis trending ~120° and coinciding roughly with Nahal Ur, caused rock uplift to the north of the axis and subsidence to the south of it. This is confirmed both by residual topography analysis which accentuates a zone of faster uplift rate in the north, and by the spatial variability of the stream profile types from north to south: deep incision down to bedrock in the north, while south of the axis the streams do not reach bedrock.

Following the procedure described in Weinberger et al (1995), we combine the inferred Pliocene vertical rotation with the Pliocene horizontal rotation (Ron et al., 1984) to attain a single rotation axis trending 65°/307°. Back rotation of 20° CW about this tilted axis brings the Pliocene paleomagnetic vector back to its expected declination and inclination (within 5%) and restores the CB back to its original horizontal position. The axis of Miocene to Pliocene rotation is then calculated, and found to be almost vertical. This reflects the transition between strike slip shear of the Dead Sea Transform (DST) as experienced by the KHY block in the Miocene, and tilting due to DSR that started in the Pliocene.

2D simulation of earthquake ground motion in the Haifa Bay, Israel

Gvirtzman, Z. [1], Louie, J. [2]

1. Geological Survey of Israel
2. University of Nevada, Reno

The coastal plain of the Haifa Bay (Zevulun Valley) is a densely populated urban zone, the largest in northern Israel, with well developed industrial facilities and with a relatively high seismic hazard. The combination of hazard, industry, and large population increases the risk at this important part of the state and calls for better understanding of the ground motion and, particularly, the basin effect. This study presents two dimensional simulation of earthquake ground motion along one geological section crossing the Zevulun Valley from south to north. Simulation was carried out using the e3d finite difference code developed by Larson et al. (1998) at the Lawrence Livermore National Lab., CA, US. Fourier and response spectra analysis of the synthetic time histories as wells as additional 1D simulation were carried out by the commercial seismic engineering package- ProShake.

In the Qishon graben which is the southern and deepest part of the basin the obtained amplification vary from about 400% at periods of 2-5 seconds to 200-300% at periods lower than 1 second. In the Afeq area, which is the central and shallower part of the basin, amplification vary from 300-400% at periods of about 0.5-1 seconds down to 200% and lower at periods higher than 1 second. The Hilazon graben at the northern part of the valley yield intermediate results.

For comparison, we show that 1D simulation in the Qishon graben yields similar spectral trends, but underestimates the degree of amplification. On the other hand, in the central and shallower part of the basin (Afeq area), 1D and 2D analysis yield very similar results.

In a wider perspective, this study is another example for basin effect which is not considered for design in standard building codes, which are based only on the soil characteristics in the uppermost 30 meters. For example, in the Qishon graben the International Building Code underestimates the basin effect along the entire spectra, and in the Afeq area it underestimates the amplification below 1 second and overestimates it above 1 second.

The Sharon graben: a key for understanding the interrelations between Shomron, Carmel, and the coastal plain during the late Tertiary

Gvirtzman Z., Steinberg J. Siman Tov R., Zilberman E., Clavo R., Grossowicz L. and Almogi-Labin A.

Geological Survey of Israel

This study presents new biostratigraphic analysis of an Oligocene-Miocene section preserved in the Sharon graben at the triple junction between Mt. Carmel, Samaria foothills, and the coastal plain. The faults bounding the graben from east and west displace both the Judea and the Mt. Scopus Gps., but not the Kurkar Gp. This alone constrains the age of faulting to post Paleocene and pre Quaternary. In addition, preservation of the Bet Guvrin Fm. in the graben and not at its immediate vicinity indicates either post- or syn Bet Guvrin faulting. Comparison of the 300-m-thick Oligo-Miocene section in the graben relative to the 40-m-thick condensed section in the Bet Rosh outcrop, 20 km to the NE, may indicate syn-depositional faulting. On the other hand, such thickening over a distance of 20 km may as well be original and if so, faulting is necessarily post Miocene.

A detailed biostratigraphic subdivision of the lithologically monotonous Bet Guvrin Fm. in 8 water wells within the graben allows us to determine the exact age of the uppermost Bet Guvrin rocks just below the Kurkar Gp. This reveals that the Kurkar Gp. lies over a flat unconformity surface that truncates deeper into the Bet Guvrin section towards the ESE. These field relations indicate that prior to truncation and flattening the inland region ESE of the Sharon region (Samaria Hills) was uplifted. In contrast, the present day dip of this unconformity surface towards the SSW indicates younger tilting and uplifting ENE of the Sharon region (Mt. Carmel).

Detailed seismic mapping offshore the Sharon region indicates that the EW trending Or Akiva fault between the Sharon graben and the Carmel block was mainly active in the Miocene (Steinberg et al., this volume). If this Miocene age is adopted for the nearby Sharon graben, the following historical sequence can be portrayed: 1. Differential vertical motions associated with faulting, erosion and sedimentation in the Miocene; 2. Regional uplifting of the Samaria Hills and WNW tilting of the continental margin; 3. Surface flattening by erosion and abrasion (Miocene-Pliocene); 4. Regional uplifting of Mt. Carmel and WSW tilting of the nearby coastal plain.

In a wider perspective here we present additional evidence for late Tertiary tectonism in the Levant continental margin. This occurred during a transition phase when deformation related to the Africa-Arabia breakup jumped from the Suez Rift inland to the Dead Sea Transform. We show that the Sharon region was active in the Miocene and that this activity decayed in the Plio-Pleistocene.

R/H Sabvabaa – the Arctic research hovercraft

Hall J. K. [1], Kristoffersen Y. [2]

1. Geological Survey of Israel (Emeritus), 30 Malchei Israel. Jerusalem 95501
2. Institute of Solid Earth Physics, University of Bergen, Allàgaten 41, Bergen, Norway

Last year we reported on construction of a research hovercraft for the Arctic. The appearance of this craft, which passed its sea-trials last October and is due to arrive in Svalbard in March, is most timely. The Arctic has been in the news lately, as the bellwether of global warming, with rising annual temperatures and steadily decreasing ice extents.

However our main area of interest, the Alpha Ridge north of Ellesmere Island, remains closed to study by icebreaker or submarine, due to its 3-4+ m ice cover. Thus for the next decades, the hovercraft appears to be the key to exploration of this area, which we believe experienced an asteroid impact a few million years ago, and which may provide definitive evidence on the origin of the enigmatic Alpha Ridge, and therefore the larger Amerasia Basin.

The research hovercraft, named the *R/H Sabvabaa* after the Inuit-Inupiaq word for flows swiftly over it, is specifically designed for research in the Arctic. Its progress can be followed at http://www2.geo.uib.no/hovercraft/. It hosts marine, aircraft, and satellite communications, FLIR, radar and an internal Gbit LAN. For operations in open leads between ice floes, it has 12/200 kHz echo-sounders, shallow CHIRP subbottom profiler, and a 40 in^3 airgun and 50 m streamer for deeper seismic work. Long range tanks can give up to 25 hours at maximum speeds of 80 km/hr, or an economical range of 2000 km. A hydraulically powered ice drill can bore holes 20 cm in diameter through 4 m of ice. Four autonomous solar powered seismic (sparker) profiling buoys are nearing completion, and plans are underway for developing numerous SSPARR autonomous echo-sounding buoys for additional deployment. A hydrostatically powered sediment corer is under development, suspended from a Kevlar® aramid fiber cable on a light-weight winch.

The hovercraft will operate in the deep Arctic Ocean during the daylight months of March-September, and be used by the UNIS university in Longyearbyen during the winter months. While Sabvabaa can be operated by only one person, berths are provided for up to four, and the usual crew will be two scientists. Operations will always be in concert with nature, as the hovercraft cannot navigate over pressure ridges or in rubble fields. Over its potential 30 year lifetime it will operate in the large areas of multiyear ice that are found in the Lincoln Sea and elsewhere, making seismic profiles along the numerous open leads which divide the pack. As the pack is constantly in motion at speeds of ~5 km per day, all areas should ultimately be available for study and sampling. These studies should define the best areas for future deep sea drilling by the European Community's future icebreaker drillship, the *R/V Aurora Borialis*.

The northern Gulf of Eilat Aqaba intra-structure complexity

Hartman G. [3], Tibor G.[1], Ben-Avraham Z. [3], Niemi T.M. [2], Al-Zoubi A. [4], Sade R.A. [5], Hall J.K. [6] , Akawi E. [4],Abueladas A. [4], Makovsky Y.[5]

1 Israel Oceanographic and Limnological Research, Haifa, Israel
2 University of Missouri-Kansas City, U.S.A.
3 Department of Geophysics & Planetary Sciences, Tel-Aviv University, Tel-Aviv, Israel
4 Surveying & Geomatics Department, Al-Balqa' Applied University, Al Salt, Jordan
5 Department of Geo-Marine Sciences, Haifa University, Haifa
6 Geological Survey of Israel, Jerusalem, Israel

A high-resolution marine geophysical survey in the northern Gulf of Eilat Aqaba (GEA) was conducted during October and November 2006, led by an international research group (Israel, Jordan, and USA) funded by MERC (#M25_004). Processing of the high-resolution (200-5000 Hz) seismic data and the multi-beam sonar's bathymetry high-resolution (sub-meter) image is in progress. Initial interpretation of the processed data in the northern shelf reveals a complex intra-basin structure: the northern GEA is partitioning into western and eastern grabens, divided by an intra-basin horst. The eastern graben occupies about half of the northern GEA width, and its partitioning into parallel sub-grabens, separated by seemingly predominantly normal faults. Recent slip along the eastern margins of the GEA is suggested by apparently normal offsets of in the top-most sedimentary layers, while the top-most sediments in the interior sub-basin are continuous. The western sub-basin is bounded by the western margin fault ("Eilat" fault) and the "Evrona" strike slip fault. This sub-basin is well defined in the bathymetry and topography. The "evrona" fault cuts through horizontal sedimentary layers up to the seafloor.

Continuous seismic monitoring by permanent and portable seismic networks of the Dead Sea basin in the last 25 years

Hofstetter R.[1], Braeuer B.[2], Asch G.[2], Amrat A.-Q.[3], Mohsen A.[2], Weber M.[2]

1. Geophysical Institute of Israel, Lod, Israel
2. GeoForschungsZentrum, Potsdam, Germany
3. Natural Resources Authority, Amman, Jordan

Seismic monitoring in the Eastern Mediterranean started at the end of the 19th century. Since then several strong events were instrumentally recorded in the Dead Sea rift in general and in the Dead Sea basin (DSB) in particular. The events in the DSB were mostly harmless except the fatal earthquake of July 11, 1927. The recent main shock in the northern Dead Sea basin earthquake, M_W 5.1, on February 11, 2004, just reminded us of the potential of the occurrence of strong earthquakes in the DSB. The mainshock was followed by a relatively short sequence of aftershocks, which lasted for about a few months, and most of the aftershocks occurred in the first 6 weeks having small magnitudes.

Two permanent seismic networks (JSO + ISN) and 3 temporary seismic networks (PSN + DESERT2000 + DESIRE) have monitored the seismicity in the DSB in the last 25 years. Small and moderate earthquakes in the Dead Sea basin, part of the Dead Sea rift, were recorded and analyzed. The earthquakes, of $0.5 \leq Md \leq 5.2$, follow a normal rate of seismicity for the region with b values around 0.9. The recorded seismicity is mainly confined to the basin and its boundaries. The activity is along the active north-south left lateral faults along the east and west boundaries of the basin, however, there is some clear activity along transverse faults crossing the basin. In the Dead Sea basin we found a tendency to clustering, which is clearly demonstrated in very similar seismograms of several events recorded at the same station. Focal plane solutions of the strong earthquakes (since 1980) suggest a strike slip faulting. However, the focal mechanisms of the small events and aftershocks present a mixture of strike slip motion, normal and reverse faulting. Scaling relationships of moment-magnitude and other source parameters (stress drop, corner frequency) reveal similar results to those of California and other regions.

A morphological and morphometric study of cinder cones in Kamtchatka and Ramat Hagolan

Inbar M. [1] Gilichinsky M. [1] Melekestsev I. [2] Melnikov D. [2] Zaretzkaya N. [3]

1. Department of Geography and Environmental Studies, University of Haifa, Haifa, Israel
2. Institute of Volcanology and Seismology, Petropavlovsk-Kamtchatsky, Russia
3. Geological Institute, RAS, Moscow, Russia

Cinder cones are the simplest and most common volcanic landforms in the world. It is probably the only landform in globe having a clear and defined initial date of formation, lasting for no more than a few million years until erosional processes flattened them, a short time in the earth geologic history. Morphological and morphometric study of cinder cones has proven an efficient tool for determining relative dates of cinder cones and the erosional processes affecting them. Such analyses generally attempt to measure the morphometric values of cinder cones, e.g. height, diameter, slope, and the relationships among them.

The evolution of landscape over time is a central aspect of geological, paleogeographical and geomorphological studies. Recent volcanic features like cinder cones offer the opportunity to monitor the processes and development of the landscape. Morphometric and morphological studies, together with remote sensing, tephrochronology and methods of absolute dating, are efficient tools for determining ages of cinder cones, their morphological evolution and spatial-time development of aerial volcanic fields over the world and in extraterrestrial conditions.

The large Kamchatka volcanic field (Russian Far East), with probably the largest number of monogenetic cinder cones in the world, provides an excellent example for a spatial and temporal classification. There are many zones of monogenetic volcanism with tens of cinder cones (such as Tolbachinsky, Tolmachev and Sedanka fields), and fields of parasitic cones at the slopes of large volcanoes (such as Kliuchevskoy plateau). Cones are located over along the ~1000 km of the Kamtchatka volcanic belt, on various absolute heights of different types (pyroclastic and lava cones, tuff rings etc.) pyroclastic rocks composition, and, particularly, they are located in various distances from large volcanic centers, that is they are covered by soil-pyroclastic successions of different thickness, which influences on the morphometric features of the cinder cone.

The Late Pleistocene and the Holocene cinder cones are well preserved in Kamchatka: older forms (e.g. of Early-Middle Pleistocene age) were strongly eroded due to various processes, particularly during the last stage of the Pleistocene glaciation. Thus the Golan Heights (Israel), with well preserved Pleistocene cinder cones, provides a good opportunity to build over a temporal range of cinder cones and trace their morphological development stages.

The aims of the study were to examine the morphology and morphometric relationships among the monogenetic cones in the Kamchatka and Golan cinder cone fields, to be measured mostly in the field, and analyze their relative ages comparing with absolute ones. This allows a new interpretation of the sequence development of the volcanic fields of the Kamchatka Peninsula and Western Levant in comparison with other volcanic fields from different climates in the world.

Was the equation: cold=humid, while warm=dry, characteristic to the whole Quaternary of the Middle East?

Issar A.S.

Institutes for Desert Research, Sede Boker Campus, Ben Gurion University of the Negev

Time series of proxy-data, from the Middle East show that during the Last Glacial as well as during the cold periods of the Holocene this region was characterized by humid climates, while the warmer Post Last Glacial and the warm periods during the Holocene were dry (Issar 2003, Issar and Zohar 2004, 2007).

The question is whether this equation i.e. cold=humid and warm=dry, characterized all the Quaternary.

The author's working hypothesis is that this was the general rule, yet it needs still to be investigated in detail involving advanced methods of dating.

This working hypothesis is based on the re-interpretation of the geological sections of the Coastal Plain of Israel, where during regressions, correlated with glacial periods, were formed red soils containing clays brought as aerosols, while in the regions bordering the deserts, loess layers were deposited by rainstorms following heavy dust storms (Issar and Bruins 1983). During transgressions, characterizing inter-glacial periods, coastal dunes were deposited. This increased supply of sands was brought from a high Nile, fed by a stronger easterlies system.

During the last Glacial period the water found under the Negev and Sinai deserts in the Nubian Sandstone layers was recharged. During the same period Lake Lisan extended over most of the Jordan Valley. (Bartov et al. 2002). Horowitz (1989) on the basis of pollen profiles from the entire Quaternary sequences of the Hula and Dead Sea lakes concluded that the glacial phases in Israel were periods of somewhat lower temperatures and higher rainfall, some of it in summer. All these observations are in contrary to Bar Yosef and Meadows (1995) claim that "during the Late Glacial Maximum (LGM or 24,000 - 16,000/14,000 BP) the climate of the entire region was cold and dry".

It is assumed that the fresh and brackish lake deposits, evidence of high ground water tables, in the midst of the Negev Desert of southern Israel, along the shores of which Lower and Upper Paleolithic tools were found (Ginat 1997, Issar et al 1984) are synchronous with glacial periods. These findings shed light on the role of the Middle East as the principal bridge between Africa and Asia. The bridge opened and closed with the global fluctuations of climate. Whenever the desert belt across northern Africa and the Middle East became humid and green, plants, animals, and humans, moved over it from Africa and when it dried up its inhabitants moved out or found refuge along rivers or springs.

Disharmonic folds and associated faults along a flank of a Syrian Arc monocline

Joseph-Hai N. [1], Eyal Y. [1], Weinberger R. [2]

1. Department of Geology and Environmental Sciences, Ben Gurion University, Beer Sheva 84105, Israel
2. Geological Survey of Israel, 30 Malkhe Yisrael Street, Jerusalem 95501, Israel

Orientations of folds, anticlines and synclines, and small faults were measured in Turonian and Senonian rocks along the western limb of the Ramallah monocline in Israel, one of the folds comprising the Syrian Arc fold belt (SAFB). Data were collected at 18 stations, along Highway 6 and near Shilat junction, some stations with more than one fold. Two trends of fold axes were determined in the Turonian carbonate rocks of Bina Formation. The minority of the folds, aligned NNE-SSW, are compatible with the WNW-ESE shortening trend of the SAFB, whereas the majority, aligned WSW-ENE, are not compatible with the NNE-SSW general trend of the SAFB in this area. A kinematic analysis of fault attitudes indicates NNW-SSE shortening and WSW-ENE extension in accordance with the shortening direction of the majority of folds. Previous studies described the small folds as structural undulations and/or intraformational folds within the Bina Formation although no measurements supporting this interpretation were given. Relations between these folds to the larger, Syrian Arc, structures in the area were only qualitatively discussed. Based on the fold trends, scale and geometry as well as the associated fault kinematics, we conclude that the folding mechanism is tectonic shortening and not intraformational folding due to sliding or due to collapse into karstic caves, as previously postulated. We propose that the folds compatible with the major trend of the Ramallah monocline are parasitic small folds within the SAFB frame. However, the majority of the folds, which are not compatible with the SAFB, were formed in association with another regional shortening. They may develop during an earlier Turonian folding phase whose shortening direction was different from the latter, SAFB, folding, or during a young, NNW-SSE shortening, associated with Miocene to Recent movement along the Dead Sea Transform. Strain directions, NNW-SSE shortening, revealed by the faults, are compatible with the regional Dead Sea Transform strain field. Assuming association between the folds and faults supports the suggestion that the structures found in the study were formed during a younger tectonic phase than that responsible for the Syrian Arc folding.

Identifying the largest earthquakes in Lisan lacustrine breccias by correlation with cave seismites and asphalt-bearing earthquake markers

Kagan E. [1,2], Stein M. [2], Bar-Matthews M. [2], Tannenbaum E. [3], Agnon A. [1]

1. Institute of Earth Sciences, Hebrew University, Givat Ram, Jerusalem, 91904, Israel
2. Geological Survey of Israel, 30 Malkhe Israel St., Jerusalem, 95501, Israel
3. Kimron Oil and Minerals, 40 Hatchelet St., Hod Hasharon 45264, Israel

Lake Lisan sediments and Soreq Cave speleothems documented the Late Pleistocene earthquake history of the Dead Sea basin and Judea Mt. area. Data were obtained at the Soreq Cave, Massada Plain (M1b), Perazim valley (PZ1), Tovlan (Nahal Tirza) (NT), and Tamar (TM), located up to 110 kms apart. The lacustrine sediments display a variety of deformed structures (e.g. brecciated, homogenated, folded, faulted). The cave's damage includes collapsed stalactites and ceilings and severed stalagmites. Except for the more fluvial NT site, where there is only one breccia layer, the sites show numerous (up to 29) earthquake events. Several breccias are associated with asphalt inclusions. This association may represent an asphalt or oil discharge into the lake before a strong earthquake. The water turbulence after the earthquake can cause the floating asphalt or oil to be trapped in the sediment before oxidation takes place. All the earthquake evidence, speleological and lacustrine, was rigorously dated by high-resolution mass spectrometry on a MC-ICP-MS at the Geological Survey of Israel. From these different and distant paleoseismic sites three to four events stand out.

At ~39±2 ka there was one or two paleoseismic events which left evidence of brecciated AAD (alternating aragonite and detritus) at all four Lisan sites (with extremely thick seismites at the PZ1 site and the only breccia at the NT site) as well as five well-constrained collapses in different areas of the Soreq cave. A group of 2-3 thick asphalt bearing breccias were dated to 39-32 ka at three sites, suggesting a large scale asphalt expulsion during these earthquakes. A ~52±2 ka seismic event has left evidence at M1b (a closely spaced doublet of seismites), at PZ1 (followed by a period with numerous {8} and very thick {up to 48 cm} brecciated AAD) and at the cave site (4 collapses). At 71±2 ka 3 collapses were dated at Soreq Cave while brecciated AAD appear near the bottom of the M1b and PZ1 Lisan sections.

We suggest that these seismic events are large-earthquakes, sufficiently strong to cause cave collapses and lake bottom brecciation in numerous and distant sites in very different kinds of sediments and that these are representatives of the largest magnitude earthquakes in the Dead Sea region.

Controls on landslides size-distribution; relation between area and volume of landslides

Kalderon-Asael B. [1,2], Katz O. [1], Aharonov E. [3], Marco S. [2]

1. Geological Survey of Israel, 30 Malke Israel St., Jerusalem 95501, Israel
2. Department of Geophysics and Planetary Sciences, Tel Aviv University, Tel Aviv 69978, Israel
3. Weizmann Institute of Science, Rehovot 76100, Israel

A remarkable observation is that landslides of different sizes, from different locations, triggered by different mechanisms, all seem to have self-similar shapes, with their area (A) to volume (V) ratios obeying a power law. The physical basis for this observation is poorly understood. In the presented work we model the relation between surface area (A) and volume (V) of landslides in homogenous slopes, using basic mechanics principles, and find an excellent agreement with field data. Our model uses a simple engineering computer program (slope-stability calculation; Geo-Slope/W) based on the limit equilibrium approach using the Bishop's Simplified method. A total of 790 individual simulations were run, with a range of cohesion values (c = 0-20 kPa), angles of internal friction (phi = 0-40 degrees) and slope heights (H = 1-1000 m). When analyzing the landslides volume-area relations at different scales, we found model-predicted universal relation: $V \sim A^{1.4}$, independent of slope height and mechanical properties, which agrees very well with the trends shown by field observed landslides around the globe. Our findings suggest that the V vs. A relation is universal, and is the result of very simple mechanical and geometrical principles – captured even by the simplest of slope failure models. Because V vs. A relations are universal, once one of these variable is set, the other must follow suit. The shape and size of the landslide is thus constrained by the size of the slope (which dictates the maximum for A) or the depth of the failure or bedding plane (which constrains V/A). The above findings have implications to hazard analysis, since the size distribution of landslides is of major consideration in both landslide and tsunami hazards evaluation.

Site effect and seismic hazard assessment for construction of local urban areas: Example from Qiryat Dan, Ramle

Kalmanovich M., Zaslavsky Y., Gorstein M., Perelman N., Giller V., Livshits I., Shvartsburg A., Dan H.

Seismology Division, Geophysical Institute of Israel, P.O.Box 182, Lod, Israel

Due to their proximity to the seismically active Dead Sea Fault system, the many towns and settlements of Israel are considered high seismic risk zones. Local variations of soil conditions can increase ground motion generated by earthquakes and the consequential damage. Consequently, site specific seismic hazard assessment became a very important issue especially when considering the construction of new densely populated local urban areas. Therefore, a better assessment of the expected ground motions inside the city is thus a key element for urban and civil protection planning; and it thus appears necessary to investigate site effects especially when considering construction of new neighborhood. This investigation was focused on estimating the seismic hazard to new building neighborhood Qiryat Dan and was carried out by initiative of Ramle town council. The study covers area of 0.15 km^2 and during one day ambient noise was recorded at 12 points. In addition, one point was instrumented with seismometers for two months and two regional earthquakes were recorded. Two empirical non-reference techniques were used for site effect estimating: horizontal-to-vertical S-wave spectral ratio obtained from seismograms of the earthquakes (receiver function) and spectral ratio of the horizontal versus vertical components of motion from ambient noise observed at the same site. The soil site exhibit H/V peak amplitudes up to 5.0 in the frequency range 0.9-1.5 Hz. We compare the averaged H/V spectral ratios obtained from seismogram of the earthquakes and ambient noise. There is clear agreement between in the locations and amplitude of the maxima between the functions obtained from the different data sets. The geophysical, geological and borehole data were integrated with H/V spectral ratios to develop model for the subsurface. The subsurface model serves as input for computing the expected Uniform Hazard Soite-Specific Acceleration Response Spectra (Shapira and van Eck, 1993) at the investigated area. The shape of spectra obtained for Qiryat Dan differ significantly from those prescribed by Israel Standard (IS-413) in that IS-413 underestimates the acceleration in the period range from 0.5 to 2 sec.

Evaluation of rockfall hazard and risk to Qiryat-Shemona (northern Israel) - possible correlation to earthquakes

Kanari M. [1], Katz O. [2], Porat N. [2], Weinberger R. [2], Marco S. [1]

1. Department of Geophysics and Planetary Sciences, Tel Aviv University, Tel Aviv, 69978
2. Geological Survey of Israel, 30 Malkhe Israel St., Jerusalem, 95501

We study rockfalls west of Qiryat-Shemona, a town in northern Israel situated within the Dead Sea Transform fault system, at the foot of the Ramim escarpment. The 40-m-thick Ein El Assad Formation limestone outcrops provide the source material for rock blocks. Aerial photos from 1946 show boulders of volumes of 1 m^3 to 150 m^3 situated within the now built town premises. For evaluating rockfall hazard and risk for Qiryat-Shemona, this study examines: (a) what is the triggering mechanism?; (b) which are the feasible downhill trajectories of the blocks?

To answer these questions we mapped hundreds of rock-blocks both on the field and on aerial photos and analyzed their volume and spatial distributions; simulated rockfall trajectories using a commercial simulation program (CRSP v4); and determined the burial ages of soil samples from beneath large fallen blocks by OSL.

Results show that the block volume distribution (Probability Density Function - PDF) follows an exponential function of the form ax^b with b value -1.17. This volume distribution is used to determine most probable rock-block volumes for hazard evaluation. Field observed piles of rock-blocks show evidence for a catastrophic nature of the rockfalls, as opposed to a possible slow weathering mechanism. Preliminary OSL dating of 9 soil samples demonstrate clustering around specific dates, which coincide with known earthquakes found in historical and seismic catalogs, implying that rockfalls were triggered by earthquakes. We use maps of maximal downhill block travel distances combined with slope morphological analysis to suggest possible downhill historical block trajectories, along which we calibrate the simulation program variables (tangential and normal coefficients of the slope). We then use these variables and simulate possible downhill rockfall block trajectories towards the town premises. Simulation results are used to compile the rockfall hazard maps. Probable block volumes determined from the volume probability density function yield risk evaluation for the area of Qiryat-Shemona. We conclude that at the south-westernmost part of town, life and property are at a present rockfall risk in particular areas, which we detail on a map. Simulated results of block velocity and block bounce height along the slope can be used as parameters for a risk reduction engineering program for Qiryat-Shemona.

Compaction bands near fractures and boreholes

Katsman R.[1], Ahronov E.[1], Haimson B.[2]

1. Weizmann Innstitute of Science, dspartmment of Environmmantal Sciences and Energy Research, 76100, Rehovot, Israel
2. University of Wisconsin-Madison, College of Engineering, 1509 University Ave. Madison. WI 53706-1595

This work aims to explain the results of rock mechanics experiments (Haimson et al., 2003-2007), in which a hole within a porous sandstone is placed under compression. Under certain material properties and far-field stress conditions, 'breakouts' start propagating from the holes perimeter. Such a situation is of practical relevance: boreholes are often drilled deep into the earth for the purpose of extracting oil, gas etc, and the question of the holes stability is important. In the experiments, as well as in real boreholes, breakouts often are preceded by compaction bands that are induced by the compressive stress field at the perimeter of the hole. Because of circulating fluids, the debonded and often fragmented grains within the compaction bands are often removed, creating the breakouts. Breakouts, or emptied compaction bands, are observed to be much longer than non-emptied ones, under the same far-field stresses, depending on the fluid flow rate. Our aim is to understand and predict the formation of these breakouts and their final length. To this end, a new analytical model is formulated that enables prediction of the stress field around emptied and filled breakouts, the various factors affecting the breakouts lengths, and the final length. Good agreement of the developed analytical model with the results of the experiments of Klaetsch and Haimson (2002), Haimson and Kovacich (2003), Sheets and Haimson (2004), Haimson and Klaetsch (2007) is clearly demonstrated.

Paleoseismology along the Southeastern Sea of Galilee margins, Dead Sea Rift, Israel

Katz O.[1], Amit R.[1], Yagoda G. [1,2], Hatzor Y. H. [2], Porat N. [1], Hecht H.[1], Malik U. [1]

1. Geological Survey of Israel, 30 Malkhe Israel St., Jerusalem 95501, Israel
2. Ben Gurion University of the Negev, P. O. Box 653, Be'er Sheva 84105, Isreal

We studied the seismic-history of the SE margins of the Sea of Galilee, situated along the Dead Sea Rift. The study area hosts the N tip of the seismically-active Jordan valley fault-segment. During the past two millennia a few strong earthquakes are known to have occurred along this segment and current seismicity is recorded.

Morphotectonic mapping using aerial-photos and field observations revealed in the studied area numerous 10 to 100 m long N-S striking lineaments as well as some old landslides. Resolving the interaction between these morphological elements is a key factor in understanding the level of local seismic hazard and the relative timing of the events.

We excavated trenches across 4 lineaments showing distinct morphological vertical steps. Each trench hosts one or more westwards dipping faults with normal displacement of the soil profiles. Total displacement is up to a meter and in places more than one displacement event can be traced on a single fault plane. The bed rock is highly fractured near the faults. OSL dating of the soil profiles indicates Holocene ages in the westernmost trenches and upper Pleistocene in the easternmost ones.

The largest landslide observed in the field, 500m wide and 1500m long, was selected for detailed analysis. A trench was excavated on the landslide, crossing a lineament clearly detected on both the N and S boundaries of the slide. The 3m deep trench exposed 3 soil profiles developed in the colluvium composing the landslide. The development of the three soil profiles implies cyclic down-slope movement of material and quiescent periods between movement episodes, allowing soil formation. Sedimentary and pedogenic disturbances detected in the trench, may be associated with the slide-crossing lineament. OSL dating of the soil profiles reveals upper Pleistocene ages in the lowermost soil profile and Holocene in the uppermost one. The temporal relationship between the slide and the lineaments are yet unclear, although the overall time frame for sliding events is similar to displacement events. Results of slope-stability analyses for the slide indicate that the slope is stable under static gravitational loading. Pseudo-static analyses results indicate that a horizontal PGA value of about 0.37g would be required for sliding if residual strength values of the rocks are assumed.

We monitored fracture-opening in a concrete structure built in Taufic area as a speculated indication to slope-creep. We found an opening of ca. 2 mm/year (3 years average).

According to the observed displaced soil-profiles in the trenches and the high PGA needed for slope instability we conclude that the study area experienced an intense seismic history with strong earthquakes (Mw 7) and high PGA (0.37g). These findings, with the observed slope-instability (Taufic) need to be taken into considerations when seismic hazard evaluations are done.

Composite dykes in southern Israel: a key for deciphering the origin of post Pan -African A-type granites

Katzir Y., Litvinovsky B.A., Eyal M., Zanvilevich A.N., Be'eri-Shlevin Y.

Department of Geological and Environmental Sciences, Ben Gurion University of the Negev, Be'er Sheva 84105, Israel

Late Neoproterozoic bimodal dyke suites are abundant in the Arabian-Nubian Shield. In southern Israel this suite includes dominant alkaline quartz porphyry dykes, rare mafic dykes, and numerous composite dykes with felsic interiors and mafic margins. The quartz porphyry chemically corresponds to A-type granite. Composite dykes with either abrupt or gradational contacts between the felsic and mafic rocks bear field, petrographic and chemical evidence for coexistence and mixing of basaltic and rhyolitic magmas. Mixing and formation of hybrid intermediate magmas commenced at depth and continued during emplacement of the dykes. Oxygen isotope ratios of alkali feldspar in quartz porphyry (13 to 15‰) and of plagioclase in trachydolerite (10–11‰) are much higher than their initial magmatic ratios predicted by equilibrium with unaltered quartz (8 to 9‰) and clinopyroxene (5.8‰). The elevation of $\delta^{18}O$ in alkali feldspar and plagioclase, and extensive turbidization and sericitization call for post-magmatic low-temperature ($\leq$ 100 °C) water-rock interaction. Hydrous alteration of alkali-feldspar, the major carrier of Rb and Sr in the quartz-porphyry, also accounts for the highly variable and unusually high I(Sr) of 0.71253 to 0.73648.

The initial $^{143}Nd/^{144}Nd$ ratios, expressed by $\varepsilon_{Nd}(T)$ values, are probably unaltered and show small variation in mafic and felsic rocks within a narrow range from +1.4 to +3.3. The Nd isotope signature suggests either a common mantle source for the mafic and silicic magmas or a juvenile crust source for the felsic rocks (metamorphic rocks from the Elat area). However, oxygen isotope ratios of zircon in quartz porphyry [$d^{18}O$ (Zrn) = 6.5 to 7.2‰] reveal significant crustal contribution to the rhyolite magma, suggesting that mafic and A-type silicic magmas are not co-genetic, although coeval. Comparison of $^{18}O/^{16}O$ ratios in zircon allows to distinguish two groups of A-type granites in the region: those with mantle-derived source, $\delta^{18}O$(Zrn) ranging from 5.5 to 5.8‰ (Timna and Katharina granitoids) and those with major contribution of the modified juvenile crustal component, $\delta^{18}O$(Zrn) varying from 6.5 to 7.2‰ (Elat quartz porphyry dykes and the Yehoshafat alkaline granite). This suggests that A-type silicic magmas in the northern ANS originated by alternative processes almost coevally.

Groundwater dynamic equilibrium during a base level drop: the Dead Sea Case

Kiro Y. [1,2], Yechieli Y. [1], Lyakhovsky V. [1], Shalev E. [1], Starinsky A. [2]

1. Geological Survey of Israel, 30 Malkhe Israel St., Jerusalem, 95501
2. Institute of Earth Sciences, Hebrew University of Jerusalem, Givat Ram, Jerusalem, 91904.

Base level changes and their effect on groundwater are important issues concerning global sea level changes and water management. The Dead Sea region is a good place for studying this effect due to its fast lake level drop and the absence of tides and waves. The fast lake level drop allows monitoring the groundwater and studying the changes within a relatively short time.

A Groundwater level drop was detected in most boreholes in the region ranging from 20% to 100% of the Dead Sea level drop rate. In Wadi Arugot, the groundwater level drop was at the same rate as the Dead Sea, regardless of the distance from the shore. The transition zone between the fresh and saline water is also dropping and becomes wider with time. Furthermore, there are seasonal changes in the transition zone location that are much greater than those in the groundwater level.

Theoretical analysis was done on the case of a continuous lake level drop. The response of the groundwater discharge to an instantaneous lake level drop was approximated to an exponential decay. In the case of a continuous base level drop, the discharge can be approximated as a sum of discrete instantaneous drops. Simulations were done with the USGS SUTRA code in order to understand the response of the groundwater system. The simulations lead to the definition of two characteristic times, one for the groundwater level response and the other for the transition zone response. The groundwater system behavior can be classified using the characteristic time. The theoretical analysis and the simulation results both show the same groundwater behavior.

The groundwater discharge to the lake during a constant level drop increases until it reaches a constant value in which the groundwater level has reached a new dynamic equilibrium. At this point the hydraulic gradient remains constant and the groundwater level drops at the same rate as the lake level. This explains the constant hydraulic gradient during the past few years in Wadi Arugot.

However, the transition zone responds slower than the groundwater level, with a relatively small transition zone characteristic time. The slower movement of the transition zone causes a widening of the transition zone due to hydrodynamic dispersion. Furthermore, the vertical movement due to the lake level drop causes an extra widening due to the longitudinal dispersion that has a vertical effect. Therefore, the topography and bathymetry also affect the thickness of the transition zone during the lake level drop.

Improvement of the reliability of subsurface void detection, including sinkhole development, at the Dead Sea shore area by means georadar

Kofman L. [1], Frumkin A. [2], Ezersky M. [3], Ronen A. [4], Libi M. [5]

1. TECHNION Research and Development Foundation Ltd., Haifa
2. Geography Department, The Hebrew University of Jerusalem
3. Geophysical Institute of Israel. Lod
4. Geotec –Engineering & Environmental Geophysics Ltd., Rishon Lezion
5. Scan_In, Engineering Scanning, Moshav Hemed

In this research the original resonant GPR pictures obtained above marked anomalous places in the Ein Gedi Caravan Park area (those which later collapsed) are analyzed. The geoelectric studies carried out in this area show a high resistivity 350–1000 Wm of the subsurface that allows GPR penetration up to 8-10m. To investigate the conditions for appearance of the resonance phenomena in reflected pattern above subsurface voids, laboratory and field tests were performed.The first experiments were performed by towing 500, 300 and 100 MHz antennas above the model voids (empty fiberglass cylinders with in diameters of 0.6, 1.0, 1.5 and 2.4m), were buried vertically with their tops at depths 0.7 - 1.5 m.

A second set of experiments was performed at the same sand test-site in TECHNION by hand-dragging a 400, 500,900 and 1600MHz antennas above model-voids in diameters of 0.3, 0.4, 0.5, 0.6 and 0.9m.Based on the results of these tests, the factors causing the appearance of the resonance phenomena are the following:

-The antenna wavelength has an approximate size as the diameter of the subsurface hole.

-The required density of the GPR survey grid must be 1 meter for observing resonance above voids with diameters of 1.5 m and smaller.

The second aim of this study was developing the GPR technology in order to find additional indicators that reveal significant differences between radar responses obtained from empty voids and those received from other radar contrasting damp geological features, such as a clay-filled lens. For this all antennas were twice towed above empty models, once in "typical" form and then in "side" form. Later, part of empty models was filled with damp clayey soil and the same towing was performed in both forms.

We can validate that turning of the antennas axis at 90 deg. ("side" form) resulted in horizontal extension and amplification of the high-amplitude reflections by 10-20% during towing above empty cylinders and an opposite effect – reduction of 10-15% of reflections' amplitudes when towing in "side" form above the models of clay-pockets, compared to "typical" form towing. The above-mentioned effects, discovered over laboratory models-voids, were first examined in real conditions at the Neve Zohar area. When towing 300, 400 and 500 MHz antennas in "side" form over the dug void, in all cases the horizontal extension and amplification of observed reflections were confirmed by 15-30% above the results in "typical" form.

The results of the laboratory and field tests demonstrated that registration of the prominent resonant oscillations and/or the amplification of high-amplitude reflections with its horizontal extension during towing antenna in "side" form may serve as reliable indicators to the existence of subsurface holes. The above observations have to be integrated into practical void detection.

Eastern Mediterranean climate changes during the last 90ka based on pollen analysis in deep sea cores

Langgut D.

The University of Haifa, Pollen Laboratory, Archaeology department, Mount Carmel, Israel

The research deals with high resolution palynological record with the aim of reconstructing changes in vegetation and climate of the Eastern Mediterranean basin during the last 90ka. The study is based on two cores: 95-09 taken off the southern Israeli coast and represents the southern Levantine basin, mainly the distal part of the Nile delta; core 95-01 was recovered south-east of Cyprus and represents the northern Levantine basin.

The chronological framework of the studies cores is based on the identification of sapropels, 14Cdating and correlation of foraminifera $\delta^{18}O$ records with the high-resolution, well-dated U-Th speleothem record from the Soreq Cave, Israel. High sedimentation rates in core 95-09, together with high resolution sampling, produced one of the most detailed marine palynological records in the Eastern Mediterranean Sea to date.

Several humid/dry periods have been documented during the last 90ka. *Quercus calliprinos* type (evergreen oak) and *Artemisia* (sagebrush) were found as the best palynological markers for the identification of humid and dry cycles, respectively. The Last Glacial (75.5-16.2ka), the deglaciation (16.2-10ka) and the Holocene are easily recognized by changes in pollen assemblages. Climatic conditions during the Last Glacial period were cold and dry, with low AP levels and high values of *Artemisia.* Several fluctuations were identified during this generally cold and dry period, such as the pluvial event between 56.0 to 54.3ka. The most dramatic climate change started at the beginning of the deglaciation and continued throughout the Holocene. During these periods the climate was very wet, suggesting that the Mediterranean maquis was more extensive in the area and that precipitation was relatively higher than before. Short climatic events such as the cold and dry LGM, the warming of Bölling/Alleröd phase, the dry Younger Dryas episode and the cooling event at 8.2ka, are also evident in the pollen record. Heinrich events H2-H5 were identified through a correlation with extremely low AP ratios.

Sapropels S3 and S1 were easily recognized by the high concentrations and good state of preservation of pollen grains, that, in turn, accord with high Total Organic Carbon content. The southern Levantine Basin, core 95-09, is characterized by higher sedimentation rates, greater taxa variability and a better state of preservation of pollen grains than the northern Levantine Basin, due to the greater distance of the latter from the Nile River. Pollen grains in the northern core were preserved mainly during sapropels S3 and S1, when the sea floor became anoxic.

The research also shows that sediments and pollen in the southern Levantine Basin derived mainly from the Nile. The continued presence of palynomorphes of nilotic origin, in core 95-09, points to a constant Nile flow during the last 90ka, even at dry periods like the LGM.

Formation of sequential basins along a strike slip fault: Geophysical observations from the Dead Sea basin

Lazar M. [1], Ben-Avraham Z. [2], Schattner U. [1]

1. Department of Marine Geosciences, Leon H. Charney School of Marine Science, University of Haifa
2. Department of Geophysics and Planetary Sciences, Tel Aviv University

The Dead Sea basin is often cited as one of the classic examples for the evolution of pull-apart basins along strike–slip faults. Despite its significance, the internal structure of the northern Dead Sea basin has never been addressed conclusively. In order to produce the first comprehensive, high-resolution analysis of this area, all available seismic data from the northern Dead Sea (lake) – lower Jordan valley (land) were combined. Results show that the northern Dead Sea basin is comprised of a system of tectonically controlled sub-basins delimited by the converging Western and Eastern boundary faults of the Dead Sea fault valley. These subbasins grow shallower and smaller to the north and are separated by structural saddles marking the location of active transverse faults. The sedimentary fill within the sub-basins was found to be relatively thicker than previously interpreted. As a result of the findings of this study, the "classic" model for the development of pull-aparts, based on the Dead Sea, is revised. The new comprehensive compilation of data produced here for the first time was used to improve upon existing conceptual models and may advance the understanding of similar basinal systems elsewhere.

Pleistocene red algal carbonates off Ashqelon – the "Tyrrhenian" warm stage was not so warm, was not exactly Tyrrhenian, and will happen again!

Lazar, S. [1,2], Avital, A. [1,2], Almogi-Labin, A. [2], Buchbinder, B. [2], Bar-Matthews, M. [2], and Benjamini, C. [1,3]

1. Department of Geological and Environmental Sciences, Ben-Gurion University of the Negev, Beer-Sheva 84105, Israel
2. Geological Survey of Israel, Jerusalem 95501, Israel
3. Ramon Science Center, Mizpe Ramon, Israel

Cores off Ashqelon contain carbonate-rich horizons bound by red algae, just above the Plio-Pleistocene unconformity. These have now been dated at 245-255 ka at the top, and approximately 320 ka at the base. Red algae bind sediment rich in mollusca, bryozoa and echinoderms, with corals and foraminifera, including symbiont-bearing larger foraminifera also present. This facies is very different from the soft-bottom siliciclastic facies characteristic of the entire nilotic eastern Mediterranean.

The carbonate facies are constrained to three transgressions and two regressions of Marine Isotope Stages (MIS) 8.0-9.2. This correlation is based on facies shifts up and down a carbonate ramp, employing a variety of sedimentological and biotic features. Much of the biota, in particular *Cladocora* corals and symbiont-bearing foraminifera indicate a warm-temperate climate (>14°) during glacial stage MIS 8. These carbonates formed because Nile sediment supply was strongly reduced, probably indicating monsoonal weakening and climatic deterioration in the headwater region at that time.

The Tyrrhenian Stage of the Mediterranean Pleistocene has recently been redefined at its type locality, and dated to MIS 5.5, which is at the previous interglacial maximum, at 125-130 ka. The Ashqelon carbonate section clearly does not belong to this stage, and therefore other reports of this stage along the Israel coast, based on warm-water faunas, need to be reconsidered.

The carbonates therefore represent not an interglacial interval, but a time during which nilotic sediments failed to reach the Levant coast. Due to anthropogenic interference (e.g. damming of the Nile), this sedimentary pattern is emerging once again. We foretell that algal carbonates similar to those of Ashqelon represent the sedimentary regime most likely to become established along the Levant coast in the near future. A similar facies is today developed along the northernmost coast of Israel.

A high resolution marine geophysical survey, Lake Kinneret

Lev L. [1], Sade A. R. [2], Tibor G. [3], Ben-Avraham Z. [1], Hall J. K. [4], Zohari T. [5]

1. Department of Geophysics and Planetary Sciences, Tel Aviv University
2. Department of Geo-Marine, Leon H. Charney School of Marine Sciences, University of Haifa
3. Israel Oceanographic and Limnological research
4. Geological Survey of Israel
5. Kinneret Limnological Laboratory, Israel Oceanographic and Limnological research

The Kinneret basin is located at the north part of Kinnarot valley, showing a complicated tectonic structure that raises questions regarding the geometry of the basin, the location and the structure of the faults and the history of the basin. The study of the tectonic and morphology phenomena of Lake Kinneret is important for the understanding of hydrological and geochemical processes that characterize the lake. For example, what are the current sources contributing to the high salinity in the lake (e.g. 190-280 mgcl.)? what is the role of sub-marine springs? Etc. To date, our knowledge on the lake morphology and shallow sub-bottom structure is based on a 100 m grid bathymetric survey that was done on the late 80's (1986-1987) and on 3.5 kHz and Chirp sub-bottom surveys that covered small areas of the lake.

In the present survey, that will take place during May and June 2008, we plan to construct a detailed map of the lake-floor and its upper sub-bottom (~ 50 m below lake floor) and to create a detail magnetic map (e.g. previous magnetic map is based on 1 km grid of magnetic survey lines). The new study is funded by the Israel Water Authority and by the MKB Foundation and will include a multi-beam sonar, a Sparker system and a marine magnetometer. We intend to calculate the sedimentation rates by comparing the new data to previous data from 1986-1987 and to identify and map craters, upwelling gas and saline water, as well as other morphological phenomenon at the bottom of the lake. The understanding of recent tectonic processes will become possible through mapping recent faulting and linking to deep tectonic mapping.

Spatial delineation of groundwater salinity using deep TDEM geophysical measurements: a feasibility study

Levi E. [1], Goldman M. [1] Gvirtzman. H [2]

1. Geophysical Institute of Israel, Lod, 71100 Israel
2. Institute of Earth Sciences, Hebrew University of Jerusalem, 91904 Israel

The objective of this study was to delineate the spatial distribution of fresh, brackish and saline groundwater bodies, as well as brine, beneath the Judea Desert, Israel. The deep time domain electromagnetic (TDEM) geophysical system, named Cycle-5M, providing the maximum exploration depth, down to ~1.5-2 km below land surface, was employed. The study was conducted at 21 locations at the desert plateau, where fresh groundwater flows through the upper aquifers from the replenishment area at the Judea Mountains toward the Dead Sea springs. At deeper aquifers, brackish and saline groundwater bodies exist, which originated from lakes and lagoons, existed at the Dead Sea Rift valley during the Pleistocene and Pliocene, respectively.

The geophysical calibration results showed that, fresh groundwater ($C<10^3$ ppm TDS salinity) is characterized by resistivity of more than 15 ohm-m; brackish groundwater ($10^3<C<10^4$ ppm salinity) by 5-15 ohm-m; saline groundwater ($10^4<C<10^5$ ppm salinity) by 0.5-5 ohm-m; and brine (105<C ppm salinity) by less than 0.5 ohm-m.

The hydrological results of the survey show that the upper Judea Group aquifer is usually saturated with fresh groundwater, while the interface between fresh and brackish water exists within the lower Judea Group aquifer and in the underlying Kurnub Group aquifer. According to the scarce calibration data available, the salinity of the brackish groundwater in most cases does not exceed a half of the normal seawater salinity.

Costal Aquifer – changes in water storage over the last seventy years

Livsihitz Y. [1], White O. [2], Brown A. [2]

1. Hydrological Service of Israel. P.O.B. 36118, 91360 Jerusalem, Israel.
2. Department of Environmental Health Sciences, Hadassah academic college Jerusalem.

Coastal Aquifer represents one of the most important water resources of Israel. The importance of this aquifer, as an operative storage reservoir, even increases today - at the epoch of water desalination.

Since 1934 maps of Coastal Aquifer are being prepared. However, the data necessary for estimation of water storage by conventional methods is available only since 1970. Current research included development of a method for evaluation of the water storage, based on the water level maps. The method includes: 1. Digitization and transformation of the existing maps to the ArcGIS raster format; 2. Calculation of a saturated thickness by application of ArcGIS tools; 3. Calculation of the water storage, basing on both storativity (data from the Hydrological service) and saturated thickness.

Estimates produced by our method are similar to those (available since 1970) in Hydrological service status reports.

Current research was focused on five historical periods: 1933/34- The first year for which water level map was prepared; 1963- The year of the lowermost water levels during the 60's; 1987- The only map prepared during 1980- 1994; 1995 – The year with the highest water levels since the 50's; And 2005 - The last available map.

Analysis of the results leads to the following conclusions:

The highest ground water storage in Coastal aquifer was in 1934, during a period of the hardest drought, known in Israel. Additionally, the exploration of the aquifer had already begun at these times. Therefore, one can assume that in undisturbed conditions the ground water storage was even higher.

The lowest ground water storage of the Coastal aquifer was in the 80's. In 1987, the storage was by 2.6 billion m^3 lower than in 1934. The most significant storage decrease (2.3 billion m^3) was during 1934 – 1963.

The highest ground water storage since the 50's was in 1995, after the excessively rainy winter 1991/92. During 1987 – 1995 about 1.0 billion m^3 of water were added to the aquifer.

In 2005 the ground water storage was lower then the storage in 1995 by 0.3 billion m^3, and by 2.0 billion m^3 lower than the storage in 1934.

The storage depletion occurred in all parts of the aquifer, except the south-eastern part. The highest depletion occurred in the central part of the aquifer, - in the main storage cells. In these cells in 1934-2005 water storage depleted by 0.9 billion m^3 in the central part; 0.5 billion m^3 in the northern part; 0.4 billion m^3 in the southern part.

In the eastern part of the aquifer (eastern cells), water storage has been increasing continually since 1963. In the south-eastern part, in 2005 storage was by 15 million m^3 higher than in 1934.

Tracer test in En Ziv

Magal E. [1], Arbel Y. [2], Caspi S. [3], Katz Y. [3], Glazman H. [4], Yechieli Y. [1], Greenbaum N. [2]

1. Geological Survey, Israel
2. Haifa University
3. Mekorot
4. Israel nature and national parks protection authority

The Ziv spring in Eastern Galilee has been contaminated by sewage in the last years; most problematic was the contamination last year (2006-2007). Many potential contamination sources were identified, yet none could be characterized specifically. Therefore, a tracer test was conducted in order to check whether sewage from a pool in Nahal Cziv (6.7 km from the spring) could be the source for the En Ziv contamination. The pool was tagged by the fluorescent dye Uranine and LiCl and water samples were taken from En Ziv, and also from other springs in the Nahal Cziv and Nahal Gaaton. Fifty-eight hours after the injection of tracers the water from the Ziv spring was colored green by the fluorescent dye Uranine, reaching its maximal concentration after 73 hours. Li breakthrough in the En Ziv water was delayed in comparison to the Uranine due to interactions with the aquifer. The maximal concentration of Uranine in the spring equals 1/1000 of its concentration in the pool. The experiment proved behind any reasonable doubt that there is a fast hydraulic connection between the sewage that percolates into the subsurface in the pool at the upper part of the Nahal Cziv stream and the water of En Ziv. The recovery of the fluorescent dye was evaluated according to the breakthrough curve and the spring discharge and found to be high. Therefore, most of the sewage that percolates into the subsurface through the pool reaches the spring and contaminates its water. It should be noted that the experiment results do not rule out contribution of other contaminating sources.

Low concentration of Uranine was also found in En Hardalit that is located 7 km west of the En Ziv in Nahal Cziv stream. It is possible that the Uranine flowed to En Hardalit spring through surface flow of Nahal Cziv, since the tagged water of the Ziv spring flowed as runoff.

The result of the experiment indicates that by proper use of artificial tracers hydrological connections can be identified. Moreover, artificial tracers can be used for identification of contamination sources where multiple sources are present.

Target Horizon 'Flattening': a pragmatic solution for deep 2D sub-salt depth imaging

Makovsky Y.

University of Haifa, Charney School of Marine Sciences, Department of Marine Geosciences

Sub-salt imaging is to-date one of the hardest tasks for seismic imaging. Salt has an anomalous seismic velocity of 4-4.5 km/s, usually >1 km/s higher than the seismic velocity of the surrounding sedimentary sequence. Salt diapirs portray in most cases a complex 3D structure; and act as complex lenses embedded in the sedimentary sequence. Seismic waves that pass through salt diapirs are strongly scattered, distorting the reflections of underlying layers. Depth imaging, through depth domain velocity analysis, is required to resolve the distortions of sub-salt structure. The velocity analysis procedure is normally based on minimization of residual moveouts through tomographic updates of a depth velocity model. Modern sub-salt depth imaging solutions are based on 3D wide-azimuth seismic data acquisition and velocity analysis. 2D seismic data can not resolve off-plain seismic ray paths, and thus minimization of residual moveouts yields erroneous imaging. Here I present a pragmatic solution to this problem: forcing a geologically reasonable solution for the shape of the sub-salt layers, and letting the seismic velocities vary wildly, yield interpretable imaging of these layers. My results have been corroborated by consistent imaging on crossing profiles, and by negative gravity anomalies that map approximately the outlines of the salt diapirs.

Morphotectonics of the Galilee: tectonic systems, landscape evolution, and drainage system establishment

Matmon A.

Institute of Earth Sciences, Hebrew University of Jerusalem, Givat Ram, Jerusalem, Israel, 91904

Several major tectonic systems exist in the Galilee:

The Syrian Arch fold system. This system is comprised of a series of anticlines and synclines stretching from northern Sinai to Syria. The axis of the folds in the Galilee is roughly oriented S-N. This system was active since the Senonian (and perhaps even since the late Turonian). Post-Eocene tectonic and erosion processes eliminated its topographic expression.

Conjugate lateral fault systems trending SE-NW and SW-NE. Components of vertical displacement can also be identified, especially at the faults' tips. These systems were active mainly during the Miocene and their topographic expression was mostly eroded. In places such as the Meron fault where the system was rejuvenated, normal displacement is topographically expressed.

A normal fault system, trending mainly E-W. The system forms the series of elongated tectonic blocks that dominate the present topography of the Lower Galilee and parts of the Upper Galilee. This extensional structure has been developing since the Miocene, prior and contemporaneously to the development of the Dead Sea fault system.

A wide arch extending from the Mediterranean coastal plain to the Dead Sea Transform (DST). The wave-length of the arch in the Galilee is 40-60 km and the amplitude of arching that took place during the Pleistocene is 200-300 m. The arching is related to the development of the DST. Similar wide structural arches are associated with other rift systems in the world.

The arching (phase 4, above) and the E-W normal faults (phase 3, above) are the most dominant tectonic phases shaping the current topography of the Galilee. The prominent results of this activity are (a) the relatively young uplift of the Upper (Northern) Galilee to an altitude of over 1000 m above sea level, the subsidence of the Lower Galilee, and the establishment of a water divide between the DST and the Mediterranean; (b) the Basin and Range type structure of the Lower (Southern) Galilee. These are the foremost factors in determining the configuration and flow pattern of the drainage systems. Lithology exposure, controlled by the interaction of Cretaceous deposition, Syrian Arch structure, and the level of post-Eocene truncation plays a relatively minor role in the shaping of the landscape of the Galilee.

Slip partitioning in the Hula basin: new evidence from high resolution geophysics

Medvedev B. [1, 3], Makovsky Y. [2], Agnon A. [3]

1. Geophysical Institute of Israel, Lod.
2. Dept. of marine geosciences, Charney School of marine sciences, University of Haifa.
3. Institute of Earth Sciences, The Hebrew University, Jerusalem.

We report a high-resolution subsurface geophysical survey acquired for locating the active strand of the transform within the Hula basin. The location was chosen across the northern protraction of the active Jordan Gorge fault. The line provides a zoom-in on an existing regional scale seismic line which did not show any deformation on the shallow subsurface; only a single marker interpreted as top basalt was mapped at a depth of hundreds of meters. Our new data consist of a seismic reflection line (5m interval, 60 channels) and a gravimetric line (station spacing 20m). Penetration depth is estimated as 250m, with a horizontal resolution of tens of meters and vertical resolution of several meters. Initial results from the newly acquired line show a positive flower structure of ~120m width, both on the seismic section and on the gravity profile; this small-scale structure is compatible with a strike slip fault with a cross-fault shortening component. It is possible that near surface lateral change affect the subsurface image and, due to that together with lack of borehole control, interpretation is qualitative only. Hence only two horizons were marked. The deep marker at ~250m depth shows vertical displacement of ~40m while the upper, shallow marker at depth of ~80m reveals only fold structure. Due to survey limitations, it is possible that smaller scale structures and additional accompanying minor faults could not be resolved. The deformation suggests slip partitioning such that the Hula boundary faults take the normal component of slip, whereas the valley floor faults take up the transform component.

The geological structure of the Golan Heights and the evolution of the adjacent Dead Sea Fault System

Meiler M., Reshef M.

Department of Geophysics and Planetary Sciences, Tel Aviv University, Tel Aviv 69978, Israel

The Golan Heights (GH) is an elevated basalt-covered plateau located at the north-eastern part of Israel. The proximity of the Plateau to the Mesozoic aulacogen, so called Palmyride Rift, the Cenozoic Dead Sea Fault System (DSFS) and Harrat-Ash-Shaam volcanic field must have had a significant influence on its geological evolution and the subsurface geological structure.

Yet, the internal subsurface geological framework of the GH remains one of the less explored areas in the Eastern Mediterranean region. The vast area of the Plateau is entirely covered by thick basaltic flows of Plio-Pleistocene age, which effectively mask any expression of subsurface structural configuration. Very few geophysical studies which were performed in the GH have provided only some general framework of its subsurface structure. Therefore the current geological knowledge of the GH is restricted to the uppermost section, i.e. the outcropping geology. The internal structure, stratigraphic column and the general geologic framework of the GH are mainly unidentified.

Within the borders of Israel, the GH is the only area accessible to geophysical studies on the eastern side of the DSFS. Moreover, the GH borders the DSFS at a location which seems to be one of its key structural parts, where the splitting of the main fault strand into five divergent segments occurs. However, due to the geo-political limitations and the lack of good quality seismic data, this crucial part of the DSFS was never explored in a detail and systematic manner.

In the course of the present research, for the first time, a complete and a comprehensive review of all seismic reflection data collected over the GH, parts of the Eastern Galilee and the Northern Samaria will be carried out. Detailed structural mapping of the key seismic horizons will illuminate the continuous stratigraphic column throughout the GH and the Eastern Galilee and thus will enable to resolve the geological framework of the Plateau.

The resolved geological setting of the GH will enable to compare the revealed structures on both sides of the DSFS in an area where the complex-branching geometry pattern of the continental plate boundary occurs.

The dataset consists of twenty five 2D seismic-reflection lines located on the GH and several additional lines located on the western side of the DSFS. Additionally, there is a set of fifteen exploration boreholes and deep water-wells located in the vicinity of the study area, at the Israeli, Jordanian and Syria sides.

Pre-Stack Depth Migration (PSDM) technique will be utilized as the main seismic processing tool. Since the outcome of the PSDM is the depth-domain migrated section, this approach will enable to carry out the seismic interpretation procedure directly in the correct (i.e. geological) domain, avoiding the traditionally used time-domain interpretation.

A preliminary image analysis based stromatolite classification algorithm

Meilijson A. [1], Benjamini C. [1], Sagiv C. [2], Sochen N. [2], Meilijson I. [2]

1. Department of Geological and Environmental Sciences, Ben-Gurion University in the Negev, P.O.B. 653, Beer Sheva, 84105 ISRAEL
2. School of Mathematical Sciences, Tel Aviv University, Tel Aviv, 69978 ISRAEL

Stromatolite classification and the difficulty in comparing our local stromatolite forms to others reported in the literature, was the stimulus to our attempt at a novel classification algorithm. This study was based on Triassic stromatolite samples, from five different layers, collected in a separate sedimentological study conducted in Makhtesh-Ramon. The objective was compiling a program that could identify microbialite textures and morphologies, in this case stromatolites, according to a photographic data base. In receiving a new stromatolite photograph, the program proved able to identify the layer or morphology it is most closely connected to, and present its amount of deviation from the other layers, or morphologies, in the data base.

Image analysis was done using Matlab including the use of Gabor filters, found as very suitable for rock surface image analysis. Data processing used mainly PCA (Principal Component Analysis) as a statistical tool. When out-sampling each photograph comprising our stromatolite data base, based on the five different layers and morphologies, the algorithm successfully identified 75% - 93% of the photographs as belonging to their appropriate layer. This is a first use of Gabor filters in rock image analysis, and in light of the apparent success, should be tried in other geological fields which require similar methods and databases, such as fracture shape and orientation comparison, sedimentological textures, surface friction and so on.

A direct contribution of the classification algorithm to the stratigraphic column studied at Makhtesh-Ramon, was in emphasizing the high morphological similarities which exist in each of the stromatolite layers, in comparison to the high morphological diversity between each of the five different stromatolite layers.

Precise hypocenter relocation of earthquakes in Zofar area, Israel

Meirov T., Hofstetter R., Kraeva N..

Geophysical Institute of Israel, P.O. Box 182, Lod 71100

To improve our understanding of the deformational processes, active structures and potential seismic hazard in the Zofar region, we investigate small magnitude events that have occurred since 1984. About 2,600 earthquakes recorded by ISN in the Arava region were used in analysis. Our study examines the earthquake hypocenter relocations in an effort to resolve fault orientations and thereby gain insights into the tectonics of the seismic zone. The fault plane solutions confirm our previous knowledge about the seismotectonics of the Arava valley. The focal mechanisms in the Arava valley demonstrate the existence of normal faulting with T-axes trending NW–SE. The orientations of nodal planes in focal mechanisms agree with northwest direction.

A novel method for non-invasive estimation of coral calcification and porosity using ultrasound tissue recognition techniques

Mor G.[1], Rinkevich B. [2], Azhari H. [3], Makovsky Y. [1]

1.Department of Marine Geosciences, Leon H. Charney School of Marine Sciences, University of Haifa.
2.Department of Marine Biology, National Institute of Oceanography, Haifa
3.Department of Biomedical Eng. Technion IIT, Haifa, Israel.

Calcification in stony (scleractinian) corals, the building blocks of tropical reefs ecosystems, is the major process of reef growth. Sensitivity of calcification to changes in ocean temperature and acidity places this biological trait at the focus of global environmental concern and scientific research. We aim to develop a quantitative non intrusive measurement method for evaluating calcification parameters in live corals *in situ* using ultrasound tissue caharacterization techniques. For a start, we intend to scan live hard corals samples, horizontally grown on glass plates in the laboratory, avoiding the complex geometry and setting of corals in nature. Our intended samples are comprised of about 1 mm thick semi-planar coral tissue that is actively spreading and depositing a skeletal frame. Thus, the skeletal density and thickness laterally vary in the sample up to a thickness of about 1-2 mm. To achieve the necessary resolution we use a pair of high frequency (3-10 Mhz) piezoelectric transducers one for transmitting the waves and detecting the echoes and the other for detecting the through-transmitted waves. The recording configuration will be varied in order to obtain the various components of the scattered and transmitted acoustic fields. We intend to delineate the dependence of the scattered and transmitted signal properties to the skeletal porosity and thickness. Preliminary scans of a glass plate with only the skeletal layer (~1mm thick) of a hard coral sample has shown lateral amplitude variations of the through-transmitted waves, which correspond to the presence of the skeletal layer. These preliminary measurements provide positive feasibility indication for our future work.

Towards flash flood prediction in the dry Dead Sea region utilizing radar rainfall information

Morin E., Jacoby Y., Navon S., Bet-Halachmi E.

Department of Geography, Hebrew University of Jerusalem, Jerusalem, Israel

Flash-flood warning models can protect life and various kinds of infrastructure. In dry climate regions rainfall is highly variable and can be of high-intensity. Since rain gauge networks in such areas are especially sparse, rainfall information derived from meteorological radar systems can provide useful input to flash-flood models. In the present paper a flash-flood warning model utilizing radar rainfall data is presented and applied to two catchments that drain to the dry Dead Sea region. Radar-based quantitative precipitation estimates (QPE) were derived using bulk adjustment either on a daily scale (assuming real-time gauge data were available) or with a constant adjustment factor derived from calibration data. The QPE's served as input to a hydrological model that represented the main hydrological processes in the region, namely infiltration, flow routing and transmission losses. Model parameters were found by calibration based on five years' data for one of the catchments. Validation was performed for a subsequent five-year period for the same catchment and then for an entire ten year record for the second catchment. The probability of detection and false alarm rates for the validation cases were reasonable. Probabilistic flash-flood prediction is presented applying Monte Carlo simulations with an uncertainty range for the QPE's and model parameters. With low probability thresholds one can maintain more than 70% detection and up to 30% false alarm rates for all the validation cases. The study demonstrates that a flash-flood-warning model is feasible for catchments in the study area.

The Ayyalon cave, Israel - a new underground world

Na'aman I. [1], Frumkin A. [2], Dimentman Ch. [3].

1. Institute of Earth Sciences, Hebrew University, Jerusalem 91904, Israel
2. Department of Geography, Hebrew University,
3. Department of Evolution Systematics and Ecology, Hebrew University

In April 2006, a large cavern was discovered, as an accidental opening in a deep limestone quarry near Ramla in the inland plain, 21 kilometers from the Mediterranean coast. Up to its opening, the cavern was isolated from the outer world. It comprises two main levels, approximately horizontal, connected by vertical karstic shafts. In the lower level of the cave groundwater of the Judea Group aquifer is exposed, creating an underground pool. In this pool and its surroundings exists a rich and vital ecologic system, including six new species of troglobite arthropods, four of them aquatic and two terrestrials. In the absence of daylight or organic matter from the outside, the system is based on chemoautotrophic primary production by sulfide oxidizing bacteria. Currently, the cave is affected and endangered by the human activities in its vicinity.

The Ayyalon cave is located in the center of the Ayalon Saline Anomaly (ASA), and the water in its pool is characteristic to the anomaly, with chloride concentration of 500 mg/L, temperature of 29°c and the presence of hydrogen- sulfide.

The upper level of Ayyalon cave is characterized by confined artesian morphology. It has a structure of a sub- horizontal maze; cave walls and ceilings are mostly smooth and rounded with many cupola-form solution pockets, and has no upper inlets or outlets which could support groundwater flow into or out of the cave, in contrast of numerous holes and elongated rift-like voids observed at the bottom of the passages. The lower level has phreatic morphology features, of a cave that was formed at groundwater level. This level was mostly flooded up to the early 1960's, when the groundwater level began to drop dramatically due to intensive pumping.

The Ayyalon cave fauna has thriving populations of blind crustaceans, including two genera of cyclopoid copepods, a thermosbaenacean genera (*Tethysbaena*), and a palaemonid prawn, (*Typhlocaris ayyaloni* n.sp.) In the area near the water live two genera of terrestrial arthropods- Pseudoscorpions and Collembola. Previously, two additional species existed in the cave, the scorpion (*Akrav israchanani* n.gen.n.sp.) and Acarina, which probably became extinct.

Combined effect of salt precipitation and heterogeneity on evaporation from porous media

Nachshon U. [1], Grader A. [2], Weisbrod N. [1], Dragila M.I. [3]

1. Department of Environmental Hydrology & Microbiology, Zuckerberg Institute for Water Research, Blaustein Institutes for Desert Research, Ben-Gurion University of the Negev, Jacob Blaustein Institutes, Midreshet Ben-Gurion, 84990, Israel
2. Energy Institute and Department of Energy and Geo-Environmental Engineering, Pennsylvania State University, University Park, State College, PA 16802, United States
3. Department of Crop & Soil Sciences, Oregon State University, 3017 Agriculture and Life Sciences Building, Corvallis, OR 97331, United States

Evaporation is a major process in the global water cycle. The literature on micro-scale evaporation mechanisms and the influence of the resulted salt precipitation within pores on evaporation processes is limited. Moreover, the role of heterogeneity on the combined evaporation – salt precipitation processes is poorly understood.

This research focuses on salt deposition inside the matrix pores during the evaporation process and its correlation to gas permeability of the matrix. Another goal is to explore the combined impact of salt precipitation and heterogeneities on evaporation. Two experimental methods are used: (1) quantifying salt deposition in pores with high-resolution X-ray CT; and (2) monitoring of evaporation and salt deposition in controlled columns. In the first experiment, a Berea Sandstone, saturated with five percent NaI solution was allowed to evaporated naturally for five days while the water, air, and salt distributions were monitored periodically using X-ray CT. Klinkenberg permeabilities were determined prior to and following the evaporation process to explore the impact of salt deposition within the matrix on gas permeability. In the second experiment, eight columns were packed with fine and coarse sand as well as fine and coarse sand combined, with a textural interface between the two grain sizes. Four columns were saturated with DI water and the rest with salty solution. The columns were placed in a temperature controlled room with continuous monitoring of evaporation rates.

Fifty percent of the salt precipitated at the top seven mm of the sandstone sample, near the evaporating interface. Large pores (>200 micron) remained open with very small amount of precipitated salt crystals, while the smaller pores were mostly clogged with salt. These observations indicate that the solution migrated to the evaporation surface by capillarity. The gas permeability was reduced by ten percent supporting the observation that most of the large-pores remained open. Preliminary results from the column experiments indicate that both grain size and pore-water salinity play a major role in the evaporation rate.

Erosion and sedimentation in the margins of Yamin plateau

Nahlieli A.[1], Dody A.[2], Avni Y.[3], Weiner D.[2], Cohen H.[1], Blumberg D.[1]

1. Department of Geography and Environmental Development, Ben-Gurion University of the Negev, P.O.B 653, Beer-Sheva, 84105, Israel.
2. NRCN, P.O. Box 9001, Be'er Sheva 84190, Israel.
3. Geological Survey of Israel, 30 Malkhe Yisrael Street, Jerusalem 95501, Israel.

The main goal of this work is to get a better understanding of the geomorphological processes rates in the margins of Yamin Plateau.

This research is dealing with long term erosion processes. The study area is alluvial sandy valley located along Yamin – Rotem syncline. The valley bedrock constitutes of the Miocene Hazeva Group, overlying on Judean Group in the margin of the basin. Several Plio-Pleistocene unites, composed of re-deposited sands and gravels were uncomfortably deposited on top and incised within the Hazeva Group units. These units are characterized by their low resistance to erosion. In addition, the high elevation differences and the proximity to the drainage basin (the Dead-Sea) are putting the Yamin Plateau in higher probability of erosion.

The objective of this research was to evaluate the stability of the landscape. The research methods included both laboratory analyses (OSL and ^{14}C dating and grain size analyses) with field work. The data that achieved in these methods led us to several conclusions:

1. There is an obvious difference in erosion rates between the eastern and western margins of the valley. In the eastern side the erosion rate is around 46 mm/year and in the western side is around 0.05 mm/year. According to OSL dating, the main process that was active till recently was accumulation, mainly by re-deposition of sands from the main sand body of Hazeva Group. In the western margin of Yamin Plateau the landscape is characterized by moderate relief with hardly any gullies. According to OSL dating, this part is stabilized since the last glacial era, and the erosion rate in this part is negligible.

2. In the eastern margin of the Yamin Plateau an acceleration of the erosion is observed along the contact between the main sand body of the Hazeva Group and/or the re-deposited sandy units and the carbonate rocks of a Judea Group.

3. According to the grain sizes analyses and the field mapping, it can be obtain that the changes in the landscape of Yamin Plateau are controlled by aeolian-fluvial interactions or complex erosion, which prevail until the area was covered by soil crust.

4. Since the closure of the area in the 50th of the last century, the balance between the erosion and sedimentation processes was changed, causing acceleration of the erosion, but only in the eastern margin of the study area.

Assessing the water quality of SAT effluents and quantification of the degree of mixing in the Shefdan SAT

Pankratov I. [1], Gassar G. [1,2], Lev O. [2], Elhanany S. [1]

1. The Water Authority, Tel Aviv, Israel
2. The Hebrew University, Jerusalem, Israel

The Soil Aquifer Treatment (SAT) of the Shefdan treats approximately 120 Mm^3/year of secondary wastewater effluents. The treated effluents are supplied for non restricted irrigation. A three - tier set of observation and reclamation wells was constructed around each of the two central SAT subsystems (i.e. the Soreq and the Yavne basins) in order to minimize wastewater leakage to the Coastal Plain Aquifer. However, to date there are still two important pending questions relating to the performance of the SAT: a) To what extent the SAT successfully removes refractory organic pollutants. b) To what extent neighboring water wells are affected by SAT water bleeds.

The lecture will summarize our attempts to develop trace organic analysis tools to provide quantitative answers to these questions. The first question is answered by compiling an extensive list of analytes and contaminants for quantification in the secondary effluents, observations wells reclamation wells, and private wells in the vicinity of the percolation lagoons. Mekorot quantifies routinely the drinking water quality parameters, but a more extensive analytical effort is still missing. The second question is even more complex and was repeatedly addressed by others before. Several natural conservative tracers such as chloride, sulfate and boron, isotope analysis, as well as bromide to chloride ratio were successfully used to quantify aquifer - SAT mixing ratios. Mekorot uses routinely the chloride level in order to quantify the mixing ratio in the SAT reclamation wells. However, all these tools are rather insensitive and fail to account for minor contamination of nearby water wells by the SAT treated effluents. Alternative organic water tracers will be presented and discussed in this lecture.

The H/V spectral ratio method from S-wave of felt earthquakes for site response estimation

Perelman N., Zaslavsky Y., Hofstetter A., Peled U.

Seismology Division, Geophysical Institute of Israel, P.O.Box 182, Lod, Israel

In Israel where big earthquake present a long return period, but might exhibit a high seismic risk, the site effect assessment based on felt earthquakes record is difficult, because creation even short data base needs much time. And nevertheless, five local earthquakes with magnitude from 4.0 to 5.2 occurred during 2004-2007 years triggered strong motion accelerometers and were recorded by three component broad band seismic stations operated as a part of Israel Seismic Network. The empirical method that we implemented to evaluate site response are based on the horizontal-to-vertical spectral ratios of selected time window of recorded earthquakes (accelerograms and seismogram).

The Lod strong motion station installed on the basement of the building of the Geophysical Institute of Israel recorded four felt earthquake. The H/V spectral ratios clearly exhibit the resonance peak in frequency range 1.8-2.0 wit amplitude up to 5.0 and two additional prominent peaks at the frequencies near 5.0 and 8.0 Hz which are second and third resonant modes of sediment layers. Another feature of these spectral ratios is systematic peak at frequency 2.5 Hz. The ambient vibration test by placing seismometers on the roof of the building and accelerograms recoded on the roof show that frequency 2.5 Hz is fundamental frequency of the building.

The broad seismic station MMLI located on the Mountain Malkishua recorded five felt earthquakes. The H/V spectral ratios from these events show prominent peak in frequency range 1.5-2.5 Hz with amplification 5.0 in EW direction while in NS direction we can see only amplification 3.0 near frequency 2.5 Hz. The preferential direction of motion is characteristically for amplification of ground motion caused by local topography. After transformation of horizontal seismograms by the axis rotation on angle 45° and repeat of spectral ratio calculation we obtained identical curves for two directions.

Strong motion station ALN (Alonim) is located on massive chalk (shear wave velocity more than 750m/sec). Nevertheless, H/V spectral ratios from two accelerograms show a prominent peak near 1.0 Hz with amplification factor of 3.0.

These earthquakes add significantly to our knowledge about the influence of the site effects of local geology and topographic prominences on the amplitude of seismic waves.

Radon signals at the Gavnunim site, southern Makhtesh Ramon

Piatibratova O., Steinitz G.

Geological Survey of Israel, Jerusalem

Monitoring (15-minute) of radon, using alpha detectors, is conducted since July 1996 in Makhtesh Ramon, some 200 meters north of the Ramon fault, in the syenite of the L. Cretaceous Gavnunim intrusion, in boreholes at 1.2 and 85 meters.

Several systematic temporal variation patterns of radon occur at the site:

1. Long-term variation, observed at 1.2m. A multi-year trend observed by gradual decrease of signal. Presently it is unclear whether this is a true variation.

2. Seasonal signal, observed at 1.2m. Seasonality is prominent in the long term temporal variation of the amplitudes of the 24- and 12-hour diurnal periodic components (see below). This seasonal pattern of the diurnal constituents is hidden within the measured signal, which by itself does not manifest seasonality.

3. Multi-day signals, observed at 1.2 and 85 meters. Non periodic signals lasting 2 to 20 days – termed humps – are the most conspicuous variation pattern in both time series of the measured signal. They demonstrate a gradual multi-day rise and plateau which is terminated with a fast decrease lasting less the half a day. The multi-day humps are correlated between the shallow (1.2m) level and the deep (85m) level, but it is evident that the sharp decrease of the signal at depth follows the decrease at shallow level with a time lag of several hours.

4. Diurnal signals, observed at 1.2m. Prominent daily periodic signals occur at the shallow while absent at depth. Cyclic constituents are observed at 1 and 2 cycles per day. These periods are equivalent to S_1 and S_2 of solar tide. Cyclic daily periodic constituents such as principal lunar M_2 (1.93 cycles/day) and principal lunar declinational O_1 (0.93 cycles/day) indicative for tidal (gravity) influence are absent. The amplitude of the semi-diurnal constituent (S_2) amplitude is always equal or larger than the amplitude of the diurnal constituent (S_1), and both clearly reflect a strong seasonal pattern (above).

5. Sub diurnal signals, observed at 85m. Sub diurnal signals, termed spikes, occur as irregularly spaced intense variations lasting several hours. The time distribution of the spike peaks within the 24-hour diurnal cycle has a bimodal frequency structure, portraying a similarity to a diurnal and semidiurnal periodicity. This distribution is unrelated to instrumental artifacts, human activity and seasonal influence. Furthermore, it is difficult to envisage subsurface geogas flow patterns of short duration that can explain the fast intense variations and their temporal pattern.

The overall complex of observed patterns at the two closely related borehole locations, which exhibit multifaceted and systematic temporal variations, cannot be explained in the frame of recognized dynamic processes. Among the features the occurrence of S_1 and S_2 periodicities and sub-periodicities indicate a link to the rotation of Earth.

Automatic earthquake location. Case study based on the data of Swiss Seismological Network

Pinsky V. [1], Husen S. [2], Lomax A. [3]

1. Geophysical Institute of Israel (vlad@seis.mni.gov.il),
2. Swiss Seismological Service, ETH Hoenggerberg, Switzerland (stephan.husen@sed.ethz.ch),
3. Alomax Scientific, Mouans-Sartoux, France (anthony@alomax.net)

The problem of reliable and accurate real-time seismic event location is a key issue in seismic event monitoring. Solutions of automatic earthquake locations and early warning systems are usually hampered by detrimental factors such as sporadic seismic noise, poor network configuration, heterogeneity of the Earth, wrong phase association or multiple event manifestation. In the presence of large outliers, traditional earthquake location techniques based on a least-square misfit function (L2-norm) often yield unstable and unreliable solutions. The Swiss Seismological Network (SDSNet) is supplied by the automatic system, providing STA/LTA based trigger time (trigger time) in a real-time manner and automatic first arrival pick time (autopick time) and automatic pick based locations (Baer et al. 2001) several minutes later. The locations provided often deviate from the reference locations based on manual picks in difficult cases mentioned above. We tested possibility of improving the automatic location results using two new robust non-linear earthquake location algorithms: Network Beamforming (NB) (Pinsky, 2006) and the new version of the NonLinLoc, based on the Equal Differential Time likelihood function (Lomax, 2005). We apply both methods to the selected reference data-base of the SDSNet events in the time period between 2002-2007. Two sets of automatic arrival times: i) trigger time, and ii) autopick time have been used. All earthquake locations have been computed using the same minimum 1D velocity model. For both methods, NB and NonLinLoc 83 % of the epicenter locations based on the trigger time are within 10 km of their corresponding reference locations. For epicenter locations computed using autopick time the performance is similar for both algorithms and higher (93 %). The standard automatic locater on the same data has 87% of success. Higher performance of automatic locations on autopick data is explained by its higher accuracy than the trigger time. However, for the Early Earthquake Warning (EEW) dealing with strong events (rare for the SDSNet) our results suggest that robust earthquake locations may be obtained using arrival times based on a simple STA/LTA trigger algorithm in combination with robust earthquake location algorithms, such as NB or NonLinLoc. This becomes important for rapid solutions since STA/LTA trigger times are usually available prior to arrival times obtained by an automatic picking procedure.

Branching of the Dead Sea transform at the Hula Basin – evidence from the sub-surface

Politi M. [1], Medvedev B. [1,2], Shamir G. [3], Makovsky Y. [4], Agnon A. [1]

1. Institute of Earth Sciences, the Hebrew University, Givat Ram, Jerusalem 91904
2. Geophysical Institute of Israel, P.O.Box 182, Lod 71100
3. Geological Survey of Israel, 30 Malkhe Israel st.., Jerusalem 95501
4. Department of Marine Geosciences, Charney School of Marine Sciences, University of Haifa, Mount Carmel, Haifa, 31905

Fault branching associated with active transforms at plate boundary has been studied along major continental transforms such as San Andreas-San Jacinto, North Anatolian, El-Pilar and Oca-Ancon faults. The branching zone is structurally complex, accompanied with features of cross-fault shortening and extension, as well as frequent earthquakes originated at various depths. Based on compilation and partial reprocessing of existing seismic sections, gravity, earthquake data and borehole data acquired in the Hula Valley we suggest an active northward branching of the Dead Sea transform (DST). A well defined gravimetric anomaly traversing through the center of the valley was interpreted to represent an N-S trending shear zone (Schattner, pers. comm.). We further suggest that this shear zone splays northward into two branches – north eastern and north western. Each branch shows different characteristics such as rate of displacement and earthquake distribution along it. The recent displacement rate commonly, estimated at about 5 mm/yr in the south of the Hula Valley, is distributed such that the NW branch is about twice as fast as the NE one. Incidentally, a lower rate of activity is observed at the NE branch. Quaternary tectonic activity along the fault branches in recorded by well defined regional basalt flows of Pleistocene age (0.8-1.1 Ma). Where traced on seismic sections, these flows show the rupture and deformation coinciding with the fault-zones and gravimetric anomalies. Hypocenters of earthquakes magnitude ranging $2<M<4$ are concentrated at the branching zone on an area of 2x2 km centered at approximately E-257000, N- 773000. This zone is associated with a local gravity anomaly and a deep structural depression developed during Quaternary. Taken together these observations suggest the existence of an active, instable zone related to the development of DST branching.

Dissolution kinetics of BaCrO4

Porges E. [1], Ganor J. [1], Wisbrod N. [2]

1. Department of Geological and Environmental Science, Ben Gurion University, Beer Sheva, 84105.
2. Department of Environmental Hydrology and Microbiology, Zuckerberg Institute for Water Research.

Chromium contamination of soils poses a problem for industrialized countries. The chromium compound appears in soils in two oxidation states: Cr^{+3} and Cr^{+6}. Cr^{+3} is less mobile in soils and is essential for plants as nutrient. In contrast, Cr^{+6} is toxic to organisms in any concentration. The long term use of wastewater rich with Cr^{+6} in Ramat Hasharon area in the past two decades leads to formation of metal aggregates containing up to 8% $BaCrO_4$. The $BaCrO_4$ dissolves to Ba^{+2} and CrO_4^{-2}. The Chromate ion is mobile in soils and therefore it is released to the ground water. Indeed, high concentrations of chromate where found in both soils and groundwater area. The present study examines the dissolution kinetics of $BaCrO_4$ under fully saturated conditions. The goals of this study are: (1) to determine the dependence of dissolution rate on the degree of saturation, and (2) to examine the effect of stirring on dissolution rate. Batch experiments were carried out to determine the equilibrium constant with respect to $BaCrO_4$ dissolution. Stirred and non-stirred flow-through experiments were conducted to study the dissolution kinetic of $BaCrO_4$. The concentration of CrO_4 was determined colometrically with a UV-visible spectrophotometer using the EPA 7196 method. Inductively Coupled Plasma Atomic Emission Spectroscopy (ICP-AES) was used to determine the concentration of Ba^{+2} and total Cr. Preliminary results of the flow-through experiments indicate that $BaCrO_4$ dissolution is stoichiometric. Dissolution rate is not significantly affected by the mass of $BaCrO_4$. We propose that as dissolution occurs relatively close to equilibrium it is limited by equilibrium, and as a result the reaction becomes a pseudo zero order reaction with respect to the mass of $BaCrO_4$. A general increase in dissolution rate is observed as the degree of under saturation become higher (further from equilibrium). All the stirred flow-through experiments show consistent and stable results. In contrast, some of the non-stirred experiments were unstable. The dissolution rates in the stirred experiments are generally faster then those in the non-stirred experiments. We suggest that some of the $BaCrO_4$ grains are not available for dissolution during the non-stirred experiments.

The kinetics of gypsum precipitation as a result of mixing Red-Sea water with Dead-Sea water – A comparison between laboratory and field experiments

Reznik I. [1,2], Ganor J. [1], Lati J. [3], Aharoni M. [3], Cohen O. [3], Maymon M. [3], Gavrieli I. [2]

1. Department of Geological and Environmental Sciences, Ben-Gurion University of the Negev, P. O. Box 653, Beer-Sheva 84105
2. Geological Survey of Israel, 30 Malkhe Israel, Jerusalem, 95501
3. Dead Sea Works Ltd. PO. Box 75, Beer Sheva, 84100

In recent decades, the Dead-Sea level has receded dramatically. In order to stabilize the lake's water level, a conduit conveying red-sea water to the Dead-Sea is being considered (the "Peace-Conduit"). However, the consequences of mixing seawater with the Dead-Sea water on the lake's physico-chemical properties should be carefully examined before carrying out the project. One of the expected results of the mixing is gypsum precipitation, which may influence the general appearance of the Dead-Sea and its heat balance. The aim of the current study is to quantify, by combining laboratory, field experiments and theoretical geochemical models, the different parameters affecting gypsum nucleation and growth rates.

The kinetics of gypsum precipitation from mixtures of Dead-Sea brine and seawater were studied using flow-through experiments in the laboratory and outdoor experiment at Sodom. The laboratory experiments are based on small flow-through cells (30ml) into which the two end members are pumped, resulting in a residence time of 3.5 hours within the cell. Compared to these, the outdoor pool is much larger (x~325,000) with a faster flow rate (x~2400) and a longer residence time of 19.5 days (x~135). In addition, the outdoor pool is subjected to evaporation and changing temperatures, which is not the case in the laboratory. Finally, the precipitate in the laboratory cell is stirred while in the field the gypsum settles to the bottom of the pool.

Spontaneous nucleation of gypsum was observed both in the laboratory and field experiments. In the laboratory, after nuclei formation, gypsum continued to precipitate heterogeneously, resulting, with time, in increasing surface area which, in turn, enhanced gypsum precipitation. Thus, gypsum growth rate was found to be first-order with respect to the surface area of gypsum. However, as the surface area increased furthermore, the rate of the reaction became limited by the degree of super-saturation, and the precipitation rate changed to a pseudo-zero order reaction.

Since the field experiment included no stirring, the gypsum that crystallized settled to the bottom of the pool or covered its side walls. Thus, as the experiment progressed, the surface area available for growth was limited by the settling velocity and the surfaces of gypsum that covered the side walls and floor. Despite the longer residence time in the outdoor pool in comparison with that of the laboratory experiment, the lower surface area to solution volume in the pool resulted in a solution that retained a higher super-saturation.

Even though profound differences exist between the two experimental setups, extrapolation of the precipitation rate attained in the laboratory resulted in values that are on the same order of magnitude as those determined experimentally in the pools.

Infiltration of flood water from Shillo wadi to the YARTAN aquifer and it's implication on future infiltration.

Rophe B.

Hydrological Service, Water Authority, 234 Yaffo st., P.O.B. 36118, Jerusalem / 91360.
e-Mail: Benny10@water.gov.il

On February 2005 flood water were diverted from W. Shillo to a quarry at Nahshonim area in order to moderate discharge down stream to the Yarkon river.

The quarry is composed of limestone and dolomite. The upper part of the quarry is composed of Bina formation where as the lower part is composed of Weradim formation. Absolute level of quarry floor is c. 33 m' higher only by 13 m' from aquifer YARTAN water level.

Water levels at diversion channel and quarry were monitored. Discharge and water volume accumulation were calculated for the diversion canal as well as volume of water at quarry at any given time.

Flood duration was about 4 days. The catchment's area is 357 km^2, mostly in Samarya. Total volume of flood water diverted was c. 3.5 MCM and maximum discharge was c. 70 M^3/Sec. Water volume flowing in Shillo W. downstream was only 0.35 MCM and it's maximum discharge was c. 17 M^3/Sec. Maximum water depth at quarry was 25 m' reflecting a volume of 1 MCM.

Maximum water infiltration rate at quarry was c. 25 M^3/Sec (90,000 M^3/h). No evidence of lateral leaks from the quarry to adjacent low areas in the quarry was found.

A considerable amount of debris was accumulated at the quarry. The debris origin is both at the drainage are and the diversion canal itself. Silt, sand, pebbles, vegetation and domestic garbage were the contribution of drainage area where as the erosion of the diverging canal resulted in large rock deposited mainly at the alluvial fun downstream the water fall, at the end of the diverting canal and down at the lower part of quarry. In places the sediment depth reached several m'. Silts and clays were deposited al over the flooded quarry except for the upper 1 m'. Voids that were detected al quarry floor were deposits free indicating a rapid flow at voids mainly at the final stage of infiltration.

The quarry infiltration potential may serve the water authority but a pre treatment id recommended in order to insure the clearing away of sediment and garbage originated at the drainage area. Continues monitoring of water quality, pre infiltration' is recommended to avoid "direct injection" of toxics into the YARTAN aquifer.

The Fate of Radium in the Concentrate of a Desalinization Plant in Israel

Rosenberg Y.[1], Oren Y.[2], Volkman Y.[2], Vengosh A.[3], Ganor J.[1]

1. Department of Geological and Environmental Sciences, Ben-Gurion University in the Negev, P.O. Box 653, BEER SHEVA 84105.
2. Department for Desalination and Water Treatment, the Zuckerberg Institute for water research, Ben-Gurion University in the Negev, Sede Boqer, 84990.
3. Earth & Ocean Sciences, Duke University, USA.

The kinetics and thermodynamics of Ra removal by precipitation from concentrate of a desalinization plant in Israel is studied using evaporation experiments. The concentrate, which is the by product of the desalinization process, is supersaturated with respect to Gypsum, Celestine and Barite (supersaturation degree = 2.08, 4.24 and 16.73, respectively) and has high activity concentration for all radium isotopes. In spite of the supersaturation of these minerals, they do not precipitate unless crystallization seeds are introduced and/or the brine is further concentrated by evaporation.

Batch experiments revealed that the precipitation sequence during evaporation of the concentrate is initiated with gypsum, followed by celestine and ends with barite. The decrease in the activity concentration of ^{226}Ra is concurrent with the decrease in Ba concentration, suggesting that Ba is the main co- precipitator for Ra. Barium and Ra precipitation initiate slowly when half of the initial amount of Ca has precipitated. Rapid precipitation of both Ba and Ra occurs when 90% of the Ca has precipitated and gypsum is close to saturation.

The partition coefficient, K_D, between Ra and Ba in barite resulting from these experiments is 0.74±0.15, (confidence interval 95%). It is much smaller than the value of 1.8, which was reported by Doerner and Hoskins (1925), for very dilute solutions of Ba -Ra chloride and sulfuric acid. The low K_D value implies that ^{226}Ra/Ba ratio in the evaporation ponds of the concentrate is expected to be higher than that of the fresh concentrate. Such an increase in ratio is actually observed at the evaporation ponds. Moreover, K_D values calculated for the first evaporation pond in the desalinization plant is within error equal to the experimental observations.

Seeding experiments showed a decrease in the activity concentration of ^{223}Ra in the solution as a function of seeds mass to concentrate volume, when barite served as the crystallization seeds. A similar trend was not evident when gypsum was used for the crystallization seeds. These results are consistent with the assumption that barite has an important role in constraining naturally radium activity levels in water (Langmauir and Melchoir, 1985)

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Exploration and prospecting of diamond occurrence in Upper Cretaceous Carmel magmatic bodies, based on mineralogical, geochemical and petrography analyses

Roup A., Kalmanovitch E., Polanski A., Baykov Y.

Shefa Yamim (A.T.M.) Ltd. B"H

Shefa Yamim (A.T.M.) Ltd. has been prospecting and exploring since 1999 for diamonds in Northern Israel. The first Diamond were discovered in 2001 in the alluvial sediments of the Kishon river. The exploration programme was continued in two directions 1) study of the placer deposition in the Kishon and 2) Location the primary source of the Diamonds.

Geological research has indicated that two different mineral associations appear in the area 1) Pyrope-Spinel association related to the Upper Cretaceous volcanism, and developed on the Eastern slope of the Mount Carmel and 2) Moissanite – Corundum association related to the Miocene volcanism.

Surveys conducted in the drainage basin indicate the primary diamond source to be the Cretaceous Volcanic rocks on Mount Carmel situated on the southern flank of the Kishon Valley.

The Pyrope – Spinel association was particularly researched because of it relationship with diamonds this was confirmed by the finding of a micro diamond from a small sample taken by De Beers in their laboratory in Kimberly (South Africa) from sample SY-300 on Mount Carmel – Rakefet area.

Shefa Yamim has executed field study of almost all Mount Carmel magmatic bodies. Points of sampling should be located within magmatic bodies, diluvium, terraces and in rivers.

More than 160 samples were selected from the Carmel area. Heavy minerals fraction from the samples were studied by microscope, more then 400,000 grains of KIM indicative minerals were found these include: Garnet (Pyrope, Almandine, Grossular, Andradite), Spinel, Cr-Spinel, Ilmenite, Picroilmenite, Rutile, Zircon, Corundum (also Ruby, Sapphire), Moissanite, Chromite, Chrome-Diopside, Clino-Pyroxene, Pyroxene, Amphibole, Kyanite, Magnetite, Phlogopite, and Hematite.

More then 2860 geochemical testing by SEM was done at IGS Jerusalem and De Beers Africa Exploration Laboratory. Also 51 thin sections were analysed at the Ben Gurion University from various magmatic bodies on Mount Carmel.

An Electromagnetic Survey (EM) and mapping was completed at 7 magmatic bodies of Mount Carmel by Creo Design (Pty) Ltd. (South Africa).

Geochemical testing indicated same volcanic rocks are para-kimberlite lamprophyre rocks (De Beers). Also petrography determination (Ben Gurion University) shows presence of eclogite in the samples.

At present the main target is to search for diamondiferous magmatic bodies within the Upper Createaceous magmatic rocks of the Carmel and in particular to determine their vents and sampling and study of the all samples taken to determine: a) composition of heavy fractions b) Coarseness (size) of indicator minerals c) Presence and size of basic and ultra-basic rock xenolite and xenocrysts in the magmatic bodies.

Work is continuing in the search to locate the vents and comparable analysis of rock for search diamond occurrence.

Time scale of water-rock interaction processes in the fresh- saline groundwater interface of coastal aquifers

Russak A. [1, 2], Sivan O. [1], Yechieli Y. [2], Lazar B. [3]

1. Department of Geological and Environmental Sciences, Ben Gurion University, Beer Sheva 84105, Israel
2. Geological Survey of Israel, Jerusalem 95501, Israel
3. Institute of Earth Sciences, Hebrew University, Jerusalem 91904, Israel

The goal of this work is to estimate the time scale of water-rock interaction processes at the fresh-saline water interface (FSI) in a coastal aquifer. For this purpose we conducted high resolution groundwater sampling at the FSI of the coastal aquifer of Israel. Seasonal and diurnal variations were investigated in a research well located 70m from the shore.

The seasonal variations were examined by sampling groundwater across the FSI with high vertical resolution (15 cm) via tubing fitted into the well. The groundwater was analyzed for major ions, alkalinity, dissolved inorganic carbon (DIC) and $\delta^{13}C$ of the DIC ($\delta^{13}C_{DIC}$). The data collected on a seasonal basis indicated that the composition of the groundwater within the FSI is controlled mainly by mixing (conservative) and cation exchange (non-conservative) processes. The calcium was up to 50% higher than in seawater, while the potassium was significantly depleted. In addition, small portion of the DIC was produced by anaerobic oxidation of organic matter as indicated by the $\delta^{13}C_{DIC}$ values.

The diurnal behavior of the FSI was examined by sampling water in six depths, every 2 h for 28 h. Water samples were taken above the FSI (depth of 20 m), below the FSI (depth of 27 m) and in four depths within the FSI. The diurnal variations in the chemical composition were mainly tidal and similarly to the observed seasonally, it showed effect of cation exchange. The composition differences between low tide and high tide may imply that cation exchange processes are fast and occur already on a time scale of 1 d, however additional measurements and calculations are needed to corroborate this conclusion.

Cation exchange estimates were conducted in the laboratory using experimental column filled with coastal aquifer sediments taken near the research well. Seawater was pumped into the column that was pre-saturated with freshwater by peristaltic pump; the water at the exit of the column was sampled regularly. The results clearly indicate that the sediments are capable for cation exchange with the same trends as observed in the field but larger in magnitude. The same cation exchange pattern was observed either in low or high flow velocities (200 and 1000 $m \cdot y^{-1}$). The $\delta^{13}C_{DIC}$ results indicate that slight oxidation of organic matter occurs already within the experimental column.

The diurnal field data was not conclusive for the role of tide in affecting the cation exchange processes within the aquifer. The cation exchange patterns observed in the well vertical profiles however, were similar to those of the seawater intrusion column experiments. We conclude that cation exchange is an important process controlling the water chemistry at the FSI in the coastal aquifer of Israel on a seasonal time scale at least.

Magmatics within the Dead Sea transform valley (insights from magnetic data)

Rybakov M.

The Geophysical Institute of Israel, POB 182, Lod, 71100.

The DST – largest continental fissure- appears to be the single shear zone consisting of several en echelon right-stepping faults, with the total sinistral displacement of about 105 km. Gravity data show obviously what the DST locates along the interface between western block with high density oceanic (transition) crust and eastern relatively light density continental crust. Assuming the interface as weakness zone the question is: Can the weakness zone to serve as magma chamber during last ten million years?

To delineate and study the magmatic bodies the magnetic survey provides excellent opportunity. The water and sedimentary strata are 'transparent' and the magnetic anomalies are caused meanly by local magmatic features. Generally the regional magnetic maps are maps of basic magmatics – outcropped and concealed.

New high-resolution aeromagnetic surveys covered the southern Arava valley and the western Dead Sea area provided the valuable data to better understanding of the tectonic pattern and distribution of magmatics within the transform valley.

The main findings:

-presence of the rift-parallel magnetic lineaments corresponding to the activetrace of the DST;

-lineament system extends NNE as an almost continuous trace over the study areas and shows the same general azimuth of the magnetic lineament and of the segmented fault system as derived from the gravity, geology and topography;

-the absence of any magnetic anomalies crossing the Arava Valley; all the local magnetic anomalies in the eastern and western parts of the valley appear to be completely separated; only a lineament appears to separate the local magnetic anomalies;

-strong magnetic anomalies suggest hitherto unknown subsurface magmatics.

Quantitative interpretation of the high accuracy detailed magnetic measurements allowed to localize the magmatic bodies and to estimate reliable theirs depth. Comparing the results with seismic reflection and geological data the belonging of magmatics located within the transform valley to corresponding magmatic event can be defined as follow:

-Wide range of the prerift magmatic events (Precambrian and Phanerozoic intrusives);

- Magmatic events synchronic but doesn't associated with the DST (e.g. young basalt flows);

-Unrecognized magmatic bodies synchronic to the DST and associated probably with tectonic development of the DST during movement along the main shear system. Such magmatics may mark the main deep penetrated faults.

Last case will be thoroughly studied in future.Magmatics are integral part of the Dead Sea transform structure and this knowledge has to be used in exploration of groundwater, oil, earthquake hazard assessment and infrastructure projects, such as the Dead Sea-Red Sea Canal.

This study was supported by the Earth Sciences Administration of the Ministry of National Infrastructures of Israel and the DESIRE project of the GeoForschungZentrum (Potsdam) and Kiel University.

A New Look on the Subsurface of Mt. Carmel and Surroundings as Revealed by Gravity and Magnetic Interpretation

Rybakov M., Levi, E., Ben-Gai, Y.

The Geophysical Institute of Israel, POB 182, Lod, 71100.

All the available data, including a newly acquired land magnetic profile and new petrophysical observations, were interpreted using the inversion schemes and 2-D and 3-D forward gravity and magnetic modeling. The assumptions applied are that Post Turonian sediments (mainly clastics) have a lesser density than the Mesozoic carbonates and that the effective density contrast between the clastic and carbonate rocks is inversely proportional to the thickness of the clastic layers.

The residual replaced gravity anomalies obtained in this scheme were found to be correlative with relief of the crystalline basement as suggested from refraction profiles. Curvature derivatives of the Bouguer and replaced gravity maps highlight the tectonic pattern and help identifying structural features such as faults.

Few positive residual gravity anomalies are observed, which may be correlated with previously unknown structural highs. These highs are generally oriented in a NE-SW direction, which correlates with the Syrian Arc trend. The study also resulted with a detailed map of the crystalline basement. The map shows that the basement under the study area is inclined to the southeast.

2,500 meters of the Asher Volcanics penetrated by the Asher Atlit-1 well can be presented as a sequence of layers magnetized in various directions. This assumption can explain the absence of an expected magnetic high at this location. The magnetic high observed to the north of the well is explained by a magma chamber, following reduction to the pole of the magnetic field and quantitative interpretation.

The Israel national bathymetric survey -2007 results

Sade A. R.[1,2,4], Hall J. K.[1], Amit G.[2], Golan A.[2,3], Sade H.[2,5], Gur-Arieh L.[3], Tibor G.[2]

1. Geological Survey of Israel, 30 Malchei Israel Street, Jerusalem 95501
2. Israel Oceanographic & Limnological Research, Ltd., POB 8030, Haifa 31080, Israel
3. Israel Mapping Centre, 1 Lincoln Street, Tel Aviv 65220, Israel
4. Tel Aviv University, Ramat Aviv 69978, Israel
5. Leon H. Charney School of Marine Sciences, University of Haifa, Haifa 31905

The Israel National Bathymetric Survey (NBS) continued its all-inclusive mapping of the seas in and around Israel. Upon its return from the Red Sea, and the October-November 2006 detailed mapping of the northern Gulf of Elat, the R/V Etziona continued its mapping of the Israel Mediterranean offshore, with surveys off central Israel. Due to the effect of high salinity and temperature on the acoustic attenuation, work in deep water was confined to the late winter and early spring, while the other months were devoted to shallower waters.

After six years of use, the EM1002 system was upgraded in late April. A central processor was introduced into the electronics console for internal data processing, and the acquisition computer changed from a Sun operating UNIX to a PC operating the new Kongsberg-Simrad Seafloor Information Software (SIS). At the end of the year the ship was taken out of the water for its first hull cleaning in 3 years. The AML sound speed probes were changed alongside the keel-mounted transducer, and within the CTD, which was also recalibrated in British Columbia, Canada. The Seapath motion reference unit (MRU) also underwent recalibration in Norway.

From the beginning of the NBS it was apparent that it would not be possible to take the 17 ton R/V Etziona to either the Dead Sea or the Sea of Galilee (Kinneret). The ship with her flying bridge was simply too high for transport over Israel's road network. Therefore the NBS was augmented in January 2007 when a multibeam system was rented from ELAC Nautik Gmbh in Kiel, and was used in a pioneering survey of the Dead Sea which is discussed in another paper. Based on the positive results, the decision was recently taken to rent the same system, but operating at a much higher frequency, for a survey to be carried out in May 2008 in the Kinneret. The survey vessel will be the R/V Lillian, a water-jet propelled flat-bottomed boat of the IOLR. In addition, the lack of coverage in the Mediterranean in depths of more than 700-900 m has resulted in a decision to equip the IOLR's R/V Shikmona with a different rented system from ELAC, the Sea Beam 3050, with 384 beams and 2000 m capability. This work will be carried out in the beginning of 2009.

The year also saw the establishment of the Leon H. Charney School of Marine Sciences (http://marsci.haifa.ac.il) at the University of Haifa. Upon its successful completion the results of the NBS are expected to be the basis of many future research projects of this new school. To complement this and the NBS, the Hall Mapping Archive was set up at the IOLR and inaugurated in late April 2007.

The 2007 Dead Sea multibeam bathymetric survey – Initial results

Sade A. R.[1,2], Hall J. K.[1], Schulze B.[8], Al-Zoubi A. S.[3], Ben-Avraham Z.[2], Akawwi E.[3], Amit G.[4], ten-Brink U.[5], Mayer L. A.[6], Calder B. R.[6], Gonen M., Sade, H. [4,9]

1. Geological Survey of Israel, 30 Malchei Israel Street, Jerusalem 95501
2. Tel Aviv University, Ramat Aviv 69978, Israel
3. Dept. of Surveying & Geomatics, Al-Balqa' Applied University, Al-Salt 19117 Jordan
4. Israel Oceanographic & Limnological Research, Ltd., POB 8030, Haifa 31080, Israel
5. U. S. Geological Survey, Woods Hole Field Office, Woods Hole, MA 02543, USA
6. Center for Coastal and Ocean Mapping (CCOM), UNH, Durham, NH 03824, USA
7. Gonen Marine Services & Underwater Works, Savyon 56530
8. L-3 Communications, ELAC Nautik Gmbh, D-23118 Kiel, Germany
9. Leon H. Charney School of Marine Sciences, University of Haifa, Haifa 31905

The survey was scheduled for winter, when the Dead Sea is mixed and work and navigation conditions are usually optimal. It was carried out over 18 days, hampered by unseasonably strong winds and heavy rains. An ELAC Sea Beam 1055 multibeam sonar was used. This 50 kHz system generally produces 126 1.5° wide beams, spread over an arc of 153°. Because the Dead Sea sound speed is ~20% above the design figure for the equipment, the abnormally high refraction at the transducers was accounted for by telling the system that the 38° angle between the two transducers was only 30°. This produced a working system, but with only 108 beams, and none at nadir directly below the ship.

The survey was very difficult as the sonar is very sensitive to the smallest changes in mounting, rapid salt deposition on the transducers, minor variations in the ~1,810±5 m/sec sound speed, as well as total confusion when encountering fresh water seepage from the seafloor and boundary faults. Almost every ping resulted in a swath with a convex (frown) or concave (smile) profile, even over a flat seafloor. Thus analysis of the data entails the Sisyphysian task of juggling the sound speed to obtain the proper profile, and clipping the totally unnatural returns likely due to fresh water seepage, dense bottom end brines, and probably some geometric interactions of the outer beams operating way beyond the usual acoustic configuration envelope.

The analysis of the data is ongoing, being carried out both in Israel and Germany with three sonar analysis packages; CARIS HIPS, and ELAC's HDPedit 922 and HDPpost 922. In parallel, CARIS's more user-friendly package has attempted to deal with various peculiarities of the ELAC acquisition system.

Initial results will be shown. The maximum depth measured was 302 m below the -422 m sea level at the time of survey. This would agree with the -730±2 m derived from the 1974 survey, suggesting perhaps 6 m of salt deposition over 33 years.

The immediate impression is that the western Dead Sea flanks are crenulated by numerous shallow rills, possibly related to rill flow of dense sediment-bearing runoff. Indications of shore-parallel changes in bottom slope may be outer beam artifacts, or if real, stratification revealed by erosion, or paleo-shorelines. Elsewhere local highs and lows may reflect salt buildup or pockmarks. In the north the Jordan River canyon was imaged and several 2-4 m high N-S trending scarps are higher on the west. In the south the first mapping was carried out east of the Lisan in the vicinity of the Ghor Fault. The seafloor there is very shallow and flat, unlike the previous contours suggested by several soundings from the 1848 US Navy survey.

Geometrical and rheological asperities on fault surfaces

Sagy A. [1], Brodsky E. [2]

1 Geological Survey of Israel
2 Department of Earth and Space Sciences, University of California Santa Cruz

Earthquake dynamics are strongly affected by fault zone structure and the surface geometry. Here we investigate the interplay of the bulk deformation processes and the surface geometry using detailed structural analysis of fault zone near Klamath Fall, Oregon combined with LiDAR measurements of the fault surface.

Ground-based LIDAR measurements on more than 30 normal and strike slip faults in different lithologies demonstrate that faults are not planar surfaces and roughness is strongly dependent on fault displacement. In addition to the well-understood roughness exemplified by abrasive striations and fracture segmentation, we found semi-elliptical topographical bumps with wavelengths of a few meters. The bumps are most easily identified on faults with total displacement of dozens to hundreds of meters. Smaller scale roughness on these faults is smoothed by abrasive processes. A key site in southern Oregon shows that the topographic bumps are closely tied to the internal structure of the fault zone. The fault zone displays layered damage architecture. Slip occurs along a band with width of 1-20 mm that contains principle slip surfaces with typical width of 100 micron. The slip band is hosted by a cohesive layer which is attained by granular flow. Measurements on several fault strands with total slips of 0.5-150 m reveal that the thickness of the cohesive granular layer is increasing monotonically with slip. The rate of the thickening is decreasing as a function of the displacement. Accordingly, we deduce that the slip is localized as a function of the displacement. The main fault displays continuous surface with 10-40 m quasi-elliptical asperities. The asperities display variation of thickness of the grainy cohesive layer. As this layer is stiffer than its surroundings the asperities are both geometrical and rheological inhomogenities. Modeling slip along wavy fault show that slip on surface with a realistic geometry requires internal yielding of the host rock. Consistently, our observations suggest that the dissipation processes in the fault zone include fracturing, slip along secondary faults and particles rotation. Granular flow found to be an important part of faulting. Slip surfaces tend to localize on the border of the grainy cohesive layer. The on going slip smooth the surfaces and thus, the structural and the geometrical evolution of the grainy layer create preference to continuation of slip on the same surface.

Historic earthquakes and tsunamis along the Dead Sea Transform: A reliable list may reduce the evaluated hazard

Salamon A. [1], Rockwell T. [2], Guidoboni E. [3], Comastri A. [3]

1. Geological Survey of Israel, 30 Malkhe Israel St., Jerusalem, 95501, Israel.
2. San Diego State University, San Diego, CA, USA.
3. Storia Geofisica Ambiente, Bologna, Italy.

Critical studies, published mainly by several researchers (e.g., Ambraseys, Guidoboni, Karcz), analyzed modern earthquake and tsunami catalogues and pointed to problematic events that are not based on original historical accounts. The questionable events probably originated from misprints, misinterpretation, duplication, etc., and seem to appear also in lists of earthquakes that occurred along the Dead Sea Transform (DST).

We compiled these studies and constructed an updated list of reliable 'significant' events that have occurred in the Levant since the mid 2nd century BC. 'Significant' earthquakes defined as those that caused damage or loss of life in at least two localities. Earthquakes that have been felt or damaged just one site were not included because they were probably of smaller magnitude.

Historical accounts contain only qualitative descriptions and retrieving the source parameters from such data is a matter of interpretation. Obviously, this is a subjective procedure because some large events may be under-reported and listed as moderate. Similarly, inflated reports of moderate earthquakes, some closely-timed moderate events, a main-shock followed by an intensive aftershock sequence, may all seem like one large earthquake to the people of the time. The location of historical events is no less tricky. For example, given the long and narrow configuration of the populated area in the Levant (constrained by the Mediterranean Sea on the west and the Syrian and Arabian deserts in the east), which is more or less parallel to the N-S trend of the DST, the isoseismals of strong earthquakes may tend to stretch along the inhabited regions and always 'coincide' with the strike of the DST. With the present understanding we assigned general estimates of magnitude and location only.

Altogether we note 57 significant DST earthquakes, and estimate that 14 events were large (following Ambraseys and Jackson [1998], these are on the order of about $7.8 > M > 7$) and 44 were moderate ($7 > M > 6$). Smaller events ($M < 6$) were not included. Regarding the location, we found that 39 earthquakes hit the northern part of the DST (Syria and Lebanon), 13 affected its central part (Israel, from the Hula Valley to the Dead Sea) and 6 struck in the south (Arava Valley and Gulf of Aqaba).

We learned that understanding the limitation of the historical data and filtering out the doubtful and uncertain events that supposedly occurred along the DST may reduce the evaluation of hazards and at the same time strengthen its reliability. As an example, we show that a careful evaluation of tsunami hazards to the Levant significantly increases the average repeat time from about 36 years to about once in a century.

Geo-sciences in engineering practice – applications and limitations

Saltzman B., Saltzman U.

Engineering Geology and Rock Engineering Israeli Standard Code for building bans construction on active faults.

Assistance of geophysical methods and the interpretation of its results is a well accepted and appreciated method used by engineering geologists and soil engineers to recognize structural features as joints and minute faults.

The target of this research is to decide whether the position of the Eastern DST Fault in the region of the Sea of Galilee allows the construction of buildings placed designed by architects regardless of geological constrains. The work has been conducted on a 1:1,000 scale. Air photos assisted in locating boundaries between existing rocks/soils as well as depicting structural lines. High-resolution seismic Reflection and Refraction profiles were carried across the site as a part of an integrated hazard assessment of the area.

The seismic data did not confirm any faults within the prescribed boundaries of the project. However, some dislocations of several meters and shallow faulting could dissect the area. The high-resolution seismic reflection profile shows a reflector that dips westward between 15 and 43 meters depth from the surface. However, a step of about 20 m vertical displacement (showing different seismic velocities) has been acknowledged parallel to the sea shore alignment. A drilling program has been used targeted at:

A. Substantiating the geophysical findings.

B. Describing the soil/rock profiles, including (if possible) the detection of lateral changes along the site.

C. Providing engineering parameters of encountered soil/rock assisting in deciding the type of foundation to be used.

D. Tracing water table.

Since no fault or any major movement has been detected, no trenches have been opened trying to substantiate the attitude of such displacements.

Results:

A. No correlation exists between geophysical results and boreholes as well as between geophysical results and air photo interpretation. This conclusion could be a result either of insufficient lines of testing or of a large interval between sensors.

B. Basalt (either a flow or a bed of boulders) has been detected in boreholes at the eastern edge of the site, but not by geophysics.

C. The difference in seismic velocities could be attributed either to higher compaction of the alluvial sandy-silty material or to the existence of higher presence of gravel-boulder fraction.

D. Observed traces of structural features could not be located by the geophysical survey.

E. The observed contact between basalt and alluvium has neither been located on air photos nor by geophysical tools.

F. It could, however, show the unsuitability of used geophysical techniques to explore shallow miniature structures in alluvium.

Methods used to protect Rd. 90 from the influence of Sink Holes

Saltzman U.

Engineering Geology & Rock Engineering

Protection of Road 90 against the influence of Sink Holes. Three sections along Rd. 90 have been surveyed, assisting in securing its further use, each resulting in a different solution:

A. close to Ein-Gedi dates plantation,
B. to the north of Nahal Arugot,
C. close to Mineral Beach.

The section of road considered potentially dangerous has been covered by strong geotextile membranes (high tearing resistance). Sensors depicting changes in the tension applied to the strong geotextile membrane have been positioned along the edges of the fabric.

Both microgravity and refraction failed to test for existing sink holes, the first by not observing an existing sink hole in a temporary by pass – the last by pointing the location of a sink hole that did not exist. The located Sink Hole proved our observation that the highest chance for the development of sinkholes does exist at cross points of two joints.

North of Nahal Arugot

Dynamic compaction has been used to densify the sediments, thus, stabilizing the area. A 16 ton load dropped from a height of 20 m provided the impact energy required for densification. An elliptic depression detected (scar) outside the planned road corresponds to a point where an old air photo interpretation revealed a crossing line between two joints. Radar inspection detected no sink hole within the section boundareis.

Mineral Beach

A bore hole reaching a depth of 60 m; has been drilled close to Rd. 90 pavement, where the existing alignment of sink holes reach the closest distance from Rd. 90. Water table is about 10 m; above sea level. A second bore hole of 40 m; in depth, has been drilled between the first Bore Hole and the existing field of sink holes. A tiltmeter has been installed in the hole, targeted at detecting underground movements associated with the circumferential collapse of soil - surrounding an already existing sinkhole. This measure detects such a deep collapse before damaging the road. A surface survey has been carried out to detect movements of the same origin, upon reaching the surface. A protecting construction is in its early stages of design with the intention of a future use - only and when a movement is detected.

Conclusions

A. Various engineering techniques could be used to protect a site from further damage by sinkholes, or to respond to its evolution.

B. The solution has to be based on local parameters and on the required designed/existing structures. Data collected by the GSI assisted in locating the edge of the salt intrusion.

C. Monitoring of measuring devices is as important as the solution itself.

New Insights into the geodynamic development of the Hula basin, Dead Sea fault

Schattner U.[1] , Weinberger R.[2]

1. Department of Marine Geosciences, Leon H. Charney School for Marine Sciences, University of Haifa, Mount Carmel, Haifa 31905, Israel. schattner@sci.haifa.ac.il
2. Geological Survey of Israel, 30 Malkhe Israel st., Jerusalem 95501, Israel. rami@geos.gsi.gov.il

The formation of rhomb-shaped pull-apart basins along continental strike-slip faults is usually attributed to response of the upper crust to motion along a displacement zone at greater depths. Here we examine the Hula rhomb-shaped graben situated along the central part of the Dead Sea fault plate boundary, between a series of basins extending south of it and a highly elevated region to the north. The structural mechanism of the Hula graben is widely accepted as a pull-apart basin. We use a 3D approach to obtain the structural framework of the basin, by combining surface geological-structural mapping with subsurface seismic reflection profiles and borehole data. Results show that post early Pleistocene a through-going diagonal fault developed across the basin. The diagonal fault is a prominent sub-vertical NNW-trending left-lateral strike-slip fault that connects the Jordan and Qiryat Shemona strands of the Dead Sea fault. It is traced to a depth of at least 1.5 km and indicated to exist to greater depths. The existence and style of deformation along the diagonal fault is also supported by independent gravity data, location of seismic events, and fault-plane solutions. The Hula basin evolved from an elongating and subsiding full-graben developing between two main border faults (pre early Pleistocene) to a basin controlled to a large extent by a diagonal fault (post early Pleistocene). We interpret the new geodynamic phase of the basin fill as a response of the upper crust to localization of movement towards the plate boundary at greater depths. Integration of the new findings with the deformation history of other locations along the Dead Sea fault points to a change in the Sinai-Arabian plate kinematics during the Pleistocene.

The interaction between cretaceous tectonomagmatic events and the Levant continental margin– geochronology, lithostratigraphy and structure

Segev A.

Geological Survey of Israel, 30 Malkhe Israel St., Jerusalem 95501

$^{40}Ar/^{39}Ar$ and K/Ar ages of whole rock and mineral separates obtained from the first (Tayasir Volcanics; C.V. 1) and the fourth (Carmel Volcanics; C.V. 4) Cretaceous magmatic events complete the accurate radiometric dating of five such events. The Tayasir igneous activity at the Mount Hermon range, northern Israel, started with a shallow microgabbro intrusion that yielded an age of 141.2±1.1 Ma (Berriasian), and was terminated by basaltic lava flows that yielded an age of 133.3±1.4 Ma (Hauterivian).

The initial Carmel volcanic phase C.V. 4a is dated to 98.9±0.5 Ma (Albian–Cenomanian boundary) and the second most widespread phase (C.V. 4b), to 98.7±0.9 Ma, although it is interpreted to have been at *c.* 98 Ma. The third local submarine basaltic flows C.V. 4c is dated by Segev et al. (2002) to 96.7±0.5 Ma, and the fourth, last Cenomanian intensive pyroclastic and lava flow phase C.V. 4d yielded an age of 95.5±0.7 Ma. Phlogopite megacryst hosted by Senonian (82 Ma) volcanics yielded an age of 170 Ma (Middle Jurassic), indicating that the Cretaceous xenolite assemblages containing also Jurassic xenolites formed in a much thicker continental crust before or during the breakup and the formation of the Levant rifted margin.

The Cretaceous magmatic events between the Berriasian and Cenomanian stages are attributed to a geodynamic evolution of a mantle plume that is postulated beneath northern Israel, southern Lebanon and western Syria (Palmyrides), where regional updoming associated by two regional denudation phases took place above the Levant continental margin before the main C.V. 1 (the above ages) and C.V. 2 (125-123 Ma) magmatic events. This dome shaped continental margin clearly characterizes their reactivated nature during the Cretaceous times. The active nature of the Levant margin continued throughout its significant igneous activity, till late Cenomanian times, keeping the Levant margin as a shallow-marine platform up to a hinge belt roughly coinciding with the present Mediterranean coastline. Thermal subsidence of this area began between Turonian and Santonian times, whereas later on it was temporarily stopped by horizontal stress of the first Syrian Arc convergence. From c. Paleocene up to middle Eocene times (*c.* 25 m.y.) the Levant continental margin was thermally subsided until it reached its single time of isostatic compensation and the ramp-shaped Arabian plate.

The exposed Hautrivian–Barremian sandstone overlying the Tayasir Volcanics is amended to the Helez Fm, correlative with the coastal plain subsurface. The Aptian – Albian quartz-arenitic sandstone of central and southern Israel and Jordan, which interfingers with marine fossil-bearing tongues, belongs to a younger sedimentary sequence. This subdivision and the Cenomanian Turonian succession are correlated from the Negev up to the northern Galilee.

Early stages in the Cenozoic tectonic evolution of the Galilee area

Segev A. [1], Lyakhovsky V. [1], Weinberger R. [1], Schattner U. [2]

1. Geological Survey of Israel, 30 Malkhe Israel St., Jerusalem 95501
2. Department of Marine Geosciences, School for Marine Sciences, Faculty of Science and Science Education, University of Haifa, Haifa 31905

The mechanics of faulting associated with major Cenozoic rifting was studied respecting the Azraq-Sirhan rift (ASR) and its propagation through the northwestern Arabian plate across the Lower Galilee, Israel. Two parallel rift systems developed during the Tertiary, before the localization of the Dead Sea Transform (DST), the ASR and the Red Sea-Suez rift in Egypt. Both rifts propagated in a NW direction toward the Mediterranean, at a Moho depth of *ca.* 23 km. Steckler & ten Brink (1986) suggested that alternations in the lithosphere structure from the continental Africa to the oceanic led to the termination of the Red Sea-Suez rift propagation. Similarly, we suggest that the ASR propagation was also terminated when it approached the Mediterranean continental margin.

To model rift propagation under these structural conditions we used a 3-D damage rheology mechanical simulation to study the earthquake-fault coupled evolution. The 3-D study area includes central Israel, central Lebanon, NW Jordan, SW Syria and the Levant marine basin. The lithosphere structure was reconstructed to Middle Eocene according to geological observations: surfaces were established in a bottom-up approach; ~100 km sinistral motions along the DST, as well as vertical isostatic motions were restored. In the vertical axis the simulation includes three main units of the lithosphere: the upper layer represents a top cover of weak sediments, while the second and third layers represent the crystalline crust and the upper mantle, respectively. The total strain in each layer is the sum of: 1) elastic strain; 2) damage-related inelastic strain; and 3) ductile strain. Analyses of laboratory stress-strain, acoustic emission and frictional data provide constraint parameters of the damage simulation.

Results show a NW propagation of the rift due to remote loading applied perpendicular to the rift direction. A new NE-trending fault system developed and the rift terminated close to the continental margin. Numeric simulations were performed with various prescribed regional heat fluxes, ranging between 40 mW m^{-2} and 60 mW m^{-2}, corresponding to cold and normal lithospheres. In the cold lithosphere the localization of the propagating rift zone was fast and terminated above a thicker crust with a thickness of *ca.* 30 km, close to the present location of the DST. In the hotter lithosphere the rift propagated further northwestwards across a thinner crust. The pattern of the fault systems close to the northwestern tip of the propagating rift demonstrates a fan shaped structure.

OSL dating of the phreatomagmatic eruptions at the maar of Birket Ram

Shaanan U.[1], Porat N.[2], Navon O.[1], Weinstein Y.[3], Weinberger R.[2]

1. Institute of Earth Sciences, The Hebrew University, Jerusalem 91904, Israel
2. Geological Survey of Israel, 30 Malkhe Israel St., Jerusalem 95501, Israel
3. Department of Geography and Environment, Bar-Ilan University, Ramat-Gan 52900, Israel

Birket Ram is a typical maar lake located at the northern Golan, formed by a series of phreatomagmatic eruptions. The tuff around the maar rests unconformably on Pleistocene basalts and Late Cretaceous limestones. West of the maar, the tuff is covered by the Saar Basalt flows. The tuff is composed mainly of lithic fragments of the surrounding basalts with a minor component of limestone and sandstone fragments from the underlying geologic section. Keramim Basalt was dated by Ar-Ar method for 233±3 Ka (Goren-Inbar, 1985). Being breached by the phreatomagmatic eruptions, this age sets a lower boundary for the tuff age.

Optically Stimulated Luminescence (OSL) age determination was performed on aeolian quartz grains in two paleosols underlying the tuff and on Early Cretaceous quartz grains found in four tuff layers, assumed to have been heated during the eruptions. One paleosol, which covers a Cretaceous limestone, yielded an age of 166±15 Ka, while the other paleosol, covering a Pleistocene scoria was dated at 215±54 Ka. Three of the dated tuff layers are located along a section at the southeastern edge of the maar. Two were found at 147±19 Ka and 112±15 Ka. The third one gave an age not compatible with the other ages, suggesting that the OSL signal was not reset during the eruption. The forth tuff layer was sampled at the northwestern edge of the maar and yielded an age of 115±13 Ka. This tuff layer is directly overlain by a flow of Saar Basalt and it is posible the age obtained for it reflects thermal resetting during the emplacement of the lava flow. A future Ar-Ar dating of the Sa'ar Basalt could confirm the OSL age interpretation.

Since no paleosols were found in the tuff succession, we assume that the phreatomagmatic eruptions at Birket Ram occurred continuously within a short period of time (e.g. weeks or months), as is usually the case in maar formation. We take the younger age found amongst the paleosols underlying the tuff (166±15 Ka) as a maximum age for the tuff emplacement and conclude that the phreatomagmatic eruptions occurred within the time span of 180 and 100 Ka. This is in agreement with the Ar-Ar age of the underlying Keramim Basalt (233±3 Ka) and with an age of 108 Ka of the earliest lake sediments, determined by extrapolation of radiocarbon ages (Ehrlich and Singer, 1976).

Ehrlich A., Singer A., 1976. Late Pleistocene Diatom Succession in a Sediment Core from Birket Ram, Golan Hights. Isr. J. Earth sci. 25, 138-151. Goren-Inbar N., 1985. The lithic assemblage of the Berekhat Ram Acheulian site, Golan Heights. Paleorient. 11, 7-28.

The maar of Birket Ram and its phreatomagmatic ejecta

Shaanan U.[1], Weinstein Y.[2], Weinberger R.[3], Navon O.[1]

1. Institute of Earth Sciences, The Hebrew University, Jerusalem 91904, Israel
2. Department of Geography and Environment, Bar-Ilan University, Ramat-Gan 52900, Israel
3. Geological Survey of Israel, 30 Malkhe Israel St., Jerusalem 95501, Israel

Birket ram is a maar lake located at the northern edge of the Golan volcanic field. It is one of the only two phreatomagmatic sites in the Golan. The maar cuts into a section of Pleistocene basalts and Late Cretaceous carbonates. The phreatomagmatic eruption that formed the maar occurred between 166±15 and 115±13 Ka (Shaanan et al., this volume). The Maar's rims are mostly covered by lithic lapili tuff, composed mainly of basaltic clasts fragmented during the phreatomagmatic activity. The tuff also contains 5% carbonate clasts and <1% Early Cretaceous sandstone grains, which may indicate diatreme depth of at least 500m. Sedimentary flow structures like anti-dunes, cross-bedding and wedging out of tuff layers imply deposition by base-surges. Occasional large basaltic clasts (5 to 50 cm) are associated with impact sags. The grain size of lithic fragmentsn in the tuff matrix is variable and large basaltic clasts may be present or absent. A section of 46 m at the southeastern part of the maar reveals three cycles of increasing and then decreasing grain size indicating repeated changes in the degree of fragmentation, which further implies variability in the intensity of the phreatomagmatic explosions.

Borehole data shows that at the center of the maar, the basaltic section is about 200 m deep. Petrographic analyses shows that while some of the basalt are known at the surface, others are found only at the subsurface, unless as fragments in the tuff. The basaltic section wedges out steeply southeastwards, where Late Cretaceous limestone is exposed. In addition to the lithic clasts and altered glass, the tuff also contains lower crustal xenoliths of pyroxenites and mafic granulites, as well as megacrysts of kaersutitic amphibole. The upper flow of Keramim Basalt, one of the flows breached by the maar, contains similar kaersutitic phenocrysts. This is the only observed amphibole phenocrysts in Cenozoic basalts from this region. This basalt also carries sedimentary quartz grains and clasts of underlying basalts. It is suggested that the crystallization of the amphibole was the result of relatively high water content in both the Keramim Basalt and the tuff magma. The wet nature of these magmas could help in entrapment of various lithic fragments en route to the surface and lead to better interaction with groundwater at shallow depth, and to phreatomagmatic explosions.

Testing the Thellier-Thellier method of geomagnetic field intensity determination on synthetic slag material

Shaar R. [1], Ron H. [1], Agnon A. [1], Kessel R. [1], Tauxe L. [2]

1. The Institute of Earth Sciences, The Hebrew University, Jerusalem
2. Scripps Institution of Oceanography, University of California, San Diego

Testing the Thellier-Thellier method of geomagnetic field intensity determination on synthetic slag material Obtaining high-resolution intensity curve of the geoamgnetic field is crucial for our understanding of geodynamo evolution and Earth's deep interior. However, reliable paleointensity measurements require material that behaves ideally in the so-called Thellier-type experiments. Until recently, the only suitable material for archeological time-scales was baked-clay (pottery and bricks). Still, available archeointensity datasets from Middle-East baked clays display an inconsistent intensity pattern. Here, we present an on-going project carried out at the paleomagnetic laboratories of The Hebrew University of Jerusalem, recently upgraded to enable absolute intensity measurements, and Scripps Institution of Oceanography, University of California, San Diego. The project aims at establishing a reliable high-resolution archeointensity curve for the past six thousand years. This is a pioneering project, which is innovative in the following respects:
1) Our laboratory is located in a region featuring abundant well-studied archeological sites. We have immediate access to a vast array of archeological samples.
2) We intend to enhance the accuracy of our measurements by using metallurgic deposits in addition to the standard baked-clay artifact. It has been shown that slag material is applicable for archeointensity measurements, and in some cases even preferable to the traditionally used material (Ben Yosef et al., in revision)
3) The project provides the first rigorous test of the standard measurement method since its development in the 1950's. A series of Thellier experiments on synthetic slag samples provide the empirical foundation for the reliability of the results.
We present results of Thellier-type experiments as well as nano-microscopic analysis of eleven synthetic slag samples, each split to four or five specimens. The samples were produced by re-melting of natural slag material under controlled laboratory magnetic field with varying intensities. Three samples were cooled fast to produce fine ferromagnetic particles. These samples exhibit pseudo-single-domain magnetic properties and behave almost ideally in the Thellier experiments. The other eight samples were slowly cooled to produce coarse particles. These samples show non-ideal behavior in the Thellier experiments associated with multi-domain behavior.

Spatial and temporal variability of submarine groundwater discharge, the role of hydrogeology: en example from Dor bay (southern Carmel coast)

Shalem Y. [1], Weinstein Y. [1], Yechieli Y.[2], Swarzenski P.[3], Burnett W.C.[4], Herut B.[5]

1. Bar-Ilan University, Ramat Gan
2. Geological Survey of Israel, Jerusalem
3. US Geological Survey, St. Petersburg, FL
4. Florida State University, Tallahassee, FL
5. Israel Oceanographic and Limnological Research, Haifa

Submarine Groundwater Discharge (SGD) of both fresh and saline water is a major coastal process and it has implications to both water balance of coastal aquifers and to seawater quality. In Dor bay, direct discharge of fresh groundwater to the sea is mainly from the Pleistocene Kurkar (calcareous sandstone) unit, while seawater recycling is usually restricted to the overlying Holocene loose sands. Discharge at the bay, measured both by seepage meters and by radon time series in bay water, is highly variable in time and space (0-55 and 0-36, cm/d, respectively). The salinity of water discharging directly from the Kurkar is low (~3 ppt), while water discharging from sand-covered areas is significantly more saline (16-39 ppt), being a mixture in various proportions of fresh Kurkar water and recycled seawater. Calculations based on radon time series showed that average advection rates of fresh water from the Kurkar area to the bay were uniform at ca. 5 cm/d in March, May and July 2006 and February 2007, but decreased to 1.3 cm/d in June 2007. Similar rates (1.0 cm/d) were calculated from radon time series taken above sandy bay floor in June 2007. Average fresh water rates measured by seepage meters were similar (5.0, 3.4 and 1.8 cm/d in July 2006, February and June 2007). Nevertheless, total advection rates were much higher (averages of 15.4, 15.1 and 11.7 cm/d, respectively), reflecting the volumetric dominance of seawater recycling in the sandy areas.

Radon-calculated advection rates show clear tidal patterns and are negatively correlated with bay water depth. On the other hand, seepage meter advection rates in the sandy areas (both fresh and saline) hardly show any correlation with water depth, but fresh and saline water discharge rates are usually positively correlated, implying coupled discharge mechanisms. We suggest that while the discharge of fresh water in the Kurkar areas is driven by inland hydraulic heads and modulated by tides, the discharge of fresh water in the sandy area is mainly modulated by the saline discharge (possibly together with a buoyancy driver). The saline discharge is driven by a combination of tidal pumping and wave setup.

On the correlation between standard magnitude determinations

Shapira A.

Ministry of National Infrastructure, Yaffo St., Jerusalem

The International Seismological Centre is responsible for the final determination of standard magnitudes m_b and M_s and also reports moment magnitudes Mw. m_b is the body-wave magnitude, determined from P wave amplitude measurements at about 1 Hz. Ms is the surface –wave magnitude determined from amplitude measurements of surface wave with period of 10-20 sec. Many seismologists may consider Mw to be the preferred reference magnitude mainly due to the saturation of the m_b and M_s of strong earthquakes. Mw is also the more useful parameter for earthquake hazard assessments frequently estimated from mb and M_s.

I have used the ISC database to study the correlations between those magnitudes and observed the following: Mw has a low scatter, almost 3 times lower than the scatter in m_b and M_s. The relatively high scatter in M_s and especially m_b also contributes to increase uncertainty in trying to estimate Mw from the other magnitudes. The practice of m_b determination by the CTBT organization also contributed to high scatter in m_b determinations and consequently, its correlation with the other scales.

Sif cave a window to the epikarst percolation

Sheffer N.A.[1], Cohen M.[2], Morin E.[3], Grodek T.[3], Gimburg A.[4], Gvirtzman H.[1] , Frumkin A.[3]

1. The Institute of Earth Sciences, The Hebrew University of Jerusalem, Jerusalem
2. The Faculty of Agricultural Sciences, The Hebrew University of Jerusalem, Rehovot
3. The Department of Geography, The Hebrew University of Jerusalem, Jerusalem
4. Regional R&D Center, Science Park, Ariel

AA study for monitoring water percolation in the epikarst is carried out at Sif cave in Sussi River (near Ariel, Samaria). The research is based on the direct measurement of the percolation in the cave area. Rainfall and water percolation into the cave are continuously measured. The water dripping in the cave is collected by three large sheets that channel the water into three barrels equipped with pressure transducers recording the water height with a 5 minute temporal resolution. The total area monitored is approximately 114 m^2 in the three sites (16 m^2, 56 m^2 and 42 m^2). The data recorded is the rate and volume of dripping for each of the three sheets. The measured rainfall combined with the knowledge of the "rain" dripping in the cave allows the estimation of recharge into the epikarst. Measurements conducted over a period of two and a half years at the cave, show two distinct flow regimes. The first, termed "quick flow", is the percolation through preferable flow paths allowing water to penetrate rapidly through the karst. The dripping starts shortly after rain begins, and ends promptly with the rain; The second, termed "slow flow", is the matrix flow, conducting water in small cracks and fissures, initiating dripping 20-30 hours after the rain begins, and allowing water to drip weeks and even month after the rain stops. At any case, an accumulated 100 mm of rain per year is needed to initiate dripping in the cave. Furthermore, the study shows that along the winter season, as the water content in the soil rises, the lag time between the rain event and the "slow flow" reaction decreases as expected. The lag time drops from 30 hours in the beginning of the winter (October) to a mere 4 hour lag towards the end of the winter (April). The overall annual recharge measured in the cave is approximately 25-30%, with the early events contributing mainly to the rise in soil water content allowing for the later events to percolate deeper and drip in the cave.

Material analysis during progressive firing of kaolinite by infrared and micro-Raman spectroscopy using curve-fitting technique

Shoval S. [1], Boudeulle M. [2], Panczer G. [2]

1. Geology Group, Department of Natural Sciences, The Open University of Israel, The Dorothy de Rothschild Campus, 108 Ravutski Street, Raanana, Israel.
2. LPCML, UMR 5620 CNRS, Claude Bernard University – Lyon 1, 43 Bd. 11 November 1918, 69622 Villeurbanne Cedex, France.

Analysis of the thermal phases formed during progressive firing of kaolinite was done by infrared and micro-Raman spectroscopy using curve-fitting technique. The study is of interest in production of ceramics from kaolinitic raw material. The use of vibrational spectroscopy has advantage in materials analysis of amorphous and short-range ordered thermal phases, which unsuccessfully observed by XRD.

Reference and local kaolinites, consist of accessory anatase (TiO_2) and free of anatase, were heated to temperatures ranging 400-1300°C for 6 hours. The different thermal phases were identified according to their indicative bands in the spectra. The locations of the bands in spectra of standard samples of metakaolinite ($Ai_4Si_4O_{12}$), Al-spinel (g-Al_2O_3), mullite (Al_4SiO_8), amorphous silica (SiO_2) and cristobalite (SiO_2) were used for the identification.

The spectroscopic material analysis enable to observed the following thermal transformations: Dehydroxylation and formation of dehydroxylated kaolinite at about 500°C. Formation of a pseudo-amorphous phase of metakaolinite above 600°C. Thermal transformation of metakaolinite to short-range ordered phases of Al-spinel at about 1000°C. Excluding of some amorphous silica at 1100°C. Thermal transformation of the amorphous silica to cristobalite above 1100°C. Formation of minor amounts of corundum at 1100°C. Thermal transformation of Al-spinel to poorly ordered mullite at 1200-1300°C. In kaolinites containing accessory anatase, thermal transformation from anatase to rutile is observed above 1100°C.

The spectroscopic results confirm the existent data on the thermal transformation from kaolinite to mullite. The use of vibrational spectroscopy and curve-fitting technique seems to be a useful method for materials analysis in the ceramic industry.

FT-IR study of gehlenite and larnite in calcination of calcareous clays

Shoval S., Harari D.

Geology Group, Department of Natural Sciences, The Open University of Israel, The Dorothy de Rothschild Campus, 108 Ravutski Street, Raanana, Israel.

The formation of gehlenite (Ca2Al2SiO7) and larnite (b-Ca2SiO4) in calcination of calcareous clays was studied by FT-IR spectroscopy using curve-fitting technique. The study is of interest in production of calcareous ceramic and Portland cement and in combustion of calcareous oil shale and coal. The use of FT-IR spectroscopy has advantage in materials analysis of amorphous and short-range ordered thermal phases, which unsuccessfully observed by XRD. Spectra of standard samples of gehlenite and larnite were served for the identification. Theses standard were obtained by calcination of mixture of silica and calcite with and without alumina, respectively. The bands in the spectra of these samples were assigned.

Mixtures of calcite with reference and local samples of kaolinites or montmorillonites were heated at 1000°C for 6 hours. The presence of gehlenite and larnite was identified according to their indicative bands in the spectra. Gehlenite is formed in calcination of mixtures of kaolinite with calcite, whereas larnite is formed in calcination of montmorillonite with calcite. It seems that the relative high alumina content in kaolinite leads to the formation of gehlenite, whereas the relative high silica content in smectite favorite the formation of larnite.

The formation of the gehlenite and the larnite took place by solid state thermal reactions between the thermal products of the clay and the calcite. The thermal reaction is encouraged in calcination in with the presence of kerogenous or bituminous calcareous clays. The entire clay reacts to form gehlenite and larnite in the presence of excess amount of calcite. However, free lime and portlandite appear in these samples. In calcination with the presence of low amount of calcite the gehlenite is accompanying by metakaolinite and the larnite by meta-montmorillonite.

The Geomorphic and Mechanical Conditions for Rock-Falls: Rama Cliff, Zurim Escarpment

Siman Tov S. [1], Katz O. [2], Matmon A. [1]

1. Institute of Earth sciences, Hebrew University of Jerusalem, 91904 Israel
2. Geological Survey of Israel, 30 Malkhei Israel St., Jerusalem 95501, Israel

Rock falls, triggered by earthquakes or meteorological-events are a typical natural-hazard along steep escarpments. Understanding the processes that lead to rock fall initiation is important for assessing hazards and for paleoseismology analysis. In this study we investigate the morphology and structure of Rama cliff, Zurim Escarpment, Galilee, northern Israel. We focus on investigating the controls of rock-fall initiation and the resultant boulder size, and evaluate the effect of earthquakes as rock-fall triggers.

The studied cliff is 15m high with two 100m long segment facing SSW and SSE. It is composed of a hard limestone unit overlying a marl bed and as a consequence presents a 'hanging cliff morphology', i.e. a notch in the marl at the cliff's base. Vertical joints striking SSW with 2-3 meter spacing are normal to the cliff face along the eastern side and sub-normal along the western side. Tens of rock-blocks are distributed up to a distance of 100m down-slope from the cliff base. We integrated aerial photograph survey, field mapping (using a laser range-finder and differential GPS), and GIS analysis to map the blocks and estimate their volume. The rock-blocks are arranged in lines parallel to the cliff's face, and form natural terraces at the foot of the cliff. Average volume of blocks in the eastern side is larger than that in the western side. The field analysis leads to initial conclusions: 1) The hanging cliff morphology seems to be the crucial condition for frequent production of rock blocks, and 2) the angle between the joints and the cliff face controls the block volume. 3) The terrace blocks arrangement favor a triggering process for rock-fall initiation. The proximity of numerous active faults supports earthquakes triggering mechanism for rock falls at the Rama cliff site.

In order to better understand the mechanism of rock falls, we modeled the Rama cliff as a series of cantilever beams which can collapse and produce a block when the forces acting on the beam overcome the rock tensile-strength. Calculations yield an expected block size of $\pm 90m^3$, much greater than those observed in the field. This discrepancy may be a result of scaling effect (strength reduction with increasing specimen size), existing fractures in the rock mass, or earthquakes triggering. Our preliminary analysis shows that earthquakes induced acceleration in the range of 0.1-1.0g can not be a dominating beam-length controlling factor, rather the scaling effect probably plays a major role in controlling the beam length.

Pliocene to present evolution of fluvial surfaces and cumulic soils under varying climatic conditions in the tectonically stable Paran Plains, Negev Desert

Simhai O. [1,2], Amit R. [2], Matmon A. [1], Haviv I. [1], Enzel Y. [1], Porat N. [2], McDonald E. [3], Benedetti L. [4], Finkel R.C. [5,6]

1. The Institute of Earth Sciences, Hebrew University of Jerusalem, Givat Ram, Jerusalem 91904, Israel
2. Geological Survey of Israel, 30 Malkhe Israel St., Jerusalem 95501, Israel
3. Desert Research Institute, 2215 Raggio Parkway, Reno, NV 89512, USA
4. Centre Européen de Recherche et d'Enseignement des Géosciences de l'Environnement, Europôle Méditerranéen de l'Arbois - BP 80 AIX EN PROVENCE cedex 04, 13545, France
5. Lawrence Livermore National Laboratory, 7000 East Avenue, Livermore, CA 94550, USA
6. UC Berkeley, Earth & Planetary Science Dept., Berkeley, CA 94720, USA

The fluvial surfaces of the Paran in the southern Negev, ~35 km west of the Dead Sea Transform, are located in a tectonically stable environment which allows a high level of landscape preservation and continuous development of cumulic-welded soils. Several stages of the Paran Plains development since the Pliocene were deduced from morphology, pedology, geochronology, and the climatological setting of the region. Ages are based on a high-resolution sampling for optically-stimulated luminescence (OSL) and cosmogenic ^{10}Be and ^{36}Cl concentrations.

The flat Paran Plains are mostly covered by desert pavement with patches of shallow small scale dry playas which are distributed over the plains. The studied profiles revealed calcic soils at ~1 m depth developed within alluvial or colluvial sediments overlain by a calcic-gypsic soil and a less gravelly gypsic-salic soil with a thick B almost gravel-free horizon, extremely thick Av horizon and a well-developed desert pavement at the top.

^{10}Be concentrations indicate that colluvial deposition, presently at depths greater than 1.3 m, took place at ~2.2 Ma. ^{36}Cl concentrations indicate an age greater than 1.2 Ma for the desert pavement. These sediments are related to the main Pliocene drainage system that drained the Negev into the newly developed Dead Sea basin. The surfaces were apparently abandoned at ~1.9 Ma. This abandonment is related to stream capture and the break-up of the Pliocene drainage system. The complex soil profile started to develop sometime after ~1.9 Ma with a calcic soil (stage III) developing during the early stages, probably during the late Pliocene and earliest Pleistocene. The transition in soil properties with time indicates increasingly arid conditions in the region with relatively wetter conditions in the Plio-Pleistocene (but still under arid regime), becoming more arid in the early Pleistocene and extremely arid since at least the middle Pleistocene. The OSL ages indicate that most of the eolian input to the top soil horizons occurred during the last 300 ky.

Late Holocene tectonic segmentation of the eastern Mediterranean continental margin, based on sea level bio-markers

Sivan D.[1], Schattner U.[2], Morhange C.[3], Lambeck K.[4], Boaretto E.[5]

1. Department of Maritime Civilizations and the Recanati Institute for Maritime Studies, University of Haifa, Haifa, 31905 Israel. dsivan@research.haifa.ac.il
2. Department of Marine Geosciences, Charney School for Marine Sciences, Faculty of Science and Science Education, University of Haifa, , Haifa, 31905 Israel . Schattner@sci.haifa.ac.il
3. IUF, CEREGE, B.P. 80 Europôle de l'Arbois, F 13545 Aix-en-Provence France, morhange@cerege.fr
4. Research School of Earth Sciences, The Australian National University, Canberra, ACT 0200, Australia. kurt.lambeck@anu.edu.au
5. Radiocarbon Dating Laboratory, Weizmann Institute of Science, 76100 Rehovot, Israel elisa@wisemail.weizmann.ac.il

The *Dendropoma petraeum* are fixed vermitides that construct the abrasion platform rims. These endemic mollusks are considered good relative sea level (RSL) indicators in the eastern and the southern Mediterranean, due to their narrow habitat at the sea surface (+/- 10cm). The observed RSL values recorded (submerged, uplifted or at present MSL) reflect a superposition of eustatic, isostatic, tectonic and possibly local sedimentary instabilities. The present study examines fossil *Dendropoma* samples gathered along the Levant coast, from northern Israel to eastern Turkey. Conventional radiocarbon dates (from Turkey, Syria and partly in Lebanon) and C^{14} AMS (from Lebanon and Israel) yields *Dendropoma* ages ranging through Late Holocene. A numerical model is used for calculating the change in sea level through the Holocene as a function of glacio-hydrology and isostasy of the eastern Mediterranean. Space-time dependent subtractions of the model values are used to eliminate the eustatic component of the RSL, in order to obtain the tectonic factor. Results show a general northward increase in tectonic uplift of the Levant coast. This differential uplift corresponds well to the major tectonic segments comprising the Levant continental margin since the Pleistocene, from the Carmel fault to the East Anatolian fault.

The Or Akiva fault: E-W Miocene faulting of the Levant continental margin and its relation to the Carmel block.

Steinberg J. [1,2], Gvirtzman Z. [2], Folkman Y. [2], Gvirtzman H. [1]

1. Institute of Earth Sciences, Hebrew University of Jerusalem, Jerusalem, Israel
2. Geological Survey of Israel, 30 Malkhe Yisrael St., 95501 Jerusalem, Israel

Several recent studies emphasize the resumption of tectonic activity along the Levant continental margin during the Late Tertiary, after a long passive history. We have previously provided evidence of a 70 km. long fault that runs parallel to the present day southern coastline. This study defines an additional fault which bounds the Jaffa basin to the north and the Carmel block to the south. The Or Akiva fault is an E-W, normal, down to the south fault that can be traced from about 10 km. inland to approximately 20 km. offshore. Maximum throw along this fault exceeds 1000 meters. The E-W trend of the Or Akiva fault is unusual for the coastal plain and continental shelf and has been recognized so far only north of the Carmel block.

We use a recently released marine three-dimensional seismic dataset to map key horizons and describe a complex tectonic and erosional system. The high spatial resolution provided by this data along with numerous two-dimensional regional seismic lines allows us to enhance our ability to define the Or Akiva fault system and the drainage systems that developed in the vicinity.

The Or Akiva fault displaces the lowermost section of the Saqiye Gp. and creates a steep wall at the base of the Pliocene Yafo Fm., indicating that faulting has been active well after the initial deposition of the lowermost Saqiye Gp. and possibly has continued into the Early Pliocene. Along the structure that the Or Akiva fault created, a new submarine channel evolved which drained westwards from the Caesarea area to the Levant basin. The base of this channel can be recognized in the seismic data as being pre-Messinian and post a regional unconformity surface thought to represent the Serravalian. This channel is not evident prior to the faulting when clastic material has been apparently transported from the Sharon region southwest, via the Netanya channel, towards the Jaffa Basin.

The age and orientation of the Or-Akiva fault along with its proximity to the Carmel block and Jaffa basin sheds new light on previously postulated events. This structural junction which separates two distinct structural provinces provides a new angle for understanding the early rising stages of the Carmel block. This may correlate with the regional information regarding the inland jumping of the major plate boundary eastwards from the Suez rift to the Dead Sea transform. We show that during this transitional period, towards the end of the Miocene, coeval with the early stages of the Africa-Arabia breakup, the Levant continental margin was also faulted and deformed and that faulting gradually decayed towards the Pliocene.

Iron oxides of the thetis deep, Red Sea

Taitel-Goldman, N.

The Open University of Israel

The Thetis Deep is located in the central Red Sea between N22°48;- N22°49; and E37°32;- E37°37;. Hydrothermal sediments of the Thetis Deep occur only in the NE basin which is 10 km long and 3 km wide and up to 1780m deep. The 1st hydrothermal activity started 23000 years B.P. forming hematite/magnetite facies and ceased about 14000 years ago. At 10000 years B.P. there commenced a second period of hydrothermal activity that increased 2700 years ago and lasted till 1200 B.P forming several Fe facies types. 20 samples from the hydrothermal metalliferrous sediments of the Thetis Deep were examined using X-Ray diffraction, IR spectroscopy and scanning electron microscopy (SEM). Layers of euhedral magnetite crystals (1-3 microns) accompanied by multi domain goethite (0.5-3 microns) are both enriched with small amounts of V, S, P, Mg, Ca, Mn, Al and Si. Both crystallized simultaneously and reflect the composition of the hot hydrothermal brine. Incomplete oxidation of dissolved Fe^{2+} lead to magnetite crystallization at the lowermost part of the hydrothermal brine, whereas close to the interface between the hot brine and the Red Sea Deep Water, slow oxidation occurred leading to goethite crystallization. Layers of magnetite and trioctahedral Fe rich chamoste enriched with additional Ti, precipitated at the oxygen depleted lowermost part of the hydrothermal brine that had leached Miocene shales and evaporites prior to its discharge. Well crystallized, lepidocrocite that appears as euhedral plates (140-340nm) or acicular crystals (500-600nm long and few nm wide) and well crystallized multi-domain goethite (longer than 500nm) form mono-layers of iron oxides. Goethite and lepidocrocite mono-layers were formed at slow or abrupt oxidation epochs. Slow oxidation of Fe^{+2} yielded goethite precipitation, whereas down-welling of dense oxidized Red Sea Deep Water formed wide mixing layer and introduced large amounts of dissolved oxygen into the brine leading to abrupt Fe oxidation and lepidocrocite precipitation. Recrystallization into hematite probably occurred after the hydrothermal discharge ceased and oxygen reached the bottom of the deep.

New insight into Bottom Morphology of the Northern Gulf of Eilat/Aqaba mapped from multi-beam and side scan sonar data

Tibor G. [1], Niemi T.M. [2], Ben-Avraham Z. [3], Al-Zoubi A. [4], Hartman G. [3], Sade R.A. [5], Hall J.K. [6],Akawi E. [4], Abueladas A. [4]

1. Israel Oceanographic and Limnological Research, Haifa, Israel
2. University of Missouri-Kansas City, U.S.A.
3. Department of Geophysics & Planetary Sciences, Tel-Aviv University, Tel-Aviv, Israel
4. Surveying & Geomatics Department, Al-Balqa' Applied University, Al Salt, Jordan
5. Department of Geo-Marine Sciences, Haifa University, Haifa
6. Geological Survey of Israel, Jerusalem, Israel

A high-resolution marine geophysical survey in the northern gulf of Eilat/Aqaba region was conducted during October and November 2006 on board the R/V "Etziona". This survey was carried out by an international research group (Israel, Jordan and USA) funded by MERC. The overall aim of the research is to provide the municipalities of Aqaba and Eilat with a base map of active faults for seismic hazard analyses and earthquake preparedness planning through the collection and interpretation of high-resolution marine geophysical imaging of the seafloor and subsurface strata. The morphology of the northern margin of the Gulf of Eilat/Aqaba is characterized by a shelf-slope structure in the north; steep slopes with almost no shelf in the east and terrace structure with a moderate slope to the west. Processing of the Kongsberg-Simrad EM 1002 multi-beam sonar data, together with slope analyses, reveals very interesting features on the seafloor (e.g. canyons, slumps, reefs, etc.) that indicate recent faulting activity in this area. Based on the multi-beam data we have classified the morphology of the northern gulf into seven domains: (i) modern reef and terrace; (ii) shelf with buried reef; (iii) submerged cliff and fan delta; (iv) Yutim and Arava submarine canyons; (v) collapsed margin; (vi) uneroded structural highs, and (vii) basin floor. These domains clearly delineate the areas within the Dead Sea transform valley that are tectonically active from more stable regions.

Rock mass quality and shaft resistance of piles in rock

Wainshtein I. [1], Hatzor Y.H. [1], Doktofsky M. [2]

1. Department of Geological and Environmental Sciences, Ben Gurion University of the Negev, Beer – Sheva, 84105, Israel
2. Mike Doktofsky Geotechnical Engineers, David Meretz St. 10/4, Jerusalem 96905, Israel

Predicting shaft resistance of rock socketed piles is a complicated task. Conventional prediction methods are highly empirical, typically relating uniaxial compressive strength (q_u) to the ultimate shear strength of the pile-rock interface (f_{su}). Recent studies suggest that f_{su} is influenced, in fact, by many factors, including peak and residual strengths of the weaker material in the interface (either rock or concrete), wall roughness, mechanical and structural characteristics of the rock mass, pile diameter, initial normal stress, and construction practices.

Rock strength, as well as the mechanical and structural characteristics of the rock mass scale with empirical rock mass classifications (e.g. RMR, Q or GSI), however conventional design procedures typically use only the elastic modulus of the rock mass (E_M) to address rock mass quality. This is not sufficient because other rock mass properties may prove to have a strong influence on f_{su}, first and foremost the degree of discontinuity of the rock mass, as may be expressed for example by RQD. E_M and RQD are intuitively interrelated as rock masses with higher RQD values exhibit higher E_{RM} values, yet their affect on f_{su} is different. While f_{su} is directly proportional to E_M, as would be expected intuitively, f_{su} seems to be inversely proportional to RQD, in contrast to immediate intuition.

We present an analysis of an international database consisting of 66 in-situ load tests. The analysis of 17 load tests with measured E_M reveals that shaft resistance has stronger empirical correlation with E_M and consequently with rock mass quality than with q_u alone. Moreover, a comprehensive analysis of the entire database reveals that adhesion factors ($a = f_{su}/q_u$) in rock masses with RQD values smaller than 50% are higher by as much as 40%, on average, than adhesion factors obtained in rock masses with higher RQD values. We explain this surprising result by the effect of RQD on borehole wall roughness. Seidel and Collingwood, 2001 proposed a method to obtain borehole roughness from in-situ load tests, and integrated it into their adhesion factor expression. In their work, Seidel and Collingwood, 2001 only relate borehole roughness to q_u. However, using our data base and applying Seidel and Collingwood's procedure for borehole roughness determination, we find that borehole roughness increases with decreasing RQD. This may explain the result of the database analysis which suggests that adhesion factors are higher for rock masses with lower RQD values. Since the influence of RQD on wall roughness may be quite pronounced we suggest that borehole roughness in empirical adhesion factor equations be modified to incorporate the influence of RQD on borehole wall roughness.

Sinkhole monitoring at the Dead Sea area

Wald R.[1], Nesichi S.[2], Bruner I.[1], Kroituru L.[1], Klein J.[1], Cohen R.[1], Soskin L.[2] Liubamirski I.[1]

1. Ecolog Engineering LTD 55/4 Oppenheimer St., Rehovot 76701
2. Reaserch and Development Department, Israel National Roads Company

Sinkholes formation and evolution is a well discussed topic over the last decade in the geological community. Governmental financial support during this period provided many research opportunities and the usage of various geophysical, geological, hydro-geological and remote-sensing methods. Both the Geological Survey of Israel (GSI) and the Geophysical Institute of Israel (GII) were involved in these projects.

On April 2006 the Research & Development Department of the Israel National Roads Company (INRC) ordered detailed mapping of the subsurface geology along road 90 (Dead Sea area) from Ecolog Engineering LTD (Ecolog). The study area extends from the "Lido" junction in the north to the Arava junction in the south, approximately 105 km long.

As part of the scope of work, Ecolog reviewed published professional literature from Israel and other parts of the world in order to summarize and present an up to date geological and geotechnical database. The database includes geological maps and published papers since 1950 that were the basis for a longitudinal cross section drawn along road 90.

The ability to track the subsurface geology (e.g. salt layer, faults) along with the regional water level and topographic profile of the road, enabled Ecolog to integrate collected literature data with physical characters and to point out possible sensitive segments. Features such as the aerial distance of the road from present sinkholes and mapped faults were also considered.

Most of road 90 is paved on the Lisan Formation while other common lithologies found at the infrastructure are alluvial sediments, Quarternary basin fill, Neogene-Quarternary conglomerates and the Sedom Formation. The Judea Group is mainly deeply buried but there are also some kilometers at which the road is paved through it, which provide 100% security against the potential of sinkhole development.

Ecolog was asked to carry out sinkhole monitoring in crucial areas along road 90 with involved field work. New geophysical approaches suitable to the investigated issue are lately being examined as well.

Diverse alkaline ultrabasic magmatism in the Early Cretaceous Levant Province: The Ramon volcanic field

Weinraub A., Yudalevich Z., Eyal M., Katzir Y.

Department of Geological and Environmental Sciences, Ben Gurion University of the Negev, P.O. Box 653, Beer Sheva 84105, Israel

A detailed field and petrographic study of the magmatic outcrops in Makhtesh Ramon revealed a plethora of previously unknown well-preserved Early Cretaceous volcanic and sub-volcanic structures and highly diverse rocks. Mapping the magmatic exposure was done on aerial photographs enlarged to scales of 1:1000 to 1:2500. The study area was divided to three parts: (1) the western part, which includes the western edge of Makhtesh Ramon all the way eastwards to Mount Arod; (2) the central part, from east of Mount Arod up to the road that crosses Makhtesh Ramon; (3) the eastern part includes the magmatic exposures that lie east of the road. Volcanic rocks in the western and central parts are spread along the southern and northern walls of Makhtesh Ramon. Tephrite, basanite and nephelinite flows are widespread in the western part, but in the central parts flows are not as abundant and their composition is mainly basanitic. Subvolcanic intrusions are also abundant in the western part and become scarce in the central and eastern part, with one exception – in Givat Ga'ash. The eastern outcrops comprise mainly of sills, dykes and laccoliths.

Most rocks are black and fine grained and thus cannot be defined in the field. Rock composition was determined by detailed petrographic work. Geochemical analysis showed that the Ramon volcanic field consists almost entirely of ultrabasic rocks ($SiO_2 \leq$ 44% wt) with both alkaline (tephrite and basanite) and ultra-alkaline (nephelinite and rare melilitite) flows and sub-volcanic bodies.

The dominant major minerals are olivine, clinopyroxene, plagioclase, nepheline, titanomagnetite and melilite. Basanites and nephelinites include up to 25% olivine and 55% clinopyroxene whereas tephrites have between 5% and 10% olivine. Plagioclase and nepheline contents are negatively correlated.

Most rocks are porphyritic including olivine and clinopyroxene phenocrysts that can reach up to 3 cm in diameter. Clinopyroxene phenocrysts are often zoned forming colourless to greyish augite or green Na-augite cores rimmed by rose titanaugite. Zoning is interpreted in terms of Na-depletion in the magma as either nepheline or plagioclase begin to crystallize.

The role of Submarine Groundwater Discharge in nutrient transport to the coastal seawater: an example from Dor bay

Weinstein Y.[1], Herut B.[2], Shalem Y.[1], Yechieli Y.[3]

1. Bar-Ilan Univerity, Ramt-Gan 52900
2. Israel Oceanographic and Limnological Research, Haifa 31080
3. Geological Survey of Israel, 30 Malkei Israel St., Jerusalem 95501

Submarine Groundwater Discharge (hereafter: SGD) is now well established as a major pathway for nutrients from land to the sea. Specifically, it was recently suggested that the recirculation of seawater in the aquifer (defined as 'subterranean estuary') results in the mobilization and transport of nutrients and other chemical to coastal water.

SGD has been studied in Dor Bay, southern Carmel coast, since July 2005. Advection rates from the sediment to the water column were assessed by methods of radon and radium isotopes and by seepage meter measurements and were found to vary between zero and 35 cm/d with average of 7-8 cm/d. In most bay sites, the discharge was dominated by saline recirculated seawater, while the fresh water fraction varied between 10-60%. In this study we investigated the nutrient contribution of the SGD to the bay. High concentrations of nitrates and silica were found in all groundwater samples next to the bay (100-430 and 90-450 mM, respectively), while high phosphate concentrations were found in groundwater of the loose sand but not in the Kurkar calcareous sandstone (0.2-4.2 and 0.01-0.2 mM, respectively), which is the main aquifer discharging to the sea. Nitrate and silica and phosphate concentrations in bay water were very low (0.5-2.9, 2.1-8.5 and 0.03-0.5 mM, respectively). Nutrients were also sampled in groundwater discharging from the bay floor through seepage meters. On a diagram of nitrate *vs.* salinity, the composition of these saline groundwater samples fall below a mixing line between seawater and the nitrate-rich onshore groundwater, and on a silica *vs.* salinity diagram the submarine groundwater compositions fall both along and below the mixing line. On the other hand, the saline groundwater compositions contain relatively high concentrations of phosphates (up to 0.8 mM) compared with both seawater and Kurkar groundwater. Higher concentrations of phosphate, up to 1.9 mM, were measured in saline groundwater sampled from near shoreline piezometer.

It is suggested that:

1. Unlike the common thought, at least in Dor Bay saline SGD is nitrate- and silica-poor, probably due to relatively short residence time in the sub-surface;
2. Nitrates carried by the fresh water toward the sea are going through denitrification or nitrate reduction processes probably due to anaerobic conditions prevailing in the sub-seafloor sediments;
3. Recirculated seawater is more effective in mobilizing and transporting phosphates to the sea, as is to be expected with high ionic strength water.

Active fault mapping by nanoseismic monitoring: Feasibility study in the Swiss Prealps

Wust-Bloch G. H.

Department of Geophysics, Tel Aviv University, 69978 Israel. hillel@seismo.tau.ac.il

Active fault mapping by nanoseismic monitoring consists in deploying a series of portable sparse seismic arrays to locate, in 3-D, very week events naturally generated by a presumed source zone. The technique, which is able to analyze extremely weak events (ML $\leq$ 0) that remain undetected by fixed networks, drastically reduces monitoring time. It is particularly suitable to quantifying the seismicity of potentially active fault zones, such as the "Fribourg Lineament" (Mosar, 2006; Kastrup et al., 2007) in the Swiss Prealps.

An initial instrumental deployment was carried out in the Fribourg region in spring 2007. Over 180 hours of continuous monitoring, recorded by two sparse arrays, detected a series of 30 natural events with magnitudes ranging 1.8 $\leq$ ML $\leq$ -2.2. This feasibility study enabled the assessment of in situ SNR conditions, the optimalization of the array design as well as an initial characterization of the weak seismicity generated within the "Fribourg Lineament".

Detecting pre-collapse failure signals in unstable landslides, cliffs and cavities by nanoseismic monitoring

Wust-Bloch G. H.

Department of Geophysics, Tel Aviv University, 69978 Israel. hillel@seismo.tau.ac.il

Nanoseismic monitoring techniques have been applied to detect very weak signals generated by subsurface instabilities within landslides, cliffs and cavities. The data is acquired by portable sparse seismic arrays, which are deployed in varying geometries as close as possible to the presumed source zone. Advanced, pattern recognition-supported, data processing schemes scan for broad-band energy spikes within continuous records sampled at 200-500 Hz.

The authenticity of source signals is verified either by simulation in the field -when possible- or through a multi-parameter validation process. This comprehensive waveform characterization process includes signal full-spectral analysis, source location, waveform cross correlation and source magnitude evaluation.

Study cases will be reviewed to show how failure generated in landslides, cliffs and cavities can be located and characterized. Additional analyses include magnitude-time series, source time migration and event coincidence with external parameters.

Sinkhole hazard assessment along the Dead Sea shores in Jordan: Integrated nanoseimic monitoring & GIS techniques

Wust-Bloch G. H. [1], Ben-Avraham Z. [1], Al-Zoubi A. [2], Al-Ruzouq R. [3], Abueladas, A. [2], Joswig, M. [4]

1. Department of Geophysics, Tel Aviv University, Israel
2. Engineering Geophysics, Al-Balqa University, Jordan
3. Surveying & Geomatics Engineering, Al-Balqa University, Jordan
4. Institute für Geophysics, Stuttgart University, Germany

Agriculture, tourism and industries have been adversely affected by sinkhole hazard along the Jordanian and Israeli shores of the Dead Sea. An integrated approach, incorporating nanoseimic monitoring with GIS techniques, was tested in the Ghor Al-Haditha - Lisan area to detect and assess pre-collapse sinkhole hazard.

A GIS-supported model was designed for the Ghor Al-Haditha - Lisan region with a custom DTM, calibrated by high-density GPS benchmarks. It also includes orthophotos, ancient aerial photos and recent satellite images. Additional information layers comprise geology, lithology, hydrology, geophysical surveys and lifelines. The model shows a high correlation between sinkhole distribution, tectonic and hydrological features.

Nanoseismic techniques enable the detection of extremely low-energy signals generated by sinkhole activity (Wust-Bloch & Joswig, 2006). The detection of nanoseismic signals and the ensuing signal waveform characterization by sonogram analysis identified two main groups of nanoseismic events: impacts on dry material and impacts in liquid. When correlated with the GIS supported information, this discrimination can be used to assess the maturity of the sinkholes since it indicates whether failure is still confined to the groundwater or is progressing towards the surface.

This project shows that the integration of both techniques permits the design of the optimized hazard maps that include a quantitative assessment of pre-collapse invisible subsurface cavitation and sinkhole activity.

Estimating Seismic Hazard for the Eastern Margins of the Sea of Galilee using Numerical Analysis of Overturned Byzantine Columns, Susita Site.

Yagoda-Biran G.[1,2], Hatzor Y.H.[1], Katz O.[2], Amit R.[2]

1. Department of Geological and Environmental Sciences, Ben-Gurion University of the Negev.
2. Geological Survey of Israel.

The Dead Sea Transform is an active tectonic plate boundary, and as such, it produces recurring seismic activity in our region. Although considered low to moderate, there is evidence for occasional large earthquakes in the region based on historical documentations, archeological sites, paleo-seismic trenches, young sediments and more. The scarcity of recorded instrumental data from strong earthquakes since implementation of the seismic network in Israel prompts us to consider alternative methods for seismic hazard estimation in our region, in order to better prepare for the next strong earthquake.

We present here a method for seismic hazard estimation using dynamic numerical analysis. We perform back analysis of structural rocking and ultimately overturning of monolithic granite columns which were used as supports in a Byzantine church at Susita. Susita, or Hippos by its Greek name, located just east of the Sea of Galilee and one of the Decapolis, a group of ten Hellenistic cities in the region, is believed to have been destroyed by the strong earthquake in 749 AD. The analysis is performed using the numerical Discontinuous Deformation Analysis (DDA) method, an implicit Discrete Element method.

First an existing two-dimensional analytical solution for dynamic rocking of a free standing column is compared with results obtained using the numerical DDA method. A very good agreement between the two solutions is achieved. We then proceed with forward DDA modeling, using sinusoidal input accelerations, to obtain the most likely frequency and peak amplitude of the input acceleration which triggered the observed failures. We find that the required PGA (peak ground acceleration) for overturning is frequency dependent, ranging from $0.2g$ to $1g$. The possible PGA range thus obtained cannot be further constrained, since a free standing column does not have a resonance frequency.

To further constrain the range of possible PGA values we apply real accelerograms from 5 different earthquake records, directly at the centre of the studied column. The modelled earthquakes were all recorded in strike-slip regimes but at various site conditions. The applied records were scaled (up or down by multiplying the entire record by a scalar) to obtain the PGA at which column overturning is obtained, defined here as the threshold PGA required for overturning.

Surprisingly, the range of PGA required for overturning obtained from real earthquake records is much narrower: between $0.2g$ and $0.4g$. This range encompasses the $0.3g$ that the 413 building code predicts for this region, as well as the $0.37g$ value found by a pseudo-static back analysis of a nearby ancient large landslide, near Ein-Gev.

Direct oil shale combustion - problems and advantages

Yoffe O. [1], Wohlfarth A. [2], Nathan Y. [1], Cohen S. [2], Minster T.[1]

1. Geological Survey of Israel, 30 Malkhei Israel St., Jerusalem 95501
2. PAMA (retired)
A. Wohlfarth address - 8 Habonim street, Nahalat Yehuda 75910
S. Cohen address - 29 Eucalyptus street, Omer 84965

A 41 MWth oil shale fired demonstration power plant in Mishor Rotem, Negev, Israel was built in 1989 by PAMA. Since then until to day, the unit is operated at high reliability and availability. At first, heavy soft fouling occurred due to the Circulating Fluidized Bed Combustion (CFBC) mode of operation which caused a considerable reduction in heat transfer coefficient of the heat exchangers. Going over to the Fluidized Bed Combustion (FBC) turbo mode of operation the "soft fouling" phenomenon stopped at once.After five months of operation at the FBC turbo mode the boiler had to be shut down because "Hard deposits" blocked physically the passes in the boiler. These deposits could be removed only manually by mechanical devices. During the first two years the boiler had to be stopped, at least, three times a year for deposit cleaning purposes.

Research conducted at the plant and in the laboratories of the Geological Survey of Israel, allowed us to understand the mechanism of formation of these deposits. The experiments carried out at the plant showed that the "Hard deposits" are formed in two stages: 1 - Deposition of very fine particles on the pipes of the boiler, these particles adhere to the pipes and to each other, and step by step build the deposit. The growth of the deposit on the pipe surface is always the opposite of the particles flow direction. 2 – With time these deposits harden due to chemical reactions. The joint experiments at the laboratories of the Geological Survey and at the plant showed: 1- The rate of deposition in the first stage is a function of the lime (free CaO) concentration in the fly ash; 2 – The hardening of the deposit is due to reactions between the deposit and SO_2, leading to the formation of anhydrite [Ca (SO_4) and hydroxylellestadite {Ca10 (SiO4, SO4)6 (OH)2}.

Following these findings, the plant was able to reduce the shut downs to twice a year. Based on the understanding of the deposit formation mechanism, we learned how to guide future oil shale fueled power plants designers and operators to minimize shutdowns, for deposit cleaning, to once a year. Furthermore, based on PAMA's experience and the joint experiments with the Geological Survey, it will be possible to use most of the oils shale sequence (using oil shale with organic matter concentrations as low as 8-9%). This will allow the possibility of exploiting phosphate deposits which are now unavailable.

Improving probabilistic earthquake prediction algorithms, by tuning to regional geological characteristics and multiple potential precursors

Yaniv M.

The institute of Earth Sciences The Hebrew University of Jerusalem

It is widely accepted that the earth's crust, which produces earthquakes, shows the behaviour of a complex system, one that is in a near-critical state most of the time. According to this view, earthquakes are singular events of energy release that cannot be deterministically predicted. It might be possible, however, to find patterns of behaviour and produce probabilistic forecasts of large events. A few methods have been trying to do that, with different levels of success. The RTP (Reverse Tracing of Precursors) method stands out with its performance in prediction, and is significantly better than random guesses. RTP system searches for premonitory "chains" of seismic events that are defined by a number of parametric conditions, mainly magnitude and distribution in space and time. It is clear that all large magnitude earthquakes follow a premonitory chain; not all chains lead to a large earthquake. The main goal of the RTP system is to separate "dangerous" chains from the rest. This is being done up to now by analysing time dependence of so called "seismic functions" on data from the catalogue (epicentre loci, time of events, magnitude etc.). The currently used algorithms disregard regional geological characteristics. These algorithms are being used for an on-going experiment of prediction-in advance. The experiment is monitoring four seismogenic regions worldwide, the Middle-East being one of them. The two largest earthquakes in this region occurred in the mid 1990s (M7.2 Nueiba, 22/11/1995; M6.9 Paphos, 9/10/1996) were preceded by such premonitory chains; these are the longest chains identified in the region. This work aims at improving the scheme for filtering chains by incorporating new and more advanced pattern recognition algorithms and methods. The improved system will then be calibrated using parameters representing regional geological characteristics; selection of chains that lead to a large earthquake might be further improved by using additional potentially precursory data, such as geochemical, isotopic, hydrological, magnetic and atmospheric measurements. At present, our system is capable of separating chains from a catalogue, evaluating seismic data and calculating values of long-term functions from seismic catalogues data.

Comparison between H/V spectra ratio from ambient noise and theoretical 1D model obtained from seismic refraction survey

Zaslavsky Y.

Seismology Division, Geophysical Institute of, Israel, P.O.Box 182, Lod, Israel

We compare H/V spectral ratios obtained from ambient noise with transfer function of 1D model. To estimate parameters of multi-layer analytical model such as S-wave, thickness, density and damping of each layer, experimental well was drilled down to a basement (total depth 70 m), samples from drills were selected for geotechnical investigations and shear wave velocities were determined by both survey refraction and down-hole measurements.

Our research consisted of two stages. The first stage was preliminary analysis of site effect in Ramat HaKovesh area before drilling borehole. For this purpose on May 10, 2006 ambient noise measurements were carried out at ten points along a profile over supposed borehole location. The second stage aimed to estimate site effect near the drilled borehole and to check stability of preliminary measurements at some locations from the first stage. This experiment was carried out on March 26, 2007. The measurements conducted in different months yielded strongly similar results.

Observed transfer functions were modeled using relative amplification function from computer program SHAKE. In according with experiment conditions (blind prediction) we could use surface-wave refraction survey results only. Therefore we started with direct modeling and used shear-wave velocity and layer thickness from seismic refraction data. The density and specific attenuation in different lithological units were chosen on the base of different literature sources.

Our results suggest that calculated transfer function based on geotechnical measurements may not accurately predict empirical weak motion transfer function. A better fit to the amplitude of resonance peak was obtained by integrating data from extensive ambient noise measurements, information about local geology and S-wave velocity profile derived from refraction line.

From Ramle to Kefar Sava: results of seismic microzoning studies 2001-2007

Zaslavsky Y. [1], Shapira A. [2], Gorstein M. [1], Ataev G. [1], Aksinenko T., Hofstetter R. [1], Kalmanovich M. [1], Perelman N. [1], Giller D. [1], Dan H. [1], Giller V. [1], Lifshits I. [1], Shvartsburg A. [1]

1. Seismology Division, Geophysical Institute of Israel, P.O.Box 182, Lod, Israel
2. The Steering Committee for National Earthquake Preparedness

In order to evaluate the local site effects in part of Shefela and Hasharon region, which is located between Ramie in the south and Kefar Sava in the north, we conducted microtremor measurements at 2000 locations in an area of about 300 km^2. Field measurements included besides the above indicated also towns like Hod Hasharon, Petah Tikva, Ramat HaSharon, Rosh HaAyin, Lod and a number of villages, which covered by a dense grid of 500*500 m^2. High variation in the observation led us to increase the density to a grid spacing of 250 m.

Based on H/V spectral ratio computations, we estimated the amplification effects to be of factor 2-8 at frequencies in the range 0.25 to 12.0 Hz. The fundamental frequencies and their associated H/V levels were correlated with the subsurface geology. The limestone and dolomite of the Judea Group is the fundamental reflector at a great part of the investigated area, and in the west only, the relatively shallow calcareous sandstone layer of the Kurkar Gr. dominates the site response. The dense measurement grid enabled us to trace accurately the conditional border between two reflectors.

Detailed borehole information about the sediments available for more than 500 of the measured sites, together with geological, geotechnical and geophysical data, were used to construct multi-layer 1D-models that yields site response functions that match the observed features of the H/V spectral ratio functions. This allows deriving S-wave velocity structure and further reconstructing subsurface structure. Our observations revealed consistent shapes of the spectral ratio curves in similar geological conditions. Therefore a sharp change in characteristics of site response function at a short distance may indicate discontinuity of subsurface model and often accompanied by fault.

The subsurface model serves as input for computing of Uniform Hazard Site-Specific Acceleration Response Spectra at the investigated sites. The final stage is generalizing the hazard by mapping zones that feature similar seismic hazard functions.

Our results point to the fact that H/V spectral ratio from ambient noise adds very useful information and when integrated with other different data sources, often limited in quantity and quality, allows us to obtain a systematic picture of the characteristics of site effects in the investigated region. The application of this methodology is very important in Israel where big earthquakes present a long return period, but might exhibit a high seismic risk.

Results of survey of groundwater chemistry in the Yarkon-Taninim basin

Zilberbrand M. [1], Rosenthal E. [1,2], Weinberger G. [1]

1. Hydrological service of Israel, P.O. Box 36118, Jerusalem 91360, Israel
2. Department of Geophysics and Planetary Sciences, Tel Aviv University, Ramat Aviv, Tel Aviv 69978, Israel

In the summer of 2005, the Geological Survey sampled for the Water Commission 194 pumping wells and 17 springs and performed both chemical and isotopic analyses of groundwater samples. Most of them were taken from the Judea-Group aquifer. Major, minor and trace components were detected. Interpretation of the results was performed in the Hydrological Service.

Spatial variation of chemical and isotopic components was presented on the background of geological maps. Five types of groundwater chemistries were distinguished: fresh "recharge" water, anomalous water in Kefar Urya - Ayalon area, brackish water south of Beer Sheba, saline sea-like water near the western boundary of the basin between Tanninim springs and Raanana, and brines in the Afiq-channel area.

The Kefar Urya - Ayalon anomalous water is characterized by increased values of temperature, concentrations of Na, K, Sr, Li, Rb, Cl, SO_4, Br, F, Al, B, Mn, Sb, and rSr/rCa and Al/SiO_2 ratios; and decreased values of pH, Eh, concentrations of NO_3, U, Tl, and rCa/rSO_4 and $^{87}Sr/^{86}Sr$ ratios. The salinity source of this groundwater is probably in deep aquifers.

The large amount of samples with complete chemical analyses enabled the use of principal-component analysis to explain the variance in groundwater chemistry. Four factors were found: saline water (marked mostly by Na, Cl, Mg, Sr, Br and SO_4), Eocene groundwater (marked by SiO_2 and Ba), Senonian groundwater (marked by phosphate components: U, Tl, Mo and Sb) and polluted water (marked by Cd, Zn and Pb). These factors explain about 86% of variance in groundwater chemistry. The factor of Senonian groundwater characterizes the slow leakage through the Senonian aquiclude, whereas the factor of Eocenian groundwater – the fast leakage. Mapping the scores of the two factors of leakage shows that they are distinguishable along the foothills to the North of Beer Sheba, except for the area of the Kefar-Urya - Ayalon anomaly. The maximum scores of these factors were revealed to the North of Taibe and in the Beer Sheba area.

Barium is not a conservative tracer. It disappears from water at increased SO_4 concentrations and is released from barite under reductive conditions. Therefore, the statistical analysis of leakage distribution using this tracer was probably not effective in areas south of Beer Sheba where brackish groundwater occurs, and in areas near the western boundary of the basin characterized by sea-like groundwater.

The leaking groundwater should not necessarily be saline. HaShfela Formation layers have been flushed for millions of years. Therefore, at sites in which leakage is relatively high, the water inflowing to the Judea-Group aquifer should be relatively fresh, whereas at sites of the saline leakage the volume of the inflowing water should be relatively small.

The origin and geochemical evolution of brines in the sinkholes along the Dead Sea coast

Zilberman-Kron T. [1,2], Katz A. [1], Gavrieli I. [2], Yechieli Y. [2].

1. Institute of Earth Sciences, the Hebrew University, Jerusalem 91904, Israel
2. Geological Survey of Israel, Jerusalem 95501, Israel

Hypersaline to saline waters fill most of the sinkholes that appeared in recent years along the Dead Sea shores, following the decline in the Dead Sea water level. Our study focuses on the identification of the source and evaluation of the geochemical evolution of these fluids, and is based on sampling and chemical analyses of 152 samples collected between 03/2006-07/2007, from the Samar and Shalem (Mineral Beach) sites, and ranging in their salinities between 5-550 and 181-508g/L, respectively. Data collection included temperature and density measured in the field, and analysis of Na, K, Mg, Ca, Sr, Ba, Li, B, Cl, Br and Si.

The results obtained during the first stage of the research suggested that evaporation plays a major role during the brine's evolution. Hence, we conducted evaporation experiments, in the field, of modern Dead Sea water and of the En-Kedem saline spring water, a common brine type discharging along the Dead Sea coastal area. Throughout the experiment Li, Sr and Ca behaved conservatively while Br displayed a non-conservative behavior.

It was found that, a) All of the Samar and most of the Mineral Beach sinkhole waters follow the evaporation path of the Dead Sea brine. b) Except for a few sinkholes, which directly drain brackish to freshwater seepages and runoff, all the Samar sinkhole brines exhibit densities very close to or higher than that of the Dead Sea, and much higher than that of the En-Kedem brine. c) A few Mineral Beach solutions follow the En-Kedem evaporation path, while others display an intermediate composition between the Dead Sea and En-Kedem evolution paths, indicating mixing between these two water types in that particular area. d) The densities of Mineral Beach sinkhole brines range from that of the En-Kedem brine, to densities exceeding that of modern Dead Sea water.

Interstitial fluid was collected from a shallow (2 m deep) borehole located a few meters upstream from a sinkhole in the Samar site. The brine retrieved is almost identical in composition to Dead Sea water sampled by Neev and Emery (1967) in 1960 from the upper water body which was undersaturated with respect to halite. The Dead Sea reached saturation only in the early 1980s, making its upper water mass of that or earlier time a likely source of the interstitial brine. Similar Dead Sea water was also available during the first half of the 18th century (Nissenbaum, 1969). The probability that the interstitial brine represents post-1980 Dead Sea water that underwent some dilution and dissolved halite mimicking earlier waters, is very unlikely. These conclusions may prove useful in estimating the desiccation rate of Samra, Lisan and Zeelim sediments in response to temporal lowering of the respective lake level.

The possible subsidence of Haifa Bay since the Late Pleistocene - New evidence

Zviely D. [1], Salamon A. [2], Galili E. [3], Bakler N. [2]

1. Recanati Institute for Maritime Studies, University of Haifa, Haifa, 31905, Israel.
2. Geological Survey of Israel, 30 Malkhe Israel St., Jerusalem 95501, Israel.
3. Israel Antiquities Authority, POB 180, IL 30300 Atlit, Israel.

Haifa Bay and the Zevulun Valley, are part of the Qishon graben, which is bordered by the Ahihud fault in the north and the Carmel fault in the south. Current seismicity and neotectonic evidence suggests that the Carmel fault, which also forms the northeastern margins of Mount Carmel, may trigger a considerable earthquake. Since this fault crosses the city of Haifa and is close to the industry and urban centers of the Zevulun Valley, it poses a seismic risk there. However, recent morphotectonic examination has not yielded conclusive evidence as to the magnitude and rate of vertical displacement of that fault. It is therefore important to study the subsidence of the downfaulted Qishon graben, in order to better understand the recent activity of the enigmatic Carmel fault.

Nine drill-cores were taken from the submerged kurkar ridges in Haifa Bay (Bakler, 1975; 1976; UNDP, 1977). The color, granulometry, mineralogy and the faunal assemblages of the cored material were re-examined and compared with other similar units previously found in the Zevulun Valley and the Carmel coastal plain.

Three of the drill-cores contain a beachrock layer, interbedded between two kurkar units, at an elevation of about 21.5 to 23.5 m below the present sea level. The beachrock is composed mainly of carbonate cemented fine quartz sand and marine mollusk shells. The kurkar is comprised of alternating sand, aggregates and hard yellow to brownish plates, up to 5 cm thick, and is similar to the Late Pleistocene kurkar in the Zevulun Valley (Slatkine and Rohrlich, 1963; Zviely et al., 2006) and the Carmel coastal plain (Neber, 2002; Frechen et al., 2004; Galili et al., 2007). Interestingly, the unique sequence of a beachrock interbedded between kurkar layers is also similar to that of the Carmel coastal plain.

Kurkar ridges are sand dunes that were originally deposited on land at different elevations and sometimes at a considerable distance inland and hence do not provide information regarding palaeo-coastlines and vertical tectonic movements. Beachrocks however, are littoral zone sediments associated with the edge of a former coastline. Thus beachrocks can be used as relatively accurate markers of former coastlines and sea levels.

Current studies indicate that the sea level reached a maximum of about 6.5 m above the present level during the Last Interglacial (MIS 5e), about 125,000 years ago. Comparing the above-mentioned stratigraphy of Haifa Bay with that of the Carmel coastal plain, it is suggested that the submerged beachrock in Haifa Bay is also of the Late Pleistocene MIS 5e stage. This implies a maximal range of vertical subsidence of the Qishon graben within the last 125,000 years of about 28 m, that is, an average rate of 224 mm/ka.

הסטטיסטי מאשש את הערכה על יציבות ופיזור נמוך של ערכי Mw לעומת הפיזור בקביעת ערכי Ms ו במיוחד mb . משואות הקורלציה מציגות אי-ודאות גבוהה בהערכת Mw מידיעת mb או Ms.

מערת סיף (סוסי) בשומרון כחלון תצפית למילוי חוזר באפי-קארסט

שפר נ. [1], מוטי כהן מ. [2], מורין א. [3], גרודק ת. [3], גימבורג א. [4], גבירצמן ח. [1], פרומקין ע. [3]

1. המכון למדעי כדור הארץ, האוניברסיטה העברית בירושלים, גבעת רם, ירושלים
2. הפקולטה לחקלאות, האוניברסיטה העברית בירושלים, רחובות
3. המחלקה לגיאוגרפיה, האוניברסיטה העברית בירושלים, הר הצופים, ירושלים
4. מרכז מחקר ופיתוח אזורי השומרון ובקעת הירדן, אריאל

במחקר ייחודי במערת סיף סמוך לאריאל, נמדד באופן ישיר חילחול מי הגשם המתקבל במרבית שטחה של המערה. המדידות במערה מאפשרות הצצה ייחודית למהלך המים באזורי מסלע קרסטיים. במערה נמדדה השפעתן של סופות גשם שונות המאפשרות לבצע חישובים להערכת חידור של מי הגשמים לאפי קארסט.

התפתחות המפלסים והקרקעות במישורי פארן כתלות בתנאים טקטוניים יציבים ותנאים אקלימיים משתנים מסוף הפליוקן ועד היום

שמחאי א.[1,2], אמית ר.[2], מטמון א.[1], חביב א.[1], אנזל י.[1], פורת נ.[2], מקדונלד א.[3], בנדטי ל.[4], פינקל ר.[5,6]

1. המכון למדעי כדור הארץ, האוניברסיטה העברית בירושלים, גבעת רם, ירושלים 91904, ישראל
2. המכון הגיאולוגי, רח' מלכי ישראל 30, ירושלים 95501, ישראל
3. Desert Research Institute, 2215 Raggio Parkway, Reno, NV 89512, USA
4. Centre Européen de Recherche et d'Enseignement des Géosciences de l'Environnement, Europôle Méditerranéen de l'Arbois - BP 80 AIX EN PROVENCE cedex 04, 13545, France
5. Lawrence Livermore National Laboratory, 7000 East Avenue, Livermore, CA 94550, USA
6. Planetary Science Dept., Berkeley, CA 94720, USA & UC Berkeley, Earth

תכונות קרקעות ארידיות שהתפתחו על מפלסים פלוביאליים עתיקים במישורי פארן וגיל הקרקעות והמפלסים מצביעים על התפתחות רב-שלבית בתנאים סביבתיים משתנים ובתנאי יציבות טקטונית. המפלסים תוארכו בשיטת האיזוטופים הקוסמוגנים וגילם פליוקן עליון-פלייסטוקן תחתון. לאחר נטישתם התפתח עליהם קומפלקס קרקעות המשתלבות אחת בשניה הכולל קרקע קלצית, קרקע קלצית–גבסית וקרקע גיבסית מלוחה. רצף הקרקעות מעיד על מעבר מאקלים ארידי–ארידי למחצה לאקלים ארידי קיצון. נמצא שתנאי האקלים המדבריים והיציבות הטקטונית מאפשרים את שימור המפלסים במשך תקופת זמן ארוכה במיוחד.

מדידת עצמה אבסולוטית של השדה המגנטי מתוך דוגמאות סיגים סינתטיים - השלכות על חקר שינויים קצרי טווח בשדה הגיאומגנטי

שער ר.[1], רון ח.[1], עגנון א.[1], קסל ר.[1], טוקס ל.[2]

1. המכון למדעי כדור הארץ, האוניברסיטה עברית, ירושלים
2. Scripps Institution of Oceanography University of California, San Diego

המעבדה הפלאומגנטית באוניברסיטה העברית שודרגה למדידת עצמת שדה אבסולוטית בשיטת תלייה-תלייה, כתרומה לשחזור שינויי עצמה בשדה הגיאומגנטי בששת אלפי השנה האחרונות. פיתחנו שיטה לאפיון רמת הדיוק של השיטה על-ידי השראת שדה מבוקר על סיגי נחושת סינתטיים שיוצרו במעבדה תוך התכת החומר הארכיאולוגי וגיבושו בקצבי קירור שונים.

על המיתאם בין מגניטודות של רעידות אדמה

שפירא א.

ועדת ההיגוי להערכות לרעידות אדמה,המשרד לתשתיות הלאומיות, רח' יפו 234, ירושלים

בסיסי הנתונים של ISC מכילים מידע על רעידות אדמה רבות שנקבעו להם שלושת המגניטודות הסטנדרטיות . מידע זה שימש לבחינת המתאמים בין סולמות מגניטודה אלה מתוך כוונה להעריך את Mw באותם מקרים בהם נתונים רק Ms או mb. מדגם

העתק אור עקיבא: העתקה מיוקנית בשולי היבשת של הלבנט והקשר לבלוק הכרמל

שטיינברג ג'. [1,2], גבירצמן ז. [2], פולקמן י. [2], גבירצמן ח. [1]

1. המכון למדעי כדור הארץ, האוניברסיטה העברית, ירושלים
2. המכון הגיאולוגי, 30 מלכי ישראל, ירושלים

אנו מציגים אינפורמציה סייסמית תלת-מימדית חדשה של העתק אור עקיבא המגביל את אגן יפו מצפון ובלוק הכרמל מדרום. תצפיות אלו מראות העתקה נורמלית בכיוון מזרח-מערב עם זריקה מירבית של מעל 1000 מטר. אנו מציעים כי שבר זה פעל בעיקר בסוף המיוקן בו זמנית לשבירה מקבילת חוף שתיארנו בעבר.

תובנות חדשות על התפתחות אגן החולה, העתק ים המלח

שטנר א. [1], ויינברגר ר. [2]

1. המכון הגיאולוגי, מלכי ישראל 30, ירושלים 95501
2. החוג למדעים גיאו-ימיים, בית הספר למדעי הים, הפקולטה למדעים והוראתם, אוניברסיטת חיפה, חיפה 31905

אגן החולה ממוקם במרכז העתק ים המלח, בין סדרת אגנים מדרום ואזור מורם מצפון. המחקר מאגד מיפוי גיאולוגי של פני האגן ושוליו עם נתוני רפלקציה סייסמית וקידוחים, לקבלת מבנה מילוי האגן. התפתחות העתק אלכסוני חוצה-אגן, צעיר מ- 1.3 מ״ש, מצביעה על שינויים בתנועת הלוחות לאורך העתק ים המלח.

הידרוגאולוגיה חופית והשונות המרחבית והעיתית של שפיעת מי תהום אל הים: דוגמא ממפרץ דור (דרום חוף הכרמל)

שלם י. [1], ויינשטיין י. [1], יחיאלי י. [2], סוורזנסקי פ. [3], בארנט ו. [4], חרות ב. [5]

1. אוניברסיטת בר אילן
2. המכון הגיאולוגי
3. US Geological Survey, St. Petersburg, FL
4. Florida State University, Tallahassee, FL
5. Israel Oceanographic and Limnological Research, Haifa

ממוצעי שפיעת המים המתוקים בדור אחידים למדי (5 ס״מ\יום). שפיעת המים המלוחים גבוהה יותר (עד 12 ס״מ\יום), אך מוגבלת לאזורים החוליים. נמצא כי הספיקות באזורי הכורכר מוכתבות על ידי שינויים טיידליים בעומק המים במפרץ, בעוד ספיקות המים המתוקים באזורים החוליים מושפעות וככל הנראה משונעות על ידי ספיקות המים המלוחים.

סקר סונר רב אלומות בים המלח – תוצאות ראשוניות

שדה א.ר. [1,2], הול, ג'. ק. [1], שולץ ב. [8], אל-זועבי א. ש. [3], בן-אברהם צ. [2], עכווי ע. [3], עמית ג. [4], טן-ברינק א. [5], מאייר ל. א. [6], קולדר ב. ר. [6], גונן מ. [7] שדה ה. [9,4].

1. המכון הגיאולגי לישראל, מלכי ישראל 30, ירושלים 95501
2. המחלקה לגיאופיזיקה ומדעים פלנטריים, אוניברסיטת תל אביב, רמת אביב 69978
3. המחלקה למיפוי וגיאומטיקה, אוניברסיטת אל-בלקה, אל סלת 19117, ירדן
4. המכון לחקר ימים ואגמים, ת.ד 8030, מיקוד 31080 , חיפה
5. המכון הגיאלוגי האמריקאי, וודס הול, מיין 02543, ארה"ב
6. המרכז למיפוי חופי וימי, אוניברסיטת ניו-המפשייר, דורהם, ניו-המפשייר 03824 ארה"ב
7. גונן שירותים ימיים וצלילה, סביון 56530
8. חברת אלאק נאוטיק, קיל D-23118 , גרמניה
9. בית הספר למדעי הים ע"ש ליאון צ'רני, אוניברסיטת חיפה 31905, חיפה

הסקר, ראשון מסוגו, באזור זה, תוכנן לחורף כאשר שכבות המים מעורבבות באופן אחיד. הוא הושפע מקשיים רבים שנבעו מתנאים סביבתיים החורגים בהרבה ממעטפת ההפעלה הרגילה. בצפון האגן, זוהה קניון נחל הירדן .ובדרום, בוצע לראשונה מיפוי מזרחית לליסאן . בנוסף זוהו ערוצי התחתרות, הסטות ותופעות שטרם נצפו. תוצאות ראשוניות יוצגו במהלך הכנס.

מחקר בספקטרוסקופית אינפרא אדום של גלניט ולרניט בצריפת חרסיות גיריות

שובאל ש., הררי ד.

קבוצת הגיאולוגיה, המחלקה למדעי הטבע, האוניברסיטה הפתוחה, קמפוס דורותי דה רוטשילד, רח' רבוצקי 108, רעננה, ישראל.

נחקרה היווצרות של גלניט ולרניט בצריפת חרסיות גיריות באמצעות ספקטרוסקופית אינפרא אדום ויישום טכניקת מתאם של הספקטרה. גלניט נוצר בצריפת תערובות של קאוליניט וקלציט ואילו לרניט נוצר בצריפת תערובות של מונטמורילוניט וחרסית. נראה כי התכולה הגבוהה יחסית של אלומינה בקאוליניט גורמת להיווצרות גלניט ואילו התכולה הגבוהה יחסית של סיליקה במונטמורילוניט מעדפת היווצרות לרניט. מינרלים אלה נוצרים בתגובה תרמית במצב מוצק בין התוצרים התרמיים של החרסית והקלציט.

אנליזת חומרים בצריפה של קאוליניט באמצעות ספקטרוסקופית אינפרא אדום ורמאן ויישום טכניקת מתאם של הספקטרה

שובאל ש. [1], בודיאול מ. [2], פנזר ג. [2]

1. קבוצת הגיאולוגיה, המחלקה למדעי הטבע, האוניברסיטה הפתוחה, קמפוס דורותי דה רוטשילד, רח' רבוצקי 108, רעננה, ישראל.
2. אוניברסיטת קלוד ברנרד, ליון, צרפת.

אנליזה של הפזות הנוצרות במהלך צריפה של קאוליניט נחקרה באמצעות ספקטרוסקופית אינפרא אדום ויישום טכניקת מתאם של הספקטרה. השימוש בספקטרוסקופיה ויברציונית מאפשר לזהות פזות תרמליות אמורפיות או שדרגת גבישיותן נמוכה. המחקר מאשר את המידע הקיים על המעבר התרמלי מקאוליניט למוליט.

ביורא ועד לסוף הקנומן. מוצע כי באיאוקן הגיעו שולי הלבנט לראשונה ולאחרונה למצב פאסיבי ולכן לאיזון איזוסטטי מלא.

שלבים מוקדמים בהתפתחות הטקטונית של הגליל במהלך הקנוזואיקון

שגב ע.[1], ליחובסקי ו.[1], וינברגר ר.[1], שטנר א.[2]

1. המכון הגיאולוגי, מלכי ישראל 30, ירושלים 95501
2. החוג למדעים גיאו-ימיים, בית הספר למדעי הים, הפקולטה למדעים והוראתם, אוניברסיטת חיפה, חיפה 31905

נחקרה התקדמות בקע אזרק-סירחן מירדן לשולי היבשה של הלבנט באוליגוקן-מיוקן תחתון. מודל נומרי מראה כי המעבר התלול בין קרום יבשתי לאוקייני, המצוי באזור הגליל, מהווה את הגורם המשפיע ביותר על מידת התקדמות הביקוע. במודל, מתפתחת רצועת מעוות בכיוון ניצב להתקדמות הבקע לצפון-מערב מעל קרום קר יחסית בעובי של כ-30 ק"מ.

פרויקט המיפוי הבטימטרי הלאומי – תוצאות לשנת 2007

שדה א. ר.[1,2,4], הול, ג'. ק.[1], עמית ג.[2], גולן א.[2,3], שדה ה.[2,5], גור-אריה ל.[3], טיבור ג.[2]

1. המכון הגיאולוגי לישראל , מלכי ישראל 30, ירושלים 95501
2. המכון לחקר ימים ואגמים, ת.ד 8030 , שקמונה חיפה
3. המרכז למיפוי ישראל, לינקולן 1, תל אביב 65220
4. המחלקה לגיאוגרפיה, אוניברסיטת תל אביב, רמת אביב 69978 , תל אביב
5. בית הספר למדעי הים ע"ש ליאון צ'רני, אוניברסיטת חיפה, חיפה 31905

הפרויקט ממשיך בסקר כולל של קרקעית גופי המים בתוך ומסביב לישראל. מיפוי הכינרת צפוי במאי הקרוב (2008) ומיפוי בים תיכון העמוק מתוכנן לתחילת שנת 2009. השלמת הפרויקט צפויה בעוד כשנתיים ותשמש כתשתית למחקרים שונים. בנוסף נציין את הארכיון החדש למפות (ארכיון הול) אשר נחנך השנה לפעילות במכון לחקר ימים ואגמים.

קינטיקת ההשקעה של גבס כתוצאה מערבוב מי ים סוף עם מי ים המלח – השוואה בין ניסוי מעבדה לניסוי שדה.

רזניק א.[1,2], גנאור י.[1], לאטי י.[3], אהרוני מ.[3], כהן א.[3], מימון מ.[3], גבריאלי א.[2]

1. המחלקה למדעי הגיאולוגיה והסביבה, אוניברסיטת בן-גוריון בנגב, ת.ד. 653, באר-שבע 84105
2. המכון הגיאולוגי, רחוב מלכי ישראל 30, ירושלים 95501

ערבוב בין ים המלח לים סוף במערכת מעבדתית ובמערכת שדה מוגדלת גורם לנוקלאציה ספונטנית של גבס. היחס בין שטח הפנים הזמין לגידול גבישי הגבס לנפח התמיסה הוכח כגורם המכריע בקביעת הקרבה לשיווי משקל כימי. קצבי השקעת הגבס כפי שמנובאים מניסוי המעבדה, חוזים בצורה יפה את קצבי השקעת הגבס בניסוי השדה.

מבט מחודש על תת-הקרקע של הר הכרמל וסביבתו על בסיס פענוח של נתונים גרבימטריים ומגנטיים

ריבקוב מ., לוי א., בן-גיא י.,

המכון הגיאופיסי לישראל, אגף סיסמולוגיה, ת.ד 182, לוד, ישראל

פענוח הנתונים הגרבימטריים והמגנטיים, כולל קו מגנטי חדש שנאסף לאורך החוף, מלמדים על נוכחות של מספר מבנים עמוקים וכן על תפרוסת של גופים מגמטיים באיזור. האנומליה המגנטית החיובית בצפון הכרמל נוצרת כנראה ממחדר מגמטי עתיק. העדר אנטמליה ברורה באיזור קידוח אשר עתלית-1 מוסברת בכיווניות משתנה של השכבות הוולקניות של תצורת אשר. מפה מפורטת של גג התשתית הקריסטלינית שנבנתה מראה על נטייה לכיוון דרום מזרח .

התפתחות גיאומטרית ומבנית של משטחי העתקה

שגיא א.[1], ברודסקי א.[2]

1. המכון הגיאולוגי לישראל
2. University of California, Santa Cruz, Department of Earth and Space Sciences

תנועת העתקים ברעידות אדמה והדינאמיקה שלהם תלויה בגיאומטריית משטח ההעתקה ובמבנה הנזק באזור ההעתק. הקשר והתלות בין שני גורמים אלו נבדק לראשונה בסדרת סקרי LiDAR קרקעי תוך ניתוח סטרוקטורלי מקומי של הנזק בקרבת ההעתק.

האינטראקציה בין האירועים הטקטונומגמטיים הקרטיקוניים לבין שולי היבשה של הלבנט – גיאוכרונולוגיה, ליתוסטרטיגרפיה ומבנה

שגב ע.

המכון הגיאולוגי, מלכי ישראל 30, ירושלים 95501

תוארכו ארבעה אירועים טקטונומגמטיים מראשית הקרטיקון (141.2±1.1 מ.ש.) ועד לסוף הקנומן (95.5±0.7 מ.ש.) ונעשתה קורלציה המבוססת על גילי היחידות הוולקניות וביוסטרטיגרפיה. נמצא כי שולי היבשה של הלבנט היו אקטיביים מאז סיום היווצרותם

ערכי $\varepsilon Nd(T)$ מגמתיים דומים נשמרו בסלעים מאפיים ופלסיים, אך ערכי $\delta^{18}O$ בזירקון מחייבים התכת קרום עליון ליצירת הריוליט.

גורלו של הרדיום ברכז ממתקן התפלה של מים מליחים

רוזנברג י.[1], אורן י.[2], פולקמן י.[2], וונגוש א.[3], גנאור י.[1]

1. המחלקה לגיאולוגיה ומדעי הסביבה, אוניברסיטת בן גוריון בנגב, ת.ד 653, באר שבע, 84105.
2. המחלקה להתפלה וטיפול במים, מכון צוקרברג לחקר המים, שדה בוקר, 84990.
3. מדעי כדור הארץ והאוקיינוס, אוניברסיטת דיוק, ארה"ב.

השקיעה של רדיום ברכז ממתקן התפלה של מים מליחים נבדקה בניסויי אידוי וזריעה של גלעיני גיבוש. ניסויי האידוי הראו שהירידה בריכוז הבריום מלווה בירידה בריכוז הרדיום, ירידה זו נצפתה גם בניסויי זריעה כאשר הבריט משמש כגלעיני גיבוש. מניסויים אלו מקדם החלוקה לרדיום ובריום הנו 0.15±0.74 (רווח בר סמך, 95%).

חיפושי יהלומים בגופים מגמתיים שנמצאים בהר כרמל השייכים לקרטיקון העליון בהתבסס על תוצאות מינרולוגיות, גיאוכימיות ופטרוגרפיות

רופ א., קלמנוביץ י., פולנסקי א., בייקוב י.

שפע ימים (א.ט.מ.) בע"מ

חברת שפע ימים עוסקת בחקר גיאולוגי בגופים המגמתיים שנמצאים בהר כרמל השייכים לקרטיקון העליון. מדגמי קרקע נאספו ברוב הגופים המגמתיים ונבדקו מינרולוגית, גיאוכימית ופטרוגרפית, בנוסף בוצע סקר אלקטרו מגנטי (EM) על 7 גופים בהר כרמל. החברה עוסקת בהמשך חיפושים בגופים המגמתיים בהר כרמל לצורך איתור ה- VENT.

החדרת מי גאות מנחל שילה אל אקויפר ירת"ן והשלכות על החדרה עתידית

רופא ב.

השרות ההידרולוגי, רשות המים, רחוב יפו 234, ת.ד. 36118, ירושלים / 91360.
Benny10@water.gov.il

כ 3.5 מלמ"ק של מי גאות הוטו מנחל שילה אל מחצבה באזור נחשונים ומשם אל אקויפר ירת"ן. ספיקת השיא הייתה כ- 70 מ"ק/שנייה. קצב מרבי של חלחול המים מהמחצבה אל אקויפר ירת"ן עמד על כ- 25 מ"ק/שנייה (90,000 מ"ק/שעה). בהרצאה ידונו יחסי הספיקה בנחל והחלחול במחצבה.

אומדן הסכנה הצפויה ל"מובל השלום" (תעלת ים-סוף – ים-המלח) בעקבות אירועי שיטפון: ניתוח באמצעות כלי ממ"ג

קלבו ר., שירב מ.

המכון הגיאולוגי. רחוב מלכי ישראל 30, ירושלים

בעקבות האצת המהלכים לביצוע מובל מים בין ראש מפרץ אילת לים-המלח (מובל השלום) נבחנה הרגישות של התוואי המוצע למגוון של תרחישי אסון (שיטפונות ענק, רעידות אדמה, דליפה וזיהום של מאגרי מי תהום בערבה). כל הנחלים החוצים את תוואי המובל נותחו באמצעות כלי ממ״ג והוצגו המלצות להערכות מפני אירועי שיטפון.

התפלגות הגדלים של גלישות: יחס בין שטח לבין נפח של גלישות

קלדרון-עשהאל ב.[1,2], כץ ע.[1], אהרונוב ע.[3], מרקו ש.[2]

1. המכון הגיאולוגי הישראלי, רח' מלכי ישראל 30, ירושלים 95501, ישראל
2. המחלקה לגיאופיזיקה ומדעים פלנטריים, אוניברסיטת תל-אביב, תל-אביב 69978, ישראל
3. מכון ויצמן למדע, רחובות 76100, ישראל

היחס בין שטח גלישת-מדרון (A) לבין נפחה (V) בחומר-הומוגני, נבחן במודל (Geo-Slope/W). נמצא כי קיים יחס-אוניברסלי: $V \sim A^{1.4}$, ללא תלות בגובה-המדרון ובתכונות-המכאניות. היחס נמצא בהתאמה טובה לגלישות ברחבי-העולם. הצורה והגודל של גלישה מוכתבים ע״י רוחב-המדרון (מכתיב את A המכסימלי) או ע״י עומק החומר החלש הקובע את מיקום הכשל (מכתיב את V/A).

הערכת תגובת אתר וסיכונים סייסמיים לתכנות בנייה באזורים עירוניים: דוגמת שכונת קריית דן בעיר רמלה

קלמנוביץ' מ., זסלבסקי י., גורשטיין מ., פרלמן נ., גילר ו., ליבשיץ י., שוורצבורג א., דן א.

המכון הגיאופיסי לישראל, אגף סיסמולוגיה, ת.ד 182, לוד, ישראל

מחקרנו התמקד בהערכת סיכונים סייסמיים לבניינים חדשים בשכונת קריית דן ברמלה. המחקר התייחס לשטח כללי של 0.15 קמ"ר בו בוצעו מדידות רעש רקע במשך יום אחד בעזרת 12 תחנות סייסמיות. נרשמו שתי רעידות אדמה מקומיות. נצפתה תופעת תגובת אתר בעלת הגברה בשיעור 5.0 במרווח תדרים של 0.9-1.5 הרץ.

דייקים מורכבים בדרום ישראל: מפתח להבנת המקור של גרניטים פוסט-פאן-אפריקאיים מטיפוס A

קציר י., ליטבינובסקי ב., אייל מ., זנבילביץ' ע., בארי-שלוין י.

המחלקה למדעי הגיאולוגיה והסביבה, אוניברסיטת בן גוריון בנגב, באר שבע 84105

דייקים מורכבים בדרום ישראל מעידים על חדירה בו-זמנית וערבוב של מגמה מאפית ומגמה ריוליטית מטיפוס A. יחסים איזוטופים גבוהים באופן חריג של O ו- Sr שנמדדו בפלדספרים אינם מגמתיים ומעידים על אינטרקציה עם תמיסות מימיות לאחר הגיבוש.

שיפור אמינות באיתור חללים תת-קרקעיים לרבות התפתחות בולענים באזור ים המלח ע"י שימוש בראדאר חודר קרקע

קופמן ל.[1], פרומקין ע.[2], יזרסקי מ.[3], רונן ע.[4], ליבי מ.[5]

1. מוסד הטכניון למחקר ופיתוח בע"מ, חיפה
2. המחלקה לגיאוגרפיה, האוניברסיטה העברית בירושלים
3. המכון הגיאופיסי לישראל
4. גיאוטק גיאופיסיקה הנדסית וסביבתית בע"מ, ראשל"צ
5. סריקה הנדסית, מושב חמד

במחקר נעשה פיתוח של טכנולוגיית ראדאר המאפשר זיהוי חללים על פי תופעת תהודה והבחנה בין תגובות מחללים ואלו הבאות מעדשות חרסיתיות. מתוצאות ניסויי מעבדה ובדיקות ראשוניות בתנאים המעשיים, נובע שרישום תמונת תהודה מובהקת ו/או התרחבות יחד עם הגדלת אמפליטודת ההחזרות במהלך גרירות אנטנות בצורה "צדדית" – הינם סימנים המצביעים ברמת וודאות גבוהה על נוכחות חללים תת-קרקעיים.

זיהוי רעידות האדמה החזקות ביותר ברקורד הסייסמיטים בתצורת ליסן ע"י קורלציה עם ספליאוסייסמיטים וברקציות המכילות אספלט

קייגן א.[1,2], שטיין מ.[2], בר-מטיוס מ.[2], טננבאום א.[3], עגנון א.[1]

1. המכון למדעי כדור הארץ, האוניברסיטה העברית, גבעת רם, ירושלים, 91904
2. המכון הגיאולוגי, רחוב מלכי ישראל 30, ירושלים, 95501
3. קימרון נפט ומחצבים, רח' התכלת 40, הוד השרון, 45264

תיעוד ותיארוך של ברקציות ומעוותים אחרים בסדימנטים מארבעה מחשופים של תצורת הליסן מראים קורלציה עם רעידות אדמה הנרשמות בארכיבים שונים. שלושה עד ארבעה אירועים יוצאים מן הכלל ונרשמו ברקורדים האגמיים, ובתוכם בברקציות המכילות אספלט וגם במערת נטיפים. ייתכן שאירועים אלה הם הגדולים ביותר באזור מרכז טרנספורם ים המלח.

שיווי משקל דינאמי במי-תהום בזמן ירידת מפלס אגם: דוגמא מים המלח

קירו י.[1,2], יחיאלי י.[1], לייחובסקי ו.[1], שלו א.[1], סטרינסקי א.[2]

1. המכון הגיאולוגי, מלכי ישראל 30, ירושלים 95501
2. המכון למדעי כדור הארץ, האוניברסיטה העברית, קמפוס גבעת רם, ירושלים 91904

ניתוח תיאורטי וסימולציות המתארות את תגובת מערכת מי התהום לירידת אגם נעשו על מנת להבין את הקצב המהיר של ירידת מפלס מי התהום בים המלח. תגובת ירידת מפלס מתמשכת יכולה להיות מתוארת כסכום של ירידות מפלס בדידות. ניתוח זה מראה כי המערכת מגיעה לשיווי משקל דינאמי חדש בזמן ירידת המפלס.

אפיון ומיפוי מזהמים באקוויפר החוף במתחם תדיראן/ תדירגן, אזור תעשייה של חולון

פרדמן מ., קרויטורו ל.

אקולוג הנדסה בע"מ

זיהום נרחב של מי התהום באקוויפר החוף באזור התעשייה של חולון גרם להשבתת מספר קידוחי הפקה למי שתייה באזור. העבודה הנוכחית בוצעה במסגרת צו לתיקון המעוות שהוצא על ידי רשות המים,במתחם תדיראן/תדירגן שבאזור התעשייה של חולון. העבודה כללה התקנת קידוחי ניטור לצורכי הגדרת פלומת הזיהום ומיפוי מוקדי זיהום פוטנציאליים באזור.

צינור לבה בדרום החורן, ירדן, והרקורד הפלאוסביבתי של נטיפי הקלציט שבו

פרומקין ע.[1], בר-מטיוס מ.[2], ווקס א.[2]

1. המחלקה לגיאוגרפיה, האוניברסיטה העברית, ירושלים 91905
2. המכון הגיאולוגי, רח' מלכי ישראל 30, ירושלים 95501

צינור לבה ארוך שהתגלה בשפך הלבה של גווא מהפליסטוקן התיכון מכיל משקעי קלציט (ספלאוטמים) שתוארכו לשלב האיזוטופי המריני 7 ו-5/4. תיארוך משקעי המערות מצביע על כך שב 300 אלף השנים האחרונות התנאים במדבר השחור של גווא היו בדרך כלל ארידיים עד ארידיים למחצה, לרבות בתקופת קיום העיר גווא במחצית ההולוקן.

הערכת תגובת אתר מיחס ספקטראלי של גלי גזירה מרעידת אדמה חזקה

פרלמן נ., זסלבסקי י., הופשטטר ר., פלד א.

המכון הגיאופיסי לישראל, אגף סיסמולוגיה, ת.ד 182, לוד, ישראל

במחקרנו נעזרנו בשיטה של הערכת תגובת אתר המתקבל מיחס ספקטראלי של גלי גזירה על בסיס רישומי מדי תאוצה בעלי פס תדרים רחב ממספר רעידות אדמה חזקות (מגניטודה 4.0-5.2) אשר התרחשו בארץ בשנים 2004-2007. התקבל מידע אודות השפעת מאפייני אתר גיאולוגיים וגיאופיסיים על הגברת גלים סייסמיים.

עדויות חדשות לשיעור השקיעה האפשרי של מפרץ חיפה בפלייסטוקן המאוחר

צביאלי ד.[1], סלמון ע.[2], גלילי א.[3], בקלר נ.[2]

1. המכון ללימודי ים ע"ש ליאון רקנאטי, אוניברסיטת חיפה, חיפה 31905.
2. המכון הגיאולוגי, מלכי ישראל 30, ירושלים 95501.
3. רשות העתיקות, ת.ד. 180, עתלית 30300.

ברכסי הכורכר התת-ימיים במפרץ חיפה, זוהה בעומק 21.5-23.5 מ' מתחת לפני הים ובין שכבות כורכר מהפלייסטוקן המאוחר, סלע חוף המכיל צדפים ימים. מוצע כי סלע זה הורבד בשיא תקופת הבין קרחון האחרון, אז הגיע מפלס הים ל-6.5 מ' מעל גובהו הנוכחי. לפיכך ניתן להניח שהמפרץ שקע כ-28 מ' ב-125,000 השנים האחרונות.

הסתעפות טרנספורם ים המלח באגן החולה – עדויות מתת הקרקע

פוליתי מ. [1], מדבדייב ב. [1,2], שמיר ג. [3], מקובסקי י. [4], עגנון א. [1]

1. המכון למדעי כדה"א, האוניברסיטה העברית, גבעת רם, ירושלים 91904
2. המכון הגיאופיסי לישראל, ת.ד. 182, לוד 71100
3. המכון הגיאולוגי לישראל, מלכי ישראל 30, ירושלים 95501
4. המחלקה למדעים גיאו-ימיים, ביה"ס למדעי הים ע"ש צ'רני, אוניברסיטת חיפה, הר כרמל, חיפה 31905

אינטגרציה של גיאופיזיקה וקידוחים באגן החולה מאפשרת זיהוי ומיקום הטרנספורם והסתעפותו בתת הקרקע. רפלקציות מקילוחי בזלת פליסטוקנית, מראות דפורמציה אינטנסיבית כשקע עמוק בסמוך לאזור מוגבה התואמת במיקומה את אזור הגזירה של הטרנספורם והאנומליה הגרבימטרית של אזור ההסתעפות. פיזור מוקדי רעידות אדמה מאפיינים את אזור ההסתעפות הפועל ברביעון כאזור לא יציב.

קינטיקת ההמסה של בריום כרומט

פורגס א. [1], גנאור י. [1], ויסברוד נ. [2]

1. אניברסיטת בן גוריון בנגב, המחלקה למדעי הגיאולוגיה והסביבה, באר שבע, 84105
2. המחלקה להידרולוגיה ומיקרוביולוגיה סביבתית, מכון המים ע"ש צוקרברג, המכון לחקר המדבר ע"ש יעקב בלאושטיין, אוניברסיטת בן גוריון בנגב.

בניסויי המסה נמצא ש- $BaCrO_4$ עובר המסה סטוכיומטרית. ככלל קצב ההמסה מושפע מהמרחק משיווי משקל וממידת הערבוב של התמיסות. עקב הקרבה לשיווי המשקל, סדר הריאקציה הוא דמוי סדר אפס ביחס למסת המינרל.

הערכת איכות ובחינת אפשרות לכימות העירבוב של קולחי מפעל השפד"ן עם אקויפר החוף בתהליך ה-SAT

פנקרטוב א. [1], גסר ג. [1,2], לב ע. [2], אלחנני ש. [1]

1. רשות המים והביוב, תל אביב
2. האוניברסיטה העברית, ירושלים

הרצאה זו תסכם ממצאים מחלקו הראשון של מחקר שבוצע בניסיון להעריך את דרגת ההרחקה של מזהמים אורגנים במי קולחים שניונים ע"י טיפול ב-SAT, ואת ההשפעה של קולחים אלה על מקורות מים שכנים. המחקר כלל זיהוי וכימות של מגוון רחב של מזהמים אורגנים בקולחים השניונים, בקידוחי ניטור, בקידוחי הפקה ובקידוחים פרטיים בסביבת שדות ההחדרה ובחינת פרופיל ההרחקה של מזהמים שונים בתהליך ה-SAT.

בחינת התנאים הגיאומורפיים והמכאניים לנפילת סלעים ממצוקים: מצוק ראמה, מתלול צורים

סימן טוב ש. [1], כץ ע. [2], מטמון א. [1]

1. המכון למדעי כדור הארץ, האוניברסיטה העברית, ירושלים 91904
2. המכון הגיאולוגי, רח' מלכי ישראל 30, ירושלים 95501

מטרת העבודה היא בחינת התנאים הקריטיים להיווצרות נפילת-סלעים. לצורך כך נבחן מצוק בנוי חילופין של גיר וחוואר (באזור הכפר ראמה) ומופו עשרות גושי-סלע בנפח 0.4-51 מ״ק, הממוקמים עד למרחק של 100 מטרים מבסיס-המצוק. התבצע ניתוח-כמותי של גודל הבלוק הצפוי להתנתק מהמצוק תוך שימוש בתיאורית הקורה בתנאים סטטיים ובתנאי רעידת-אדמה.

רשימה אמינה של רעידות אדמה וצונאמי היסטוריים באזור טרנספורם ים המלח עשויה להפחית את הסיכון הסיסמי המוערך

סלמון ע. [1], רוקוואל ת. [2], גוידובוני ע. [3], קומסטרי א. [3]

1. המכון הגיאולוגי, מלכי ישראל 30, ירושלים, 95501.
2. San Diego State University, San Diego, CA, USA.
3. Storia Geofisica Ambiente, Bologna, Italy.

בחינת קטלוגים של רעשי אדמה וצונאמי היסטוריים מעלה כי לא ניתן לזהות מקור לחלק מהאירועים וקיים ספק אם הם התרחשו. ניפוי האירועים המסופקים עשוי להקטין את הקטלוג ובהתאם גם את הסיכון הסיסמי. לדוגמא, סינון קפדני של רשימות צונאמי מעלה את זמן החזרה הממוצע שלהם באופן משמעותי.

חקר התכונות המורפולוגיות והמורפומטריות של קונוסי אפר באזורי הגעש של קמצ'טקה ורמת הגולן

ענבר מ. [1], גיליצ'ינסקי מ. [1], מלקסצב, א. [2], מלניקוב, ג. [2], זרצקיה, נ. [3]

1. החוג לגאוגרפיה ולימודי הסביבה
2. המכון לוולקנולוגיה וסייסמולוגיה, פטרופבלובסק, קמצ'טקה, רוסיה
3. המכון הגואלוגי, מוסקבה, רוסיה

מטרת המחקר היא פיתוח מודל על סמך מדידות שדה של גובה, קוטר ושיפוע הקונוסים, עומק ומילוי הלוע, ומידת השינוי המורפולוגי. בהתאם לנתונים אלה נקבע הגיל היחסי של קונוסי געש בשדות וולקניים שונים בעולם.המחקר כלל כ 60 קונוסים באזור הגולן ושדה של קונוסים צעירים בקמצטקה. בהתפרצות של הר הגעש טולבציק ב1975, נוצרו מספר קונוסים שנמדדו ונחקרו בעבודת שדה בחודש אוגוסט 2007 ע״י צוותי המחקר הרוסי והישראלי.

השפעה משולבת של שקיעת מלחים והטרוגניות על אידוי מתווך נקבובי

נחשון א. [1], גרדר א. [2], וייסברוד נ. [1], דרגילה מ. [3]

1. המחלקה להדרולוגיה ומיקרוביולוגיה, מכון צוקרברג לחקר המים, המכון לחקר המידבר, אוניברסיטת בו גוריון, מדרשת בן גוריון 84990
2. המכון לאנרגיה, המחלקה לאנרגיה והנדסה גיאו-סביבתית, אוניברסיטת המדינה של פנסילבניה, פנסילבניה, 16802, ארה"ב
3. המחלקה למדעי הקרקע והחקלאות, אוניברסיטת המדינה של אורגון, אורגון, 97331, ארה"ב

עבודה זו חקרה את ההשפעה המשולבת של השקעת מלחים והטרוגניות התווך על קצבי האידוי של מי הנקבים. לצורך כך בוצעו מספר ניסויי קולונות אשר מדדו קצבי אידוי מקרקעות הומוגניות והטרוגניות. בנוסף, הקרקעות הורוו בתמיסות מלח שונות אשר גרמו להשקעת מלחים תוך כדי תהליך האידוי. שימוש בסורק CT בעל רזולוציה גבוהה של 10 מיקרון איפשר חקירה של השקעת המלחים בתוך התווך. תוצאות המחקר הראו כי רוב המלח שוקע בחלק העליון של התווך, בעיקר בנקבובים הקטנים. כתוצאה מכך; תווך הומוגני ייאטם יותר לעומת תווך הטרוגני עם גדלים שונים של נקבובים.

סגמנטציה טקטונית של שולי היבשת של מזרח הים התיכון על פי סמנים ביולוגיים למפלס ים

סיון ד. [1], שטנר א. [2], מורנג' כ. [3], למבק ק. [4], בוארטו א. [5]

1. החוג לציוויליזציות ימיות ומכון רקנאטי ללימודי ים, אוניברסיטת חיפה, הר כרמל, 31905, חיפה
2. החוג למדעים גיאו-ימיים, בית הספר למדעי הים ע"ש צ'רני, הפקולטה למדעים והוראתם, אוניברסיטת חיפה, הר כרמל, 31905, חיפה
3. IUF, CEREGE, B.P. 80 Europôle de l'Arbois, F 13545 Aix-en-Provence France
4. Research School of Earth Sciences, The Australian National University, Canberra, ACT 0200, Australia. kurt.lambeck@anu.edu.au
5. מעבדת התיארוך בפחמן 14, מכון ויצמן למדע, רחובות, 76100

על פי מדידות גיל וגובה סמנים ביולוגיים-ימיים (*Dendropoma petraeum*) ביחס למפלס הים הנוכחי, ומודל נומרי לחישוב שינויי הים באותן תקופות אנו מבודדים את השפעת הטקטוניקה על חופי מזרח הים התיכון. תוצאות המחקר מראות הרמה טקטונית דיפרנציאלית של שולי הלבנט בהולוקן, בהסכמה עם סגמנטציה הטקטונית של השולים מאז הפליסטוקן.

המבנה הגיאולוגי של רמת הגולן והתפתחות מערכת שבר ים המלח בשוליה

מיילר מ., רשף מ.

החוג לגיאופיסיקה ומדעים פלנטאריים, אוניברסיטת תל אביב, תל אביב 69978

במסגרת המחקר הנוכחי ייבחנו קווי הרפלקציה הסיסמית הזמינים ברמת הגולן, בגליל המזרחי וצפון השומרון. האינטרפרטציה הגיאופיסית תתבסס על תוצאות העיבוד הסיסמי בשיטת מיגרציית עומק (פרה-סטאק) והלוגים הסטרטיגפיים של הקידוחים העמוקים הזמינים באזור המחקר. על סמך האינטרפרטציה הסיסמית תתבצע בחינה והשוואה של המבנה הגיאולוגי והסטרטיגרפי משני צידי מערכת שבר ים המלח.

אלגוריתם מבוסס עיבוד תמונה למטרת קלסיפיקציה של סטרומטוליטים

מלכסון א.[1], בנימיני ח.[1], שגיב ח.[2], סוכן נ.[2], מלכסון י.[2]

1. המחלקה למדעי הגיאולוגיה והסביבה, אוניברסיטת בן-גוריון בנגב, ת.ד. 653, באר שבע 84105
2. בית ספר למדעי המתמטיקה, אוניברסיטת ת"א, ת"א 69978

הבעייתיות שנמצאה בקלסיפיקציה והשוואה של מבני סטרומטוליטים שונים, היוותה תמריץ לפיתוח אלגוריתם מבוסס תמונות לקלסיפיקציה כמותית של מורפולוגיות וטקסטורות סטרומטוליטיות. עיבוד התמונה התבצע בתכנת Matlab ובעזרת Gabor filters, וניתוח הנתונים נעשה בעיקר בעזרת PCA . נרשמה הצלחה גבוהה עם אחוזי זיהוי נכונים של 75% - 93% בזיהוי של שכבות הסטרומטוליטים השונות.

תהליכי סחיפה והשקעה בשולי מישור ימין

נחליאלי א.[1], דודי א.[2], אבני י.[3], ויינר ד.[2], כהן ח.[1], בלומברג ד.[1]

1. אוניברסיטת בן גוריון בנגב, המחלקה לגיאוגרפיה ופיתוח סביבתי.
2. הקריה למחקר גרעיני – נגב.
3. המכון הגיאולוגי – ירושלים.

מחקר זה מנסה לבחון את קצבי התפתחות הנוף בשולי מישור ימין, בהתבסס על מיפוי שדה משולב בתיארוך OSL. ישנם הבדלים ברורים בין חלקו המזרחי של המישור לבין חלקו המערבי. בעוד חלקו המערבי יציב במאות אלפי השנים האחרונות, בחלקו המזרחי של המישור יש שינוי של התהליך במאה האחרונה. החלק המזרחי שהיה נתון למשטר השקעה מתחילת ההולוקן, שינה את המגמה והחל בתהליך סחיפתי.

מדידת השקעת שלד באלמוגי אבן בשיטה אקוסטית חדישה ולא חודרנית

מור ג.[1], רינקביץ ב.[2], אזהרי ח.[3], מקובסקי י.[1]

1. המחלקה למדעים גיאוימיים, ביה"ס למדעי הים ע"ש ליאון צ'רני, אוניברסיטת חיפה.
2. המחלקה לביולוגיה ימית, המכון לחקר ימים ואגמים, חיפה.
3. המחלקה להנדסה ביורפואית, טכניון.

אנו מציגים שיטה אקוסטית חדישה ולא פוגענית להערכת מדדים של השקעת שלד באלמוגי אבן. השיטה מבוססת על סריקת אולטרסאונד של דוגמאות אלמוגי אבן חיות אשר גדלות שטוחות על זכוכית במעבדה. מתוך ניתוח התכונות האקוסטיות של האלמוג, המכיל שילוב של שלד ורקמה, בכוונתנו להעריך כמותית את עובי השלד ונקבוביותו.

התרעה מפני שיטפונות באזור הצחיח של ים המלח באמצעות נתוני גשם ממכ"ם מטאורולוגי

מורין א., יעקובי י., נבון ש., בית-הלחמי א.

המחלקה לגיאוגרפיה, האוניברסיטה העברית בירושלים, ירושלים, ישראל

פיתוח מודל התרעה מפני שיטפונות לאגני נחל ערוגות ודרגה באמצעות נתוני עצמות גשם המתקבלות ממערכת מכ״ם מטאורולוגי המכויל למרחב ים המלח.

המורפוטקטוניקה של הגליל: מערכות טקטוניות, מערכות ניקוז והתפתחות הנוף

מטמון א.

המכון למדעי כדור הארץ, האוניברסיטה העברית, גבעת רם, ירושלים, 91904

מספר מערכות טקטוניות ניכרות בגליל:

1. מערכת הקשת הסורית לה כמעט ואין בטוי מורפולוגי.
2. מערכת העתקים אופקיים בכיוון צפ' מז'-דר' מע' וצפ' מע'-דר' מז'.
3. מערכת העתקים נורמלים בכיוון מז'-מע'.
4. מערכת הקשתה באורך גל של 40-60 ק״מ מחוף הים התיכון לבקע ים המלח.

עיצוב מערכות הניקוז והנוף בגליל מוכתבים בעיקר על ידי שתי המערכות האחרונות.

איכון מחודש של רעידות אדמה באזור צופר ,ישראל

מאירוב ט., הופשטטר א., קראבה נ.

המכון הגיאופיסי לישראל, רח' הבעש"ט 6, לוד.

לשפור ההבנה של תהליכי דפורמציה, מבנים פעילים וסיכון ר"א בצופר בדקנו רעידת אדמה חלשות שהתרחשו באזור משנת 1984. בחנו מיקום של רעידות אדמה בשביל מציאת שברים וקבלת תובנה של הטקטוניקה. קבלנו מספר ריכוזים של אירועים עם עומק קצת גדול יותר. המנגנונים המכאניים מציגים קיום שברים נורמאליים באזור.

ניסוי סמנים בעין זיו

מגל ע. [1], ארבל י. [2], כספי ש. [3], כץ י. [3], גלזמן ה. [4], יחיאלי י. [1], גרינבאום נ. [2]

1. המכון הגיאולוגי
2. אוניברסיטת חיפה
3. חברת מקורות
4. רשות הטבע והגנים

בינואר 2007 נערך ניסוי סמנים שמטרתו בחינת הקשר ההידראולי בין ביוב הזורם בחלקו העליון של נחל כזיב, וחודר דרך בריכה אל תת הקרקע, ובין עין זיו. הניסוי נערך על ידי החדרה של הצבע הפלואורסנטי Uranine ומלח LiCl לתת הקרקע ומעקב אחר ריכוזי החומרים במעיין. סימנים ראשונים של הצבע הפלואורסנטי נמצאו בעין זיו 58 שעות לאחר ההחדרה ובהתאם לזה הוערכה מהירות הזרימה של מי התהום בתת הקרקע ל-2 ק"מ ליום.

מידור החלקה באגן החולה, עדויות חדשות לאור תצפיות גיאופיסיות חדשות

מדבדייב ב. [1,3], מקובסקי י. [2], עגנון א. [3]

1. המכון הגיאופיסי לישראל, לוד.
2. המחלקה למדעי כדור הארץ, בי"ס צ'רני ללימודי ים, אוניברסיטת חיפה.
3. המכון למדעי כדור הארץ, האוניברסיטה העברית, ירושלים.

סקר סייסמי בהפרדה גבוהה ומדידה גרבימטרית באגן החולה מצביעים על מידור העתקי הטרנספורם. תוצאות ראשוניות מראות מבנה פרח חיובי ברוחב של כ-120 מטר ,תוצאה של העתקה אופקית בעלת רכיב התקצרות. כיוון שאין קידוחים לקורלציה לאורך החתך, סימון המחזירים הסייסמיים איכותני. שני מחזירים מראים הסטה אנכית בעומק וקימוט בתת-הקרקע הרדוד.

הצטברות יחידה עשירת קרבונט במדף היבשת הרדוד של ישראל, מול חופי אשקלון בפליסטוקן העליון – מה משמעותה האקלימית/סביבתית ומה השלכותיה לגבי העתיד

לזר ש.[1,2], אביטל א.[1,2], אלמוגי-לבין א.[2], בוכבינדר ב.[2], בר-מטיוס מ.[2], בנימיני, ח.[1,3]

1. המחלקה לגיאולוגיה ומדעי הסביבה, אוניברסיטת בן-גוריון בנגב, באר-שבע 84105, ישראל
2. המכון הגיאולוגי, מלכי ישראל 30, ירושלים 95501, ישראל
3. מרכז מדע רמון, מצפה רמון, ישראל

יחידה קרבונטית עשירה באצות אדומיות, אלמוגים ופורמיניפרה נושאי סימביונטים הצטברה לפני 320 עד 245 אלפי שנים לפני ההווה במדף היבשת הרדוד של ישראל מול חופי אשקלון. יחידה זו, המציינת הפסקה זמנית בהספקת סליסיקלסטיים ממקור נילוטי לאזורנו כתוצאה מהחלשות פעילות מערכת המונסון באזור מקורות הנילוס, מעידה על מגמה שעלולה להתרחש בעתיד במשטר הסדימנטציה בחופי ישראל.

אקוויפר החוף - שינויי אוגר מי התהום במהלך שבעים השנים האחרונות

ליבשיץ י. 1, וייט א. 2, בראון ע. 2.

1. השירות ההידרולוגי,ת.ד 91360, ירושלים 36118
2. המגמה לבריאות הסביבה, המכללה האקדמית הדסה, ירושלים

פיתחנו שיטה להערכת אוגר מי התהום על בסיס מפות מפלסים ויישמנו את השיטה לאקוויפר החוף. בשנת 1987 האוגר היה נמוך בכ- 2500 מלמ"ק. כאשר מרבית ירידת האוגר כ- 2300 מלמ"ק התרחשה בין 1934- 1963. ב2005 האוגר היה נמוך בכ- 320 מלמ"ק משנת 1995 ובכ- 2000 מלמ"ק מהאוגר ב- 1934.

שינויי אקלים במזרח הים-התיכון במהלך 90,000 השנים האחרונות, בהסתמך על אנליזות פלינולוגיות בקידוחים ימיים

לנגוט ד.

אוניברסיטת חיפה, המעבדה לפלינולוגיה, החוג לארכיאולוגיה

עבודה זו עוסקת בשחזור הצומח והאקלים במזרח הים-התיכון במהלך ka90. המחקר מתבסס על הפקת פולן משני קידוחים ימיים: 09-95 מדרום האגן הלבנטיני ו-01-95 מצפונו. קצבי סדימנטציה גבוהים בשילוב עם דיגום ותיארוך ברזולוציה גבוהה הניבו רקורד פלינולוגי המשחזר את האקלים בסוף הרביעון באזורנו ברמת פירוט גבוהה מאוד הכוללת גם זיהויין של תנודות משנה ואירועים אקלימיים קצרי מועד.

שינוי בהתפלגות גודל הגרגר של הלס בנגב במהלך הפליסטוקן מצביע על החולות כמקור לאבק גס (50-60 מיקרומטר)

כרובי א. [1,2], אמית ר. [1], אנזל י. [2], פורת נ. [1], סנדלר ע. [1]

1. המכון הגיאולוגי, מלכי ישראל 30, ירושלים, 95501
2. המכון למדעי כדור הארץ, האוניברסיטה העברית, גבעת רם, ירושלים, 91904

התפלגות גדלי גרגר של שלשה חתכי לס אאולים מהנגב מראים בי-מודאליות כאשר השכיח הגס (גודל סילט גס) מורכב רובו מקוורץ ושכיחותו עולה עם הזמן. בסביבה הקרבונטית של הנגב מקור האבק הגס המסביר את התצפיות הללו הוא דיונות החול בצפון-מערב הנגב. אנו מציעים כי רב גרגירי הסילט הגס נוצרו משחיקת גרגירי החול במהלך סופות חול. בנוסף יתכן כי חלק מהסילט הגס הגיע ישירות מחשיפת מדף היבשת.

סקר גיאופיסי ימי ברזולוציה גבוהה בכינרת

לב ל. [1], שדה ר.א. [2], טיבור ג. [3], בן-אברהם צ. [1], הול ג'. ק. [4], זהרי ת. [5]

1. החוג לגיאופיסיקה ולמדעים פלנטרים, אוניברסיטת תל-אביב
2. החוג לגיאו-ים ביה"ס למדעים גיאו-ימיים, בית הספר למדעי הים ע"ש צ'רני, אוניברסיטת חיפה
3. המכון לחקר ימים ואגמים
4. המכון הגיאולוגי
5. מעבדת הכנרת, המכון לחקר ימים ואגמים

סקר גיאופיסי ברזולוציה גבוהה מתוכנן להתבצע בחודש מאי-יוני 2008 בכנרת במימון הרשות למים וקרן MKB. הסקר יכלול מיפוי בתימטרי מפורט של קרקעית הכינרת באמצעות מערכת סונאר רב-אלומות, מיפוי תת-הקרקע הרדוד באמצעות מערכת ספארקר ומיפוי של השדה המגנטי באמצעות מגנטומטר ימי. מטרות הסקר הם ליצר מפה עדכנית של קרקעית הכינרת, לחשב את קצבי הסדימנטציה ע"י השוואה למיפוי קודם, לאתר ולמפות בורות, נביעות גז ומים מלוחים וכן תופעות מורפולוגיות אחרות בקרקעית הכינרת. הבנת תהליכים טקטונים צעירים יעשה באמצעות מיפוי השבירה הצעירה וקישורה למיפוי הגיאופיסי העמוק.

מיפוי גופי המים המלוחים בתת הקרקע בשיטת ה-TDEM העמוק, סקר התכנות מדבר יהודה.

לוי א. [1], גולדמן מ. [1], גבירצמן ח. [2]

1. המכון הגיאופיסי לישראל, הבעש"ט 6, לוד, .71100
2. המכון למדעי כדור הארץ, האוניברסיטה העברית, גבעת רם, 91904.

סקר גיאוחשמלי במדבר יהודה מלמד על קיומה של שכבה בעלת התנגדות חשמלית נמוכה (5-15 אוהם-מ) מתחת שכבה בעלת התנגדות חשמלית גבוהה (50-500 אוהם-מ). המעבר בין השכבות משתנה ונע בין העומקים 500-1000 מ מתחת פני השטח באקוויפר התחתון של חבורת יהודה ובאקוויפר חבורת כורנוב, והוא מלמד על מעבר בין מי תהום מתוקים למי תהום מליחים.

הערכת הסכנה לנפילת סלעים לעבר קרית-שמונה והקשר האפשרי לרעידות אדמה

כנרי מ. [1], כץ ע. [2], פורת נ. [2], וינברגר ר. [2], מרקו ש. [1]

1. החוג לגיאופיזיקה ומדעים פלנטרים, אוניברסיטת תל אביב, תל אביב 69978
2. המכון הגיאולוגי, רח' מלכי ישראל 30, ירושלים 95501

מאות גושי-סלע בנפחים של 1-150 מ"ק, שמקורם בתצורת עין אל-אסד במצוק רמים שמעל קרית-שמונה, פזורים במדרון הגובל בעיר ממערב. גושי-סלע כאלו נצפים בתצלומי אוויר מ-1946 באזורים בהם העיר בנויה כיום. המחקר מאתר אזורים עירוניים הנמצאים על מסלולי תנועת סלעים אפשריים מהמצוק לעבר בתי העיר ומציע הערכת גילים לנפילות-הסלעים וקשר אפשרי שלהן לרעידות-אדמה.

ההיסטוריה של רעידות האדמה באזור דר'-מז' הכנרת; משמעות לסיכון הסיסמי

כץ ע. [1], אמית ר. [1], יגודה ג. [1,2], חצור י. [2], פורת נ. [2], הכט ה. [2], מליק א. [2]

1. המכון הגיאולוגי, מלכי ישראל 30 ירושלים, 95501
2. אוניברסיטת בן גוריון בנגב, ת.ד. 653,באר שבע, 84105

ההיסטוריה של רעידות האדמה באזור דר'-מז' הכנרת נבחנה תוך שילוב של תעלות פליאוסיסמיות וניתוח יציבות של גלישת מדרון עתיקה. נמצאו עדויות לרעידות-אדמה חזקות (Mw~7) מגיל הולוקן ופלייסטוקן-עליון, ונמצא כי התאוצה האופקית הדרושה לכשל של גלישת המדרון היא g0.37. גיל (OSL) הרעידות נמצא בהתאמה כללית לגיל של אירועי גלישת-מדרון.

אפיון מקורות אבק באמצעות דגמים מרחביים של גודל הגרגר בפני השטח בנגב

כרובי א. [1,2], אמית ר. [1], אנזל י. [2]

1. המכון הגיאולוגי, מלכי ישראל 30, ירושלים, 95501
2. המכון למדעי כדור הארץ, האוניברסיטה העברית, גבעת רם, ירושלים, 91904

בעבודה זו יצרנו מפות של תפוצת מקטעי החול, הסילט והחרסית בפני השטח בנגב, באמצעות אינטרפולציה (בשיטת קריגינג) של למעלה מ – 300 פרופילי קרקעות. מקטעי החול והסילט מציגים דגמים הפוכים במרחב ומחזקים את ההשערה כי מקור המקטע הסילטי הינו משחיקת גרגירי החול בסופות חול מקומיות. דגם מקטע החרסית מתאים לדגם המקטע הסילטי ובנוסף גם לדגם המרחבי של כמות הגשם השנתית הממוצעת.

קמטים דיסהרמוניים ושברים נלווים באגף מונוקלינה של הקשת הסורית

יוסף - חי נ. [1], אייל י. [1], וינברגר ר. [2]

1. המחלקה לגיאולוגיה ומדעי הסביבה, אוניברסיטת בן גוריון, באר שבע 84105, ישראל
2. המכון הגיאולוגי, רח' מלכי ישראל 30, ירושלים 95501, ישראל

שני כיוונים של צירי קמטים נקבעו בסלעים טורוניים - סנוניים, באגף המערבי של מונוקלינת רמאללה. כיוון רב הקמטים, WSW-ENE, אינו תואם את כיוון ציר המבנה הראשי. מנגנון הקימוט המוצע הוא התקצרות טקטונית ולא גלישות או קריסה לחללים קארסטיים. כיוון ציר ההתקצרות, NNW-SSE, תואם את שדה המעוות של טרנספורם ים המלח.

סכנת בולענים - ממצאים חדשים המבוססים על מחקר גיאופיסי משולב

יזרסקי מ. [1], לגצ'נקו א. [2], אל-זואובי א. [3], קמרלינק ק. [4]

1. המכון הגיאופיסי לישראל, הבעשם"ט 6, לוד, 71100, ישראל
2. המכון לפיתוח ומחקר (IRD), גרנובל, צרפת
3. האוניברסיטה מעשי אל-בלקה, סולט, יורדן
4. אוניברסיטה של פיאר ומאריה קורי, פריס, צרפת

ממצאים מחקר מראים שברוב האזורים מתוך 11 באזור ים המלח בולענים מפותחים לאורך קצה של מלח (מערבי בישראל ומזרחי בירדן. התנגדות חשמלית של תת קרקע נמצאת במסגרת של 1 הום-מטר. ממצאים של MRS שיטה מעידים שמערות קרסטיות במלח מתמלאים עם הזמן בחומר דק כתוצאה מהתמטטות של קרקע. זה מוריד באופן דרסתי פרמטרים הידרוגיאולוגיים ומאית המסת מלח.

שיפור שיטת RTP לחיזוי רעידות אדמה על ידי כיול למאפיינים איזוריים ושימוש בסמנים פוטנציאליים מרובים

יניב מ.

המכון למדעי כדה"א, האוניברסיטה העברית, גבעת רם, ירושלים

RTP היא שיטה לחיזוי הסתברותי של רעידות אדמה על ידי זיהוי תבניות בעלות התפלגות ייחודית במרחב ובזמן (שרשראות). השיטה מסננת שרשראות המובילות לאירוע גדול בשיטות זיהוי תבניות ונותנת תוצאות מובהקות סטטיסטית. המחקר בוחן דרכים לשיפור ביצועי השיטה על ידי כיול המערכת למאפיינים איזוריים, ושימוש בסמנים פוטנציאליים נוספים לזיהוי השרשראות.

מבט חדש על המרופולוגיה של הקרקעית בצפון מפרץ אילת/עקבה כפי שמופתה מנתוני סונאר רב-אלומות וסונאר סורק צד

טיבור ג. [1] , ניימי ט. [2], בן-אברהם צ. [3], אל-זובי ע. [4], הרטמן ג. [3], שדה ר.א. [5], הול ג'.ק. [6], אקאוי ע. [4], עבולדס ע. [4]

1.המכון לחקר הימים והאגמים, חיפה, ישראל
2. אוניברסיטת מיזורי-קנזס, מיזורי, ארה"ב
3. החוג לגיאופיסיקה ומדעים פלנטריים, אוניברסיטת תל אביב, תל אביב, ישראל
4. אוניברסיטת אל-בלק'ה, אל-סאלט, ירדן
5. החוג לגיאו-ים ביה"ס למדעים גיאו-ימיים, בית הספר למדעי הים ע"ש צ'רני, אוניברסיטת חיפה
6. המכון הגיאולוגי, ירושלים, ישראל

עיבוד נתוני סונאר רב-אלומות וסונאר סורק צד שנאספו בסוף 2006 במסגרת מחר MERC מאפשרים לחלק את המורפולוגיה של קרקעית צפון המפרץ לשבעה אזורים המרמזים על התפתחות המפרץ ופעילות טקטונית צעירה. 1604

תחמוצות ברזל משקע תטיס בים סוף

טייטל-גולדמן נ.

האוניברסיטה הפתוחה

נחקרו תחמוצות-ברזל משקע תטיס בים-סוף. שרידי פיריט, וונדיום, זרחן, וצורן מהתמלחת המקורית מצויים במגנטיט, בכלוריט עתיר ברזל שהתגבשו בחלקה התחתון של עמודת-המים בגאותיט שהתגבש במקביל מעל. שכבות מונו-מינרליות של גאותיט ולפידוקרוציט התגבשו בחמצון מלא של ברזל בתהליכים איטיים ומהירים בהתאמה. גיבוש מחדש להמטיט התרחש בקרקעית השקע משפסקה הפעילות ההידרותרמלית.

הערכת הסכנה הסייסמית במזרח הכנרת באמצעות ניתוח לאחור של כשל עמודים ביזנטיים באתר סוסיתא

יגודה-בירן ג. [1,2], חצור י. [1], כץ ע. [2], אמית ר. [2]

1. המחלקה למדעי הגיאולוגיה והסביבה, אוניברסיטת בן גוריון בנגב.
2. המכון הגיאולוגי לישראל.

בשל מיעוט ברישומי רעידות אדמה חזקות מאזורנו, מתעורר הצורך להעריך את הסכנה הסייסמית הצפויה בשיטות שונות. בעבודה זו אנו מבססים שיטה להערכת הסכנה הסייסמית על ידי ניתוח לאחור באמצעות שיטה נומרית של כשל עמודים באתר הארכיאולוגי בסוסיתא. בעבודה זו נמצא כי כאשר העמודים מועמסים על-ידי תאוצות מרישומי רעידות אדמה שונות, טווח תאוצת הקרקע המרבית הדרוש להפלתם נע בין $g0.2$ ל- $g0.4$.

כי אין העתק באזור המיועד לבניה. לא נתקבלה התאמה בין ממצאי הקדוחים והפרופיל הגיאופיסי של החתך.

השוואה בין יחס ספקטראלי המתקבל מרעש רקע למודל אנליטי חד ממדי מסקר רפרקציה

זסלבסקי י. [1]

המכון הגיאופיסי לישראל, אגף סיסמולוגיה, ת.ד 182, לוד, ישראל

במחקר מתבצעת השוואה בין יחס ספקטראלי מרעש רקע לבין פונקציה אנליטית חד ממדית. להערכת פרמטרים של מודל אנליטי רב שכבתי (מהירות גלי גזירה, עובי, צפיפות ומקדם ריסון לכל שכבה) נקדח קידוח ניסיון עד הבסיס (עומק כללי – 70 מ). דוגמאות מהקידוח נלקחו למחקר גיאוטכני להערכת מהירויות גלי גזירה לצד נתוני רפרקציה.

שיטות להגנת כביש 90 מהשפעת בולענים

זלצמן ע.

גיאולוגיה הנדסית והנדסת סלע

ניתן יעוץ גיאוהנדסי בשלושה קטעים: מטע התמרים של עין גדי, מצפון לנחל ערוגות וחוף מינרל. הפתרונות: יריעות מבד גיאוטכני חזק, הידוק דינאמי והכנת פיתרון מגירה – למקרה שתתגלה סכנה לכביש. ניתן להסתמך על הדו"ח שהוצא על ידי המכון הגיאולוגי בקביעת מיקום שכבות המלח בעומק. 1591

מרמלה לכפר סבא: מחקר חלוקה לאזורים סייסמיים (2001-2007)

זסלבסקי י. [1]**, שפירא א.** [2]**, גורשטיין מ.** [1]**, אטייב ג.** [1]**, קלמנוביץ' מ.** [1]**, פרלמן נ.** [1]**, גילר ד.** [1]**, דן א.** [1]**, גילר ו.** [1]**, ליבשיץ י.** [1]**, שוורצבורג א.** [1]

1. המכון הגיאופיסי לישראל, אגף סיסמולוגיה, ת.ד 182, לוד, ישראל
2. ועדת ההיגוי להיערכות לרעידות אדמה

להערכת תגובת אתר מקומית באזור השפלה והשרון (בין ערים רמלה בדרום וכפר סבא בצפון) בוצעו מדידות רעש רקע ב-2000 אתרים בשטח כללי של כ-300 קמ"ר. חישובי יחס ספקטראלי מציגים ערכי תדר תהודה במרווח מ-0.25 עד 12.0 הרץ כאשר שיעורי הגברה נעים מ- 2 עד 7.

מגמתיזם אלקליני אולטרה-בסיסי מגוון בפרובינציית הלבנט: השדה הוולקני של מכתש רמון

וינרויב ע., יודלביץ' ז., איל מ., קציר י.

המחלקה לגיאולוגיה ומדעי הסביבה, אוניברסיטת בן גוריון בנגב, ת.ד. 653, באר שבע 84105.

במכתש רמון חשופים סלעים מגמתיים אולטרה בסיסיים בהרכבים שונים ומגוונים. הסלעים מופיעים כזרמים או כמחדרים סוב-וולקנים. זרמי טפריט, בסניט או בסניט נפליניטי ומחדרים סוב וולקנים נפליניטים נפוצים במערב הרמון בעוד שבמרכז ובמזרח הם נדירים, במזרח הרמון עיקר הסלעים המגמתיים מופיע כסילים או דייקים.

תוצאות סקר כימיית מי תהום באגן ירקון-תנינים

זילברברנד מ.[1], רוזנטל א.[2], ווינברגר ג.[1]

1. השירות ההידרולוגי, ת. ד. 36118, ירושלים 91360
2. המחלקה לגיאופיסיקה ומדעים פלנטאריים, אוניברסיטת תל אביב, רמת אביב, תל אביב 69978

בשנת 2005 המכון הגיאולוגי בהזמנת נציבות המים ביצע דיגום מים מ-194 קידוחים שואבים ו-17 מעיינות ובדיקות כימיות ואיזוטופיות שרובם מאפיינים את אקוויפר חבורת יהודה. פענוח התוצאות נעשה בשירות ההידרולוגי. מי אנומליה איילון אופיינו על סמך יונים ראשיים ומשניים, יסודות קורט ואיזוטופים. נעשה ניתוח גורמים אשר קובעים שונות בכימיית מי תהום. על בסיס זה הובחנו מקומות בהם מתרחשת דליפה מירבית לאקוויפר דרך שכבות חבורת הר הצופים.

תמלחות הבולענים בחוף המערבי של ים המלח: מקור והתפתחות גיאוכימית

זילברמן-קרון ת.[1,2], כץ א.[1], גבריאלי א.[2], יחיאלי י.[2]

1. המכון למדעי כדור הארץ, האוניברסיטה העברית, ירושלים 91904.
2. המכון הגיאולוגי הישראלי, ירושלים 95501.

לאורך חוף ים המלח התפתחו בולענים המכילים מים בתחום מליחויות רחב. מטרת המחקר היא הגדרת מקור התמלחות והצעת תהליך להתפתחותן הגיאוכימית. ניסויי איוד של מים מסוגים שונים הנפוצים באזור והרכב התמלחת מקידוח רדוד הסמוך לבולענים מצביעים על כך שמקור המים בבולענים הוא ים המלח שכיסה את האזור בעבר, ואיודם שהביא להרכביהם הנוכחיים.

מגבלות השילוב של נתונים גיאולוגיים בתכנון הנדסי

זלצמן ב., זלצמן ע.

גיאולוגיה הנדסית והנדסת סלע

התקן הישראלי אוסר בניה על העתק פעיל. הוטל עלינו לקבוע באם מיקום העתק המזרחי של טרנספורם ים-המלח יחייב הזזת מיבנים מתוכננים באזור המזרחי של הכנרת. סקר רפרקציה ורפלקסיה בוצעו ע"י המכון הגיאופיסי. בוצעו קדוחי נסיון לאימות המידע. נמצא

ניטור רציף של אגן ים המלח במשך 25 שנה ע"י רשתות סייסמיות קבועות וניידות

הופשטטר ר. [1], בראואר ב.[2], אש ג. [2], אמרת ע.ק. [3], מוחסן א.[2], ווברמ. [2]

1. מכון גיאופיסי לישראל, לוד, ישראל
2. מרכז גיאופיזי, פוטסדם, גרמניה
3. רשות משאבים טבעיים, עמן, ירדן

במשך 25 שנה מתבצע ניטור רציף של פעילות סייסמית ע"י שתי רשתות קבועות של ישראל וירדן, ושלוש רשתות ניידות של ישראל, DESERT, DESIRE2000. הרעידות במגניטודות בין 0.5 לבין 5.2 מציגות ערך b של 0.9. אנו מציגים מיכניזם שבירה של הרעידות וקשרי מומנט-מגניטודה.

השפעת איכות מסת הסלע על תסבולת בחיכוך של כלונסאות יצוקים

ויינשטיין א. [1], חצור י. [1], דוקטופסקי מ. [2].

1. המחלקה למדעי הגיאולוגיה והסביבה, אוניברסיטת בן גוריון בנגב, באר שבע, 84105.
2. מייק דוקטופסקי מהנדסי קרקע וביסוס, רח' דוד מרץ 10, ירושלים, 96905.

המאמר מבוסס על חלק מן התוצאות שהתקבלו עד כה במחקר העוסק בהשפעת איכות מסת הסלע על תסבולת בחיכוך (f_{su}) של כלונסאות יצוקים. ניתוח של השפעה זו מבוצע על בסיס תוצאות של 66 ניסיונות העמסה בסלע. הניתוח מראה כי הקשירה האמפירית של f_{su} לאיכות מסת הסלע מדוייקת יותר מאשר קשירתו לחוזק לחיצה חד צירי של הסלע הרציף (דבר אשר נהוג להשתמש בו עד היום). כמו כן המאמר דן בצורה מפורטת בהשפעת RQD על f_{su} ואף מציע גישה חלופית לשילובו של RQD בתהליך תכנון של כלונסאות יצוקים בסלע.

התפקיד של שפיעת מי תהום בהובלה של נוטריינטים אל הים, דוגמא מחוף דור

ויינשטיין י. [1], חרות ב. [2], שלם, י. [1], יחיאלי י. [3]

1. אוניברסיטת בר-אילן
2. Israel Oceanographic and Limnological Research,
3. המכון הגיאולוגי לישראל

אנליזה של נוטריינטים במים הנובעים מקרקעית מפרץ דור מראה כי המים המתוקים הם הספק הבלבדי של ניטראט וסיליקה למפרץ, אך נראה כי המים המתוקים עוברים תהליך חלקי של דניטריפיקציה בסדימנט שמתחת לים. לעומת זאת, בניגוד למקובל,המים המלוחים שעברו בסדימנט דלים בניטראט וסיליקה, אך מועשרים במקצת בפוספאט.

השפעת המבנה הגיאולוגי של הרי יהודה על שדה הזרימה באגן ירקון-תנינים

דפני א. [1], בורג א. [2], גבירצמן ח. [1]

1. המכון למדעי כדור הארץ, האוניברסיטה העברית, גבעת רם, ירושלים 91904
2. המכון הגיאולוגי הישראלי, מלכי ישראל 30, ירושלים 95501

שלושת הקמרים הראשיים המרכיבים את הרי יהודה- קמר רמאללה, קמר חברון וקמר מעון מכתיבים את שדה הזרימה של מי התהום בחלק הפריאטי של אגן ירקון תנינים. לשדה הזרימה באזור ההרים השפעה גם על שדה הזרימה באזור הכלוא ובכלל זה על יצירת פרשות מים מקומיות וזרימות עונתיות כלפי דרום. הערמויות מים עונתיות נוצרות מול פתחת מודיעין ופתחת עגיור אך לא מול פתחת תל-שוקת, שם המילוי החוזר נמוך יותר, ושינויי העומד המיידיים מתמתנים במעברם דרך מספר תת-אקוויפרים.

ר/מ* סבוואבה – רחפת למחקר הקוטב

הול ג'. ק. [1], כריסטופרסון י. [2]

1. המכון הגיאולוגי לישראל (גימלאי) , מלכי ישראל 30, 95501 ירושלים
2. המכון לפיזיקת כדור הארץ, אוניברסיטת ברגן, אלגטן 41, ברגן, נורווגיה

רחפת חדשה למחקר הקוטב הושלמה לאחרונה במספנות באנגליה ותגיע לנורווגיה השנה, לתחילת פעילות. הקוטב נמצא במוקד התעניינות עקב אפקט ההתחממות הגלובלי ובעקבותיו, הצטמצמות שטחי הקרח. הרחפת, המצויידת באמצעים למחקר סייסמי, תפעל בים הארקטי העמוק במשך חודשי האור על ידי אוניברסיטת לונגיירברן (Longyearbyen). פרטים נוספים יופיעו באתר http://www2.geo.uib.no/hovercraft/ .

* ר/מ - רחפת מחקר

מורכבות במבנה הפנימי של צפון מפרץ אילת

הרטמן ג. [3], טיבור ג. [1], בן-אברהם צ. [3], ניימי ט. [2], אל-זובי ע. [4], שדה ר.א. [5], הול ג'.ק. [6], אקאוי ע. [4], עבולדס ע. [4], מקובסקי א. [5]

1. המכון לחקר הימים והאגמים, חיפה, ישראל
2. אוניברסיטת מיזורי-קנזס, מיזורי, ארה"ב
3. החוג לגיאופיסיקה ומדעים פלנטריים, אוניברסיטת תל אביב, תל אביב, ישראל
4. אוניברסיטת אל-בלק'ה, אל-סאלט, ירדן
5. החוג לגיאו-ים ביה"ס למדעים גיאו-ימיים, בית הספר למדעי הים ע"ש צ'רני, אוניברסיטת חיפה
6. המכון הגיאולוגי, ירושלים, ישראל

סקר גיאופיסי-ימי ברזולוציה גבוהה נערך בצפון מפרץ אילת במהלך אוקטובר-נובמבר 2006. פענוח ראשוני של הנתונים הסיסמיים והבתימטריים של המדף הצפוני, חושף מבנה פנימי מורכב של האגן: צפון מפרץ אילת מחולק לגרבן מזרחי ומערבי, המופרדים ע"י הורסט.

מערכת הקניונים האוליגו-מיוקנים באגן הלבנט וחשיבותה לחיפושי הידרוקרבונים מול חופי ישראל

גרדוש מ. [1], דרוקמן י. [2], בוכבינדר ב. [2], קלבו ר. [2]

1. המכון הגיאופיסי לישראל, רחוב הבעש"ט 6, לוד 71100.
2. המכון הגיאולוגי, רחוב מלכי ישראל 30, ירושלים 95501.

מערכת נרחבת של קניונים תת-ימיים התפתחה במהלך האוליגוקן והמיוקן באגן הלבנט. קניונים אלו הובילו משקעים קלסטים גסי-גרגר ממחשופים בשולי היבשת לתוך האגן. במערכת זאת קיים פוטנציאל גבוה להימצאות סלעי מאגר ומלכודות להידרוקרבונים, במיוחד בפתחי הקניונים שבחלקו העמוק של האגן אשר טרם נבחן על ידי קידוחים.

אופי והרכב הנוזלים בשיווי משקל עם פרידוטיט בסביבות נחיתה: ניסיונות מעבדה – תוצאות ראשוניות

דביר א., קסל ר.

המכון למדעי כדוה"א, האוניברסיטה העברית, ירושלים

בעבודה זו נבדק הרכב הנוזלים בשווי משקל עם פרידוטיט בלחצים של 4-6 GPa וטמפרטורות של 700-800°C. ב-4 GPa בטמפרטורות של 700°C ו-750°C הנוזל מכיל ~80 wt% H_2O ונמצא בשווי משקל עם OL, CPX, OPX ו-Chl אשר מתחלף ל-10Å ב-750°C. ב-800°C מתקיימים בשיווי משקל נתך המכיל ~50 wt% H_2O עם OL ו-CPX.

מיפוי מינרולוגי באמצעים היפרספקטראליים בערבה, בקעת תמנע והרי אילת -תוצאות ראשוניות

דדון א. [1], קרניאלי א. [1], בן-דור א. [2]

1. המעבדה לחישה מרחוק, המחלקה לאנרגיה סולרית ופיסיקה של הסביבה, המכון לחקר המדבר ע"ש יעקוב בלושטיין, אוניברסיטת בן-גוריון בנגב.
2. המעבדה לחישה מרחוק ו GIS-, מחלקת גיאוגרפיה וסביבת האדם, אונברסיטת תל אביב .

חישה מרחוק היפרספקטרלית (חמ"ה) מאפשרת זיהוי ההרכב הכימי של השטח הנמדד מחתימה ספקטראלית בהפרדה גבוהה. מוצגות תוצאות ראשוניות של מיפוי יחידות סלע לאורך הערבה, בקעת תמנע והרי אילת באמצעות עיבוד מתקדם של הדמיות חמ"ה לוויינאית ומדידות שדה. תוצאות אלו ישמשו בהמשך המחקר למיפוי מינרלוגי.

השפעת המעטפת על פיזור של מרבצי גז ונפט

גלנט י.

ת.ד 164 יוקנעם-מושבה 20600 ישראל

מתברר כי התנהגות לא שגרתית, תוך כדי התהוות של בסיסי משקעים ופעילות עוצמתית של שיעור ההיתכות החלקי, אינטנסיביות של אקטיביות מגמטית וקרום המעטפת, ופעילות מוגברת של אקטיביות מגמטית תקופתית יחד עם פעילות פחות עוצמתית של קרום המעטפת- בהשוואה לבסיסים שאינם פעילים- מהווה סימן מובהק להיווצרות מרבצי גז ונפט.

שיטה חדשה ללימוד אקוויפרים על סמך מידע ליטופציאלי ופטרופיסי מקידוחים

גנדלר מ. [1], גולדברג א. [1], פליישר ל. [1], בן-גיא י. [1], גבירצמן ח. [2] דפני א. [2]., שטיינברג י. [1, 2]

1. המכון הגיאופיסי לישראל, ת.ד. 182 לוד 71100
2. המכון למדעי כדור הארץ, אוניברסיטה עברית, ירושלים 91904

השיטה המוצעת מבוססת על מידע ליטולוגי ופטרופיסי מקידוחים. השיטה משמשת ככלי עזר נוסף בחיפושי מים ובעזרתה ניתן לקבל פתרונות אמינים יותר לבעיות כגון חלוקה לתת אקוויפרים והערכת השתרעותם המרחבית, זיהוי הטרוגניות ליטופציאלית, מתאם בין אזורים בעלי נקבוביות גבוהה ובין אזורים סדוקים וחללים והערכת מליחות מי השכבה.

הביקוע הנאוטתי והשפעתו על עיצוב אזור הלבנט

גרדוש מ. [1], גרפונקל צ. [2] דרוקמן י. [3], בוכבינדר ב. [3]

1. המכון הגיאופיסי לישראל, רחוב הבעש"ט 6, לוד .71100
2. המכון למדעי כדור הארץ, האוניברסיטה העברית, ירושלים .91904
2. המכון הגיאולוגי, רחוב מלכי ישראל 30, ירושלים 95501.

במחקר זה שולבו תוצאות קידוחים עמוקים, בחלקם חדשים, וסקר סיסמי מודרני אשר בוצע בים התיכון כדי לשחזר את מערכת הביקוע הניאוטתית אשר התפתחה מהפלאוזואיקון המאוחר עד ליורא המוקדם במרחב הלבנט. שיחזור זה מאפשר לקבוע את כוון הביקוע, אופיו והשפעתו על עיצוב הקרום באזור.

קביעת ערכי רוויה של תערובות בין מי ים המלח למי ים סוף ביחס לגבס.

גל א. [1], רזניק א. [1,2], גנאור י. [1], גבריאלי א. [2]

1. המחלקה למדעי הגיאולוגיה והסביבה, אוניברסיטת בן-גוריון בנגב, ת.ד. 653, באר-שבע 84105
2. המכון הגיאולוגי, רחוב מלכי ישראל 30, ירושלים 95501

ניסויי השקעה והמסת גבס מתערובות ביחסים שונים של ים סוף וים המלח נערכו במערכת סגורה לצורך קביעה אמפירית איזה מודל תרמודינמי מנבא שוו"מ כימי בצורה המדויקת ביותר. שוו"מ בתמיסות המכילות 50%-30% ים המלח נחזה טוב יותר ע"י קרומגלץ בעוד שה -PhreeqC חוזה טוב יותר שוו"מ בתמיסות המכילות 100%-50% ים המלח.

זיהום פרכלורט בתווך הלא רווי ברמת השרון. האם דרושה פעולת שיקום מיידית?

גל ה. [1], וייסברוד נ. [2], רונן ז. [2], דהן ע. [2], נתיב ר. [1]

1. המחלקה למדעי הקרקע והמים, האוניברסיטה העברית, ת.ד. 12, רחובות 76100
2. המחלקה להדרולוגיה ומיקרוביולוגיה סביבתית, מכון צוקרברג למחקרי מים, אוניברסיטת בן גוריון בנגב, שדה בוקר 84990

פרכלורט, מרכיב עיקרי בדלק מוצק לטילים ורקטות, נמצא בריכוזים גבוהים בתווך הלא רווי ובמי התהום שמתחתיו באזור רמת השרון. המחקר בדק את תנועת הפרכלורט בתווך הלא רווי והעריך את המשך זיהום מי התהום על ידי פרכלורט שמקורו בתווך זה.

הרס הכפר הניאוליתי בעתלית-ים ונמל קיסריה בחוף הכרמל - תהליך איטי או אירוע קטסטרופאלי?

גלילי א. [1], סלמון ע. [2], צביאלי ד. [3]

1. רשות העתיקות, ת.ד. 180, עתלית 30350.
2. המכון הגיאולוגי, מלכי ישראל 30, ירושלים 95501.
3. המכון ללימודי ים ע"ש ליאון רקנאטי, אוניברסיטת חיפה, חיפה 31905.

עתיקות עשויות להימצא שלא באתרן כתוצאה מגורמים טבעיים ו/או אנושיים והשימוש בהן לזיהוי אסונות מצריך בדיקה זהירה. נבדקו שני אתרים שנטען כי נהרסו על ידי צונאמי: עתלית-ים והנמל ההרודיאני בקיסריה. נראה כי בשני מקרי המבחן שנבדקו נגרם עיקר ההרס כתוצאה מתהליכים איטיים ולא מאירועי צונאמי הרסניים.

לקראת הבנה פיזיקלית של התנזלות קרקעות כתוצאה ממעוות בלתי הפיך של המטריצה הגרנולרית

גורן ל.[1], אהרונוב ע.[1,2]

1. המחלקה למדעי הסביבה וחקר האנרגיה, מכון וייצמן למדע, רחובות 76100, ישראל.
2. המכון למדעי כדור הארץ, האוניברסיטה העברית, גבעת רם, ירושלים 91904, ישראל.

התנזלות קרקעות היא תופעה קטסקרופלית שגורמת לקרקע לאבד את חוזק הגזירה שלה. המנגנון הפיזיקלי העומד מאחורי התופעה אינו ידוע. מחקר אנאליטי ונומרי של המערכת המזוגת של מטריצה גרנולרית שיכולה לעבור מעוות בלתי הפיך ושל מכניקת מי הנקבים מאפשר פתח להבנת הפרמטרים והמנגנונים שגורמים להתנזלות קרקעות.

גישה תרמו-פורו-אלסטית לשאלת היציבות של גלישות קרקע

גורן ל.[1], אהרונוב ע.[1,2]

1. המחלקה למדעי הסביבה וחקר האנרגיה, מכון וייצמן למדע, רחובות 76100, ישראל.
2. המכון למדעי כדור הארץ, האוניברסיטה העברית, גבעת רם, ירושלים 91904, ישראל.

תצפיות שדה מעידות כי ישנן גלישות קרקע המאיצות במורד המדרון וישנן גלישות שעוצרות על אותו המדרון. מחקר אנאליטי ונומרי של מודל תרמו-פורו-אלסטי המייצג גלישת קרקע חושף את חשיבות פרמביליות הסלע הגולש לקביעת יציבות הגלישה. תוצאות המחקר מראות כי פרמביליות נמוכה מובילה להאצה ואילו פרמביליות גבוה מובילה להתייצבות הגלישה ועצירתה.

שימוש בשיטת יחס ספקטראלי מרעש רקע לפענוח מספר מאפיינים ייחודיים הנצפים בעמק לוד והשרון הדרומי

גורשטיין מ., זסלבסקי י., אטייב ג., קלמנוביץ' מ., פרלמן נ., גילר ו., ליבשיץ י., שוורצבורג א., גילר ד., דן א.

המכון הגיאופיסי לישראל, אגף סיסמולוגיה, ת.ד 182, לוד, ישראל

בוצע ניסיון לפענוח שינויים חדים במאפייני יחס ספקטראלי באזור סמוך למדרון המערבי של הרי שומרון וכן ערכי הגברה גבוהים במיוחד באתר שדה תעופה (לוד). שתי התופעות נצפו תוך כדי מדידות רעש רקע בשטחי עמק לוד והשרון הדרומי.

ניסיון כיול אקוסטי בישראל – הכנות ופיצוצי ניסיון

גיטרמן י., הופשטטר ר.

מכון גיאופיסי לישראל, לוד

המכון הגיאופיסי מבצע מדידות אקוסטיות במסגרת פרויקט של כיול של תחנות אקוסטיות בישראל ובמזרח התיכון. בשנה הקרובה יבוצעו מספר פיצוצים בזמנים ועונות שונות של השנה לבדוק את התלות במזג האויר וקבלת עקומות כיול.

הגדרת פרמטרים הידראוליים של תת הקרקע בעזרת שיטות גיאופיזיות: מיתוסים ומציאות

גולדמן מ. [1]**, כפרי א.** [2]

1. המכון הגיאופיסי לישראל, הבעש"ט 6, לוד 71100
2. המכון הגיאולוגי, מלכי ישראל 30, ירושלים 95501

השיטות הגיאופיזיות השונות אינן מספקות תשובות ישירות מניחות את הדעת באשר לפרמטרים הידראוליים. אפילו שיטת התהודה המגנטית הגרעינית שהיא השיטה הגיאופיזית היחידה לחיפושים ישרים של מי תהום, מספקת תוצאות לא תמיד מהימנות באשר לתכולת מים ותולכה של המקטע הנמדד, כמוצג בעבודות מישראל וקפריסין. השיטה האלקטרומגנטית בתחום הזמן הוכיחה בארץ את יעילותה בקבלת נתוני נקבוביות במקטעים רוויי מי ים או תמלחת בהם המליחות ידועה. השיטה ישימה הן לגבי אקוויפרים גרנולריים והן, במידה מסוימת, לגבי אקוויפרים קרבונאטיים.

תהליכים ביוגיאוכימיים בשמורת החולה- מעקב אחר מחזורי החנקן הזרחן והגופרית

גולן ר. [1,2]**, גבריאלי א.** [2]**, מרקל ד.** [3]**, לזר ב.** [1]

1. המכון למדעי כדור הארץ, האוניברסיטה העברית
2. המכון הגיאולוגי לישראל
3. אגן היקוות כינרת, רשות המים

מחקר זה עוסק בשינויים העונתיים בהרכב הגיאוכימי של גופי המים בשמורת החולה במטרה לאפיין ולכמת את התהליכים הביוגיאוכימיים הקובעים את איכות המים. נמצא כי השמורה מסלקת קלציום-קרבונט, חנקן וגופרית ממי השמורה תוך שינויים יממיים קיצוניים בריכוזי החמצן. הערכים האיזוטופיים של גופרית מצביעים על חיזור בקטריאלי בסמוך לקרקעית.

עדויות וסמנים גאומורפולוגיים לטקטוניקה פעילה בכוכב הירדן

גורלניק ב., שער ר., ליבנה א., מטמון א.

המכון למדעי כדור הארץ, האוניברסיטה העברית, ירושלים 91904

מנתונים פלאומגנטיים, ידוע כי מאז המיוקן עבר בלוק כוכב הירדן רוטציה אופקית נגד כיוון השעון. נטיית בזלת הכיסוי הפליוקנית לדרום-מערב מחייבת קיום ציר סיבוב אופקי, שמצפונו הבלוק עלה ומדרומו ירד, דבר הנתמך על ידי פרופילי הנחלים באזור. ציר הסיבוב השקול של שתי התנועות בפליוקן הינו נטוי, ויחד עם ציר הסיבוב המיוקני האופקי מתאר את המעבר ממאמצי טרנספורם למאמצי ביקוע.

סימולציה דו מימדית של תנודות קרקע בזמן רעידת אדמה במפרץ חיפה

גבירצמן ז.[1], לואי ג.[2]

1. המכון הגיאולוגי של ישראל
2. האוניברסיטה של נבדה, רינו, ארה"ב

המחקר מציג סימולציה דו מימדית של תנודות קרקע בזמן רעידת אדמה לאורך חתך החוצה את עמק זבולון מצפון לדרום. בחלקו העמוק של האגן (גרבן קישון) מתקבלות הגברות חזקות בזמני מחזור ארוכים בעוד שבחלקו הרדוד (אפק) מתקבלות הגברות בזמני מחזור קצרים. בניתוח חד מימדי התקבלו תוצאות דומות עבור אפק ושונות עבור קישון.

גרבן השרון: אזור מפתח להבנת הקשר בין כרמל, שומרון ומישור החוף בטרציאר המאוחר

גבירצמן ז., שטיינברג ג., סימנטוב ר., זילברמן ע., גרוסוביץ ל., אלמוגי-לבין .

המכון הגיאולוגי של ישראל

באזור השרון החתך הפליו-פלייסטוקני מונח על מישור אי התאמה המתרומם בהדרגה לצפון/מזרח בהתאם למגמה הצעירה של התרוממות הכרמל. מאידך, מידת הגידוע מתחת למישור זה מתחזקת לדרום/מזרח ומתאימה לתקופה בה התרומם השומרון. מישור אי ההתאמה גודע שברים שפסקו לפעול ומזה אנו מסיקים שלהתרוממות הפנים יבשתית קדם שלב של תנועות אנכיות דיפרנציאליות.

אודות סוגים שונים של נקבוביות בסלעים קרבונטיים של אקויפר ירקון תנינים

גולדברג, א., גנדלר, מ.

המכון הגיאופיסי לישראל, ת"ד 182, לוד 71100

אקוויפר ירקון תנינים מורכב בעיקר משכבות גירים ודולומיטים. את הקרבונטים ניתן לחלק לשני סוגים: סלעים בעלי צפיפות גבוהה ונקבוביות נמוכה (1-3%) וקרבונטים נקבוביים. נקבוביות ותולכה הם פרמטרים עיקריים של אקוויפר ולכן חשוב לנתח את תפקידם של סוגי הנקבוביות השונים בהתפתחות של תכונות קיבולת-סינון של האקוויפר. תאור נכון של מבנה מערכת הנקבוביות הוא קריטי להבנה וחיזוי של הפקת מי- תהום.

את היכולת לדמות באופן ספרתי תופעה של שכבות מכאניות בסלעים סדימנטריים ובוחנת את ההשפעה של אורך עקבות הסדקים בסלע על יציבותם של חללים תת-קרקעיים.

עיצוב מחדש של המעבר ים – יבשה בשולי הלבנט באיאוקן המאוחר – אוליגוקן המוקדם

בר (פרגו) ע. [2,1], גבירצמן ז. [1], פיינשטיין ש. [2], זילברמן ע. [1]

1. המכון הגיאולוגי, רחוב מלכי ישראל 30, ירושלים 95501
2. המחלקה למדעי הגיאולוגיה והסביבה, אוניברסיטת בן גוריון, באר-שבע 84105

באיאוקן המאוחר – אוליגוקן מוקדם התרחשה השתפלות של אגן הלבנט והתרוממות של צפון מערב הפלטו הערבי, באמצעות חידוש פעילות לאורך מדרגות סטרוקטורליות המפרידות ביניהם. תנועות אלו יצרו הפרדה טקטונית אנכית בין שני המחוזות, בשיעור העולה על 1.5 ק״מ. הפרדה זו התרחשה בו-זמנית לתחילת ההתנגשות בין ערב לאירואסיה.

ביקוע באפריקה: רעידות אדמה, דייקים, והתפרצות הר געש קרבונטיטי, טנזניה, 2007

בר ג. [1], חמיאל י. [1], שמיר ג. [1], נוף ר. [2,1]

1. המכון הגיאולוגי, מלכי ישראל 30, ירושלים, 95501
2. המחלקה למדעי הגיאולוגיה והסביבה, אוניברסיטת בן גוריון בנגב, באר שבע, 84105

נחיל רעידות אדמה פקד את הבקע המזרח אפריקאי בטנזניה בקיץ 2007 מלווה בהתפרצויות אלימות של הר הגעש הקרבונטיטי הסמוך – Oldoinyo Lengai. המעוות בפני השטח נמדד באמצעות אינטרפרומטריה של רדאר מלוויינים ואומת בסקר שדה. מודלים אלסטיים מצביעים על אירוע ביקוע של מעל מטר לאורך כ – 20 ק״מ. יחסים דומים בין רעידות אדמה והתפרצויות אלימות נצפו בהר ב–50 השנים האחרונות.

תנועת מזהמים דרך תווך לא רווי עמוק מתחת לרפת

ברעם ש. [1], ארנון ש. [1], גרוס ע. [1], רונן ז. [1], כהן ק. [2], פנקרטוב א. [2], דהן ע.[1]

1. המחלקה להידרולוגיה ומיקרוביולוגיה של הסביבה, מכון צוקברג לחקר המים, מכון בלאושטיין לחקר המדבר, אוניברסיטת בן גוריון, קמפוס שדה בוקר, ישראל.
2. רשות המים

מעקב אחר תנועת מזהמים דרך תווך לא רווי עמוק מתחת לרפת באזור באר טוביה, הראה כי הרפת מהווה מקור לזיהום מי תהום. ריכוזים גבוהים של כלוריד וניטרט (4000 ו- 1000 מג״ל, בהתאמה) נמדדו במי הנקבים ותנועתם למי התהום הובילה לעליה בריכוז הכלוריד (פי 2) והניטרט (פי 5), בהשוואה לריכוזים הממוצעים במי התהום באזור.

ניסויי חיכוך בגזירה ישירה

בירן ע.[1] ,חצור י.[1] , זיו א.[1]

המחלקה למדעי הגיאולוגיה והסביבה , אוניברסיטת בן- גוריון בנגב, ת.ד. 653, באר-שבע, 84105.

במחקר זה נערכו סדרת ניסויים אשר בוצעו עד כה במערכת גזירה כפולה, וכעת בוצעו במערכת גזירה ישירה. כמו בניסויים שבוצעו במערכת גזירה כפולה, גם ניסויים אילו מראים שהחיכוך תלוי בלוגריתם של מהירות ההחלקה וגיל המגעים. תוצאות הניסויים של המחקר הנוכחי זהות לתוצאות מחקרים קודמים. מעודדים מממצאים אלו, בכוונתנו לבדוק כיצד מושפע מקדם החיכוך משנויים מחזוריים במאמץ הנורמאלי.

הקניון של מערב ראשון והשלכותיו על תבנית הניקוז הטרציארית של שולי הלבנט

בן-גיא, י.

המכון הגיאופיסי לישראל, רחוב הבעש"ט 6, לוד 71100.

סקר סייסמי חדש באיזור מערב ראשון איפשר מיפוי מפורט של תעלה מגיל מיוקן עליון הנמשכת לכיוון תעלת פלמחים. בתעלה זו ובדומות לה אין אפשרות להגדיר באופן ברור קיום מערכת קדומה יותר. זיהוי מערכת אוליגו-מיוקנית ביבשה משליכה על השאלה מהו המקור האפשרי של סלעי מאגר אוליגו-מיוקניים, אם אכן קיימים, באגן הלבנט.

מדידות מגנטיות ברזולוציה גבוהה בהר עמרם

בס מ.[1,2], שטייניץ ג.[1], מרקו מ.[2]

1. המכון הגיאולוגי, מלכי ישראל 30, ירושלים 95501, ישראל
2. החוג לגיאופיזיקה ומדעים פלנטריים באוניברסיטת תל אביב, תל אביב 69978, ישראל

מערכת ניסיונית המבוססת על גרדיומטריה מגנטית הוצבה במצפה הגיאופיסי בהר עמרם על מנת לנטר פעילות גיאודינמית בקרבת העתק ים המלח. מטרות המחקר הינן ללמוד את יכולות המערכת, למפות ולסווג את הסיגנלים השונים שנראים בסדרת הנתונים ולייחס אותם לתהליכים גיאופיזיים. בסדרת הנתונים שהתקבלה מן המערכת נראים שינויים מגנטיים יומיים וסערות מגנטיות.

גישה משולבת חדשה להדמיה ספרתית של תופעת שכבות מכאניות בסלעים סדימנטריים

בקון-מזור ד.[1] חצור י.[1] דרשוביץ ו.ב.[2]

1. המחלקה לגיאולוגיה ומדעי הסביבה, אוניברסיטת בן גוריון בנגב, ת.ד. 653, באר שבע 84105
2. חברת גולדר, רדמונד, וושינגטון, והמחלקה להנדסה אזרחית וסביבתית, אוניברסיטת וושינגטון, סיאטל, וושינגטון.

גישה חדשה, המשלבת שתי סביבות עבודה ממוחשבות, מאפשרת הדמיה ספרתית נאמנה יותר של תופעת סטרוקטורליות מגוונות לצורך חישובים גיאו-הנדסיים. העבודה מציגה

שימוש בעוקבים מלאכותיים וסביבתיים מאפיקים סלעיים בנחלי אכזב להערכת קצבי הזרימה ומנגנוני החלחול במסלע קרבונטי.

ארבל י.[1], גרינבאום נ.[1], לנג י.[2], פלוריאן ו.[2], ענבר מ.[1], ויטנברג ל.[1]

1. החוג לגיאוגרפיה ולימודי סביבה, אוניברסיטת חיפה.
2. Institute of hydrology, Freiburg University, Germany.

החדרה של עוקבים מלאכותיים באפיקי אכזב סלעיים בשילוב עם ניטור סמנים סביבתיים אפשר הבנה והערכה כמותית של מנגנוני הזרימה ומהירותם בחידור למי התהום. הוכחו קיומם של נתיבי חידור מועדפים אל מי תהום, דרך שברים, סדקים ו/או מולכים קרסטיים, קצבי הזרימה ב"קצרים" אלו יכולים להיות מהירים ביותר ולכן מהווים אזורי סיכון לזיהום מי התהום. העוקבים המלאכותיים מאפשרים זיהוי וודאי של מקור הזיהום, והערכת הסיכון (זמני הגעה ושהיה).

אפיון ברזולוציה גבוהה של פרט פצלי השמן בישראל – עדויות על שלביה האחרונים של מערכת הפוריות הגבוהה בקרטיקון העליון על פי פורמיניפרים

אשכנזי-פוליבודה ש.[1,2], אברמוביץ ס.[1], שניידר-מור א.[1], פיינשטיין ש.[1], אלמוגי-לבין א.[2]

1. המחלקה לגיאולוגיה ומדעי הסביבה, אוניברסיטת בן-גוריון בנגב, באר שבע
2. המכון הגיאולוגי, ירושלים

החתך העבה של פצלי שמן בנגב מייצג שינוי התפתחותי חשוב וארגון מחדש של האקוסיסטמה הביולוגית במערכת הפוריות הגבוהה בקרטיקון העליון בדרום התטיס. שינויים חדים במאספי הפורמיניפרים במעברים שבין גג פרט הפוספט לפרט פצלי השמן וממנו לפרט החוואר, מסמנים עליה באוורור הקרקעית והעמקה ומעידים על דעיכתה של מערכת הפוריות הגבוהה באזורנו.

התפתחות צפון השילד הערבי-נובי: עדויות חדשות מיחסי Nd ו-Hf

בארי-שלוין י.[1], קציר י.[1] קליינהנס א.ס.[2] בלישרט-טופט י.[3]

1. המחלקה למדעי הגיאולוגיה והסביבה, אוניברסיטת בן גוריון
2. GZG – Isotopengeologie, Georg-August Universität, Göttingen, Germany
3. Laboratoire des Sciences de la Terre, Ecole Normale Supérieure, Lyon, France

יחסי Nd ו-Hf אשר נמדדו בסלעים מהקבוצות הקלק-אלקלינית בתוליתית והאלקלינית (635-580 Ma) מדרום ישראל וסיני מחולקים לשלוש קבוצות ע"פ המיקום הגיאוגרפי. ההשלכות של חלוקה זו על מודלים של יצירת השילד יידונו בהרצאה.

מערכת הפחמן במי התהום המלוחים באזור ים המלח

אברהמוב נ.[1,2], סיוון א.[1], לזר ב.[3], לבנברג ע.[2,3], יחיאלי י.[2]

1. המחלקה לגיאולוגיה וסביבה, אונברסיטת בן גוריון בנגב
2. המכון הגיאולוגי הישראלי, ירושלים
3. המכון למדעי כדוה"א, האוניברסיטה העברית, ירושלים

אנליזות כימיות ואיזוטופיות של מי התהום המלוחים באזור נחל ערוגות מלמדות על שחלוף בין ים המלח לבין מי התהום. עם זאת נראה כי במי התהום מתרחש תהליך בקטריאלי הגורם לדלדול בערכי הפחמן 13. ככל שמתרחקים מים המלח השחלוף קטן וניכרת השפעת מי התהום המתוקים.

מיפוי העתקים בעזרת מדידות רעש רקע באזור עיר עפולה וסביבתה

אטייב ג., זסלבסקי י., גורשטיין מ., קלמנוביץ' מ., אקסיננקו ט., גילר ו., פרלמן נ., ליבשיץ י., דן א., גילר ד., שוורצבורג א.

המכון הגיאופיסי לישראל, אגף סיסמולוגיה, ת.ד 182, לוד, ישראל

על שטח המחקר בוצעו 320 מדידות רעש רקע. מתוצאות שקבלנו עולה כי קיימות שתי שכבות המחזירות של בזלת מגיל ניאוגן. ניתוח תוצאות וחישוב מודלים של תת קרקע אפשרו בניית שלושה חתכים גיאופיסיים ומיפוי מערכת העתקים החולקים את השטח למספר בלוקים בעלי עומק שונה.

האם המשוואה: קר=לח – חם=יבש, הייתה תקיפה לגבי כל הרביעון במזרח התיכון?

איסר א.ש.

המכונים לחקר המדבר, אוניברסיטת ב"ג בנגב

מפלסי ימת הלשון הגיעו לשיא בתקופת הקרחון האחרון. במשך רוב ההולוקן תקופות קרות היו לחות ותקופות חמות יבשות. האם האגמים בנגב בפלייסטוקן התחתון חלו בתקופות קרחוניות? האם היו אלו התקופות של פתיחת הגשר מאפריקה לאסיה?

שחזור מבנה תת קרקע וזיהוי העתקים בעזרת מדידות רעש רקע בחלק הדרומי של עמק זבולון

אקסיננקו ט., זסלבסקי י., גורשטיין מ., קלמנוביץ' מ., גילר ד., דן א., פרלמן נ., אטייב ג., גילר ו., ליבשיץ י., שוורצבורג א.

המכון הגיאופיסי לישראל, אגף סיסמולוגיה, ת.ד 182, לוד, ישראל

במחקרנו בצענו סדרת מדידות רעש רקע לאורך ארבעה חתכים המכוונים מדרום לצפון בחלק הדרומי של עמק זבולון. אורכם הכללי של החתכים 17.5 ק"מ ומספר אתרי מדידה – 80. תוצאותינו הוכיחו כי שיטת יחס ספקטראלי מרעש רקע יכולה לשמש כלי יעיל למחקר מבנה תת קרקע.

על המיתאם בין מגניטודות של רעידות אדמה

שפירא א. 34

מערת סיף (סוסי) בשומרון כחלון תצפית למילוי חוזר באפי-קארסט

שפר נ., מוטי כהן מ., מורין א., גרודק ת., גימבורג א., גבירצמן ח., פרומקין ע. 35

האינטראקציה בין האירועים הטקטונומגמטיים הקרטיקוניים לבין שולי היבשה של הלבנט – גיאוכרונולוגיה, ליתוסטרטיגרפיה ומבנה

שגב ע. 30

שלבים מוקדמים בהתפתחות הטקטונית של הגליל במהלך הקנוזואיקון

שגב ע., ליחובסקי ו., וינברגר ר., שטנר א. 31

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שדה א. ר., הול, ג'. ק., עמית ג., גולן א., שדה ה., גור-אריה ל., טיבור ג. 31

סקר סונר רב אלומות בים המלח – תוצאות ראשוניות

שדה א.ר., הול, ג'. ק., שולץ ב., אל-זועבי א. ש., בן-אברהם צ., עכווי ע., עמית ג., טן-ברינק א., מאייר ל. א., קולדר ב. ר., גונן מ., שדה ה. 32

מחקר בספקטרוסקופית אינפרא אדום של גלניט ולרניט בצריפת חרסיות גיריות

שובאל ש., הרדי ד. 32

אנליזות חומרים בצריפה של קאוליניט באמצעות ספקטרוסקופית אינפרא אדום ורמאן ויישום טכניקת מתאם של הספקטרה

שובאל ש., בודיאול מ., פנר ג. 32

העתק אור עקיבא: העתקה מיוקנית בשולי היבשת של הלבנט והקשר לבלוק הכרמל

שטיינברג ג'., גבירצמן ז., פולקמן י., גבירצמן ח. 33

תובנות חדשות על התפתחות אגן החולה, העתק ים המלח

שטנר א., ויינברגר ר. 33

הידרוגאולוגיה חופית והשונות המרחבית והעיתית של שפיעת מי תהום אל הים: דוגמא ממפרץ דור (דרום חוף הכרמל)

שלם י., ויינשטיין י., יחיאלי י., סורזנסקי פ., בארנט ו., חרות ב. 33

התפתחות המפלסים והקרקעות במישורי פארן כתלות בתנאים טקטוניים יציבים ותנאים אקלימיים משתנים מסוף הפליוקן ועד היום

שמחאי א., אמית ר., מטמון א., חביב א., אמל י., פורת נ., מקדונלד א., בנדטי ל., פינקל ר. 34

מדידת עצמה אבסולוטית של השדה המגנטי מתוך דוגמאות סיגים סינתטיים - השלכות על חקר שינויים קצרי טווח בשדה הגיאומגנטי

שער ר., רון ח., עגנון א., קסל ר., טוקס ל. 34

שיווי משקל דינאמי במי-תהום בזמן ירידת מפלס אגם: דוגמא מים המלח

קירו י., יחיאלי י., לייחובסקי ו., שלו א., סטרינסקי א. 27

אומדן הסכנה הצפויה ל"מובל השלום" (תעלת ים-סוף – ים-המלח) בעקבות אירועי שיטפון: ניתוח באמצעות כלי ממ"ג

קלבו ר., שירב מ. 28

התפלגות הגדלים של גלישות: יחס בין שטח לבין נפח של גלישות

קלדרון-עשהאל ב., כץ ע., אהרונוב ע., מרקו ש. 28

הערכת תגובת אתר וסיכונים סייסמיים לתכנות בנייה באזורים עירוניים: דוגמת שכונת קריית דן בעיר רמלה

קלמנוביץ' מ., זסלבסקי י., גורשטיין מ., פרלמן נ., גילר ו., ליבשיץ י., שוורצבורג א., דן א. 28

דייקים מורכבים בדרום ישראל: מפתח להבנת המקור של גרניטים פוסט-פאן-אפריקאיים מטיפוס A

קציר י., ליטבינובסקי ב., אייל מ., זנבילביץ' ע., באר-שלוין י. 28

גורלו של הרדיום ברכז ממתקן התפלה של מים מליחים

רוזנברג י., אורן י., פולקמן י., ווגגוש א., גנאור י. 29

חיפושי יהלומים בגופים מגמתיים שנמצאים בהר כרמל השייכים לקרטיקון העליון בהתבסס על תוצאות מינרולוגיות, גיאוכימיות ופטרוגרפיות

רופ א., קלמנוביץ י., פולנסקי א., בייקוב י. 29

החדרת מי גאות מנחל שילה אל אקויפר ירת"ן והשלכות על החדרה עתידית

רופא ב. 29

קינטיקת ההשקעה של גבס כתוצאה מערבוב מי ים סוף עם מי ים המלח – השוואה בין ניסוי מעבדה לניסוי שדה.

רזניק א., גנאור י., לאטי י., אהרוני מ., כהן א., מימון מ., גבריאלי א. 30

מבט מחודש על תת-הקרקע של הר הכרמל וסביבתו על בסיס פענוח של נתונים גרבימטריים ומגנטיים

ריבקוב מ., לוי א., בן-גיא י., 30

התפתחות גיאומטרית ומבנית של משטחי העתקה

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שימוש בעוקבים מלאכותיים וסביבתיים מאפיקים סלעיים בנחלי אכזב להערכת קצבי הזרימה ומנגנוני החלחול במסלע קרבונטי.

ארכל י., גרינבאום נ., לנג י., פלוריאן ו., ענבר מ., ויטנברג ל. 2

אפיון ברזולוציה גבוהה של פרט פצלי השמן בישראל – עדויות על שלביה האחרונים של מערכת הפוריות הגבוהה בקרטיקון העליון על פי פורמיניפרים

אשכנזי-פוליבודה ש., אברמוביץ ס., שניידר-מור א., פיינשטיין ש., אלמוגי-לבין א. 2

התפתחות צפון השילד הערבי-נובי: עדויות חדשות מיחסי Nd ו-Hf

באר-שלוין י., קציר י., קליינהנס א.ס., בלישרט-טופט י. 2

ניסויי חיכוך בגזירה ישירה

בירן ע., חצור י., זיו א. 3

הקניון של מערב ראשון והשלכותיו על תבנית הניקוז הטרציארית של שולי הלבנט

בן-גיא י. 3

מדידות מגנטיות ברזולוציה גבוהה בהר עמרם

בס מ., שטייניץ ג., מרקו מ. 3

גישה משולבת חדשה להדמיה ספרתית של תופעת שכבות מכאניות בסלעים סדימנטריים

בקון-מזור ד., חצור י., דרשוביץ ו.ב. 3

הוצאה לאור ע"י החברה הגיאולוגית הישראלית

עיצוב גרפי: חנה נצר-כהן

תמונת שער: מתלול צורים. צילום: נבות מורג

הפקה: אפרת 2000, ירושלים

טלפון: 02-6522144

כנס החברה הגיאולוגית הישראלית

תקצירים

עורכים:
ירון בארי-שלוין
נעמה גזית יערי
נבות מורג
יבחר גנאור
איתי רזניק
רן נוף

נצרת 6-8.4.08 א'-ג' ניסן תשס"ח

דו"ח קרן הפרס ע"ש פרץ גרדר ז"ל ליום 31/12/07

דו"ח קרן הפרס ע"ש פרץ גרדר ז"ל ליום 31/12/2007

בהתאם להוראות ועדת הביקורת של החברה הגיאולוגית, אשר ניתנו לוועד החברה וליו"ר הקרן, מובא להלן מצב הקרן נכון ליום 31/12/2007.

א. השקעות בניירות ערך	**ערך נקוב**	**ערך בשקלים חדשים**
הראל-פיא - קרן נאמנות	1,112.94	4,123.44
סגולה - קרן נאמנות	5,223.00	21,558.98
סה"כ ניירות ערך		**25,682.42 ₪**

ב. השקעות בשקלים	**ערך בשקלים חדשים**
ע"ש 02500/21-330	110.36

1. בשנת 2007 חולק הפרס למר עדי טורפשטיין ומר רועי גרנות וזאת לפי החלטת ועדת הפרס. הפרס, ע"ס 400 ₪ כ"א, ניתן באסיפה הכללית של החברה הגיאולוגית בים המלח.
2. הפרס מומן מפדיון של ניירות ערך מקרן נאמנות הראל-פיא.
3. הדו"ח הכספי נערך עפ"י מסמכי בנק לאומי בע"מ, סניף ככר ציון, ירושלים.

בברכה
רני קלבו
יו"ר הקרן

הרינו לאשר כי בדקנו את הדו"ח ומצאנו אותו מתאים למסמכים אשר הוצגו בפנינו.
ועדת הביקורת:

אלון זיו

עלית וויל שפרן

תרומות מוסדות שהועברו ישירות לספקים

	סכום (₪)	יעד התרומה
האוניברסיטה העברית	5,000.00	חוברות תקצירים
אוניברסיטת בן-גוריון	4,000.00	חוברות תקצירים

התחיבויות:	העיתון הישראלי למדעי האדמה	55,000.00
	אתר אינטרנט	3,050.72
	רו"ח	2,200.00
	עו"ד	1,778.78
	סה"כ ₪	62,029.50

5.3.2008

הנדון: פרוטוקול ישיבת ועדת ביקורת

לאחר שעיינו בדוחות הכספיים של העמותה לשנת הכספים 2007 אנו מאשרים אותו ואין לנו הערות נוספות.

חברי ועדת הביקורת

עלית וייל-שפרן

אלון זיו

חברה גיאולוגית ישראלית "ע"ר"

דוח כספי לשנת 2007

החברה הגיאולוגית הישראלית ת.ד. 1239
מספר עמותה 580008415, מספר תיק מס הכנסה 550008411

מאזן הכנסות והוצאות החברה הגיאולוגית לשנת 2007
מתאריך 1.1.2007 עד לתאריך 31.1.2007
חשבון עו"ש 240999 בבנק הפועלים (סניף 533)

הכנסות

העברה משנת 2006			22,160.68
		מזומן (קופה קטנה)	0.00
		עו"ש בבנק הפועלים	22,160.68
השתתפות בכנס			148,840.00
		השתתפות בכנס 2007	148,840.00
דמי חבר			77,400.00
	11 4%	חברי כבוד	0.00
	69 29%	סטודנטים/פנסיונרים	13,800.00
	159 67%	רגיל	63,600.00
	סה"כ 239	חברים	
תרומות			15,500.00
			1000.00$
		תרומה אנונימית	1000.00$
		משרד התשתיות הלאומיות	2,500.00
		נשר סחר (שווק מלט) בע"מ	3,000.00
		רותם-אמפרט ומפעלי ים המלח	5,000.00
		מפעלי ים המלח (לכנס 2008)	5,000.00
		סה"כ הכנסות ₪	**263,900.68**
		סה"כ הכנסות $	**1000$**

הוצאות

כנס			181,831.07
		אירוח במלון נירוונה והסעות	144,000.00
		שירה בציבור	2,340.00
		חולצות	2,587.00
		ביטוח סיורים	4,285.00
		הפקת חוברות תקצירים וסיורים, עבודות דפוס שונות	19,901.00
		מתנות	7,941.00
		מים מינרלים	400.00
		האמת המטרידה - סרט	126.57
		שונות	250.50
אתר אינטרנט			199.49
		חידוש דומיין	199.49
הוצאות תפעוליות			228.72
		עמלות בנק	228.72
		עמלות בנק $	5.00$
		סה"כ הוצאות ₪	**182,259.28**
		סה"כ הוצאות $	**5.00$**

העברה לשנת 2008

עו"ש בבנק הפועלים ביום 31.1.2007	81,530.90
מט"ח $	995.00 $
מזומן (קופה קטנה)	110.50
סה"כ הוצאות ₪	**263,900.68**

על החתום:
יבחר גנאור
נשיא החברה הגיאולוגי

איתי רזניק
גזבר החברה הגיאולוגית

אנחנו קוראים בזאת לחברי החברה הגיאולוגית וציבור החוקרים במדעי כדור הארץ השונים (לדוגמא: גיאולוגיה, אטמוספירה, אוקיאנוגרפיה, הידרולוגיה, סביבה ואחרים השונים) להגיש מאמרים לעיתון. כמו כן, אנו פונים לחברים להציע נושאים לחוברות נושאיות ולהתנדב לערוך אותן.

בתחילת 2008, החליף יהודה אנזל את יוסי מרט בתפקיד העורך הראשי של העיתון הישראלי למדעי האדמה. אנו מודים ליוסי מרט על העבודה הרבה שהוא השקיע בעריכת העיתון ומאחלים הצלחה ליהודה.

Planet Earth). המכון הגיאולוגי והחברה הגיאולוגית לקחו על עצמם לרכז את הפעילות בישראל במסגרת שנה זו. בשלב ראשון מונה שחר בוקמן כרכז פעולות של שנת מדעי כדור הארץ והוקמה ועדת היגוי. כמו כן קיבלנו הבטחה לעזרה במימון הפעולות מהועד הישראלי לאונסקו.

במסגרת "שנת מדעי כדור הארץ הבין לאומית- מדעי כדור הארץ למען החברה", מתוכננות פעילויות רבות, ביניהן:

- סדרת ימי עיון שיציגו את המחקר החדשני והרלוונטי לחברה, בנושאים: משאבים מול צרכים, רעידות אדמה, משאבי הים ומשבר האקלים (יוזם: ניר אוריון)
- יום מדעי כדור הארץ - הרצאות בערים לאורך בקע ים המלח בנושא: רעידות אדמה חזקות לאורך בקע ים המלח.
- 4 סרטים תיעודים שיציגו נושאים מתחום מדעי כדה"א בהקשרם החברתי-תרבותי-כלכלי. הסרטים יוכנו בשיתוף עם ערוץ 1 וישודרו במסגרת התוכנית "מבט שני".
- סדרת הרצאות במסגרת האוניברסיטה המשודרת בגלי צה"ל, (מתאם: יהודה אנזל).
- חודש בו ישודרו בגלי צה"ל תכניות "60 שניות על שנת כדור הארץ".
- פעילות מיוחדת בשיתוף אוניברסיטת ת"א עם זוכי פרס דן דוד, שחלקו הוקדש השנה למדעי כדור הארץ.
- סדנה בין לאומית בנושא "בקע ים המלח כמעבדה טבעית לחקר רעידות אדמה היסטוריות ופרה-היסטוריות", ביוזמת המכון הגיאולוגי (מרכזת: רבקה אמית) ובשיתוף עם ועדת המשנה לפלאו-סייסמולוגיה ב-INQUA.
- תרומה לקהילה המארחת- הרצאות לתלמידים מאזור נצרת במהלך כנס החברה הגיאולוגית.

העיתון הישראלי למדעי האדמה:

בשנים האחרונות לא הצלחנו להוציא את החוברות במועד. מאז כנס החברה האחרון ייצאו שתי חוברות בלבד. חוברת שלישית שהיא הראשונה לשנת 2007 אמורה לצאת לאור לקראת הכנס. ביחד עם שתי החוברות שיצאו בשנה לפני כן, יצאו 5 חוברות בשנתיים (במקום 8 חוברות). הפיגור בהוצאת החוברות נובע בעיקר ממספר המאמרים המועט המגיע לשולחן המערכת ומאיכותם. מספר זה נמצא במגמת ירידה: בשנת 2005 הגיעו למערכת 16 כתבי יד שמתוכם התקבלו לפירסום 9 (כלומר גם בעיית איכות), בשנת 2006 הגיעו 14 מאמרים (12 התקבלו) ובשנת 2007 הגיעו רק 5 כתבי יד (2 התקבלו). כמו כן הוכנו על ידי עורכים-אורחים מספר חוברות סביב נושאים מוגדרים. חוברת אחת שנערכה על ידי עינת אהרונוב וולדימיר ליחובסקי בנושא מתמטיקה גאולוגית (בהגדרה כוללנית לנושא) אמורה לצאת לקראת הכנס. מספר חוברות נמצאות בעריכה: א) חוברת שתכיל בין עשרה לששה עשר מאמרים בנושא גיאוארכיאולוגיה (עורכים מובילים: סטיב ויינר ורותי גרוס) ומצוייה בשלב של תחילת ביקורת, ב) חוברת בנושא גאומורפולוגיה בשלב של איסוף מאמרים (אנא צרו קשר עם העורך: יונתן לרון), וחוברת מוצעת בנושא הים האגאי (עורך: דב אביגד).

פעילות החברה הגיאולוגית תשס"ז-תשס"ח (2007-2008)

החברה הגיאולוגית ומרכז מדע רמון

בכנס החברה הגיאולוגית שהתקיים ב- 2007 בים המלח נדונה באסיפה הכללית מערכת היחסים של החברה הגיאולוגית ומרכז מדע רמון (ממ"ר) וזאת עקב צמצום חלקו של המחקר הגיאולוגי באופן משמעותי בממ"ר.
סגן נשיא החברה הגיאולוגית, אריאל היימן, לקח על עצמו לטפל בנושא יחד עם מספר חברים נוספים. התקיים דיון נוקב ולעיתים לא קל עם מרכז מדע רמון, תוך עירוב בשלב מסויים גם של משרד המדע. הדיון התנהל עם ראש הועד המנהל של ממ"ר, פרופ' יעל לובין ועם המנכ"ל, ד"ר כרמי קורין. ממ"ר הבין את החשיבות הרבה אותה רואה החברה הגיאולוגית לפעילות במדעי כדור הארץ במרכז מדע רמון וזאת משום חשיבותו הגדולה של מכתש רמון בפרט וארץ המכתשים בכלל.
במהלך דיונים מתמשכים סוכם הסכם הבנות בין עמותת מרכז מדע ארץ המכתשים לחברה הגיאולוגית אשר ממסד את מערך היחסים בין העמותות ואת הפעילות הגיאולוגית בממ"ר.

כנס החברה הגיאולוגית הישראלית:

הכנס יתקיים במלון גולדן קראון בנצרת בין התאריכים 6-8 באפריל 2008. בכנס צפויים להשתתף כ- 200 חברים. יתקיימו 94 הרצאות, ויוצגו 33 פוסטרים. ביום השלישי של הכנס יתקיימו 6 סיורים מקבילים באזור הגליל והכרמל. במהלך הכנס ייערכו הרצאות לתלמידים באזור נצרת, כחלק מהפעילות של "שנת מדעי כדור הארץ למען החברה".

פרסי החברה הגיאולוגית

פרס החברה הגיאולוגית על שם דר' פרץ גרדר ז"ל מוענק השנה לגוני יגודה-בירן על עבודתה לתואר שני בנושא " הערכת הסכנה הסיסמית במזרח הכנרת באמצעות ניתוח לאחור של כשלים טבעיים ומבניים עקב הטרחה סיסמית".

פרס החברה הגיאולוגית ע"ש פרופ' רפי פרוינד ז"ל מוענק השנה לד"ר אלון זיו על סדרת מאמריו העוסקים בפיזור בזמן ובמרחב של אירועים סיסמיים ובעיקר של תופעת ה- aftershocks, ובפיתוח מודלים מתמטיים-ספרתיים לחקר מנגנון יצירתם, המכניקה שלהם והתנהגותם בזמן ובמרחב.

שנת מדעי כדור הארץ הבין לאומית- מדעי כדור הארץ למען החברה

בעקבות יוזמה של האיגוד הבינלאומי למדעי הגיאולוגיה (IUGS) בשיתוף עם אונסקו הכריזה עצרת האומות המאוחדות על שנת 2008 כשנת מדעי כדור הארץ הבינלאומית (International Year of

חברי ועד החברה הגיאולוגית הישראלית 2007-2008:

- נשיא - יבחר גנאור
- סגן נשיא - אריאל היימן
- מרכז פעולות - ירון בארי
- גזבר - איתי רזניק
- מנהל אתר האינטרנט - רן נוף
- אחראי סיורים - נבות מורג
- חברת ועד - נעמה גזית יערי

מנהל הקרן על שם דר' פרץ גרדל ז"ל - רני קלבו

ועדת ביקורת - עלית וייל-שפרן ואלון זיו

החברה הגיאולוגית מודה לחנה נצר-כהן, בת שבע כהן, אירה פאר, שלמה אשכנזי ויעקב רפאל על עזרתם בארגון הכנס והכנת חוברות התקצירים והסיורים.

חברי ועדת פרס החברה הגיאולוגית ע"ש דר' פרץ גרדר ז"ל לשנת 2008:

יבחר גנאור, אורי פריזלנדר, בעז לזר

חברי ועדת פרס החברה הגיאולוגית ע"ש פרופ' רפי פרוינד ז"ל לשנת 2008:

יבחר גנאור, יהודית הר לבן, רונית קסל, ברק חרות, שמעון פיינשטיין

החברה הגיאולוגית הישראלית מודה למוסדות הבאים על השתתפותם ותרומתם לכנס השנתי בנצרת:

משרד התשתיות הלאומיות

המכון הגיאולוגי

המכון הגיאופיסי לישראל

האוניברסיטה העברית, המכון למדעי כדור הארץ

אוניברסיטת בן-גוריון בנגב, המחלקה למדעי הגיאולוגיה והסביבה

אוניברסיטת בן-גוריון בנגב, מכון צוקרברג לחקר המים

אוניברסיטת חיפה, בית הספר למדעי הים

נשר מפעלי מלט ישראליים בע"מ

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כנס החברה הגיאולוגית הישראלית

תקצירים

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Comparison between H/V spectra ratio from ambient noise and theoretical 1D model obtained from seismic refraction survey

Zaslavsky Y.

Seismology Division, Geophysical Institute of, Israel, P.O.Box 182, Lod, Israel

We compare H/V spectral ratios obtained from ambient noise with transfer function of 1D model. To estimate parameters of multi-layer analytical model such as S-wave, thickness, density and damping of each layer, experimental well was drilled down to a basement (total depth 70 m), samples from drills were selected for geotechnical investigations and shear wave velocities were determined by both survey refraction and down-hole measurements.

Our research consisted of two stages. The first stage was preliminary analysis of site effect in Ramat HaKovesh area before drilling borehole. For this purpose on May 10, 2006 ambient noise measurements were carried out at ten points along a profile over supposed borehole location. The second stage aimed to estimate site effect near the drilled borehole and to check stability of preliminary measurements at some locations from the first stage. This experiment was carried out on March 26, 2007. The measurements conducted in different months yielded strongly similar results.

Observed transfer functions were modeled using relative amplification function from computer program SHAKE. In according with experiment conditions (blind prediction) we could use surface-wave refraction survey results only. Therefore we started with direct modeling and used shear-wave velocity and layer thickness from seismic refraction data. The density and specific attenuation in different lithological units were chosen on the base of different literature sources.

Our results suggest that calculated transfer function based on geotechnical measurements may not accurately predict empirical weak motion transfer function. A better fit to the amplitude of resonance peak was obtained by integrating data from extensive ambient noise measurements, information about local geology and S-wave velocity profile derived from refraction line.

Improving probabilistic earthquake prediction algorithms, by tuning to regional geological characteristics and multiple potential precursors

Yaniv M.

The institute of Earth Sciences The Hebrew University of Jerusalem

It is widely accepted that the earth's crust, which produces earthquakes, shows the behaviour of a complex system, one that is in a near-critical state most of the time. According to this view, earthquakes are singular events of energy release that cannot be deterministically predicted. It might be possible, however, to find patterns of behaviour and produce probabilistic forecasts of large events. A few methods have been trying to do that, with different levels of success. The RTP (Reverse Tracing of Precursors) method stands out with its performance in prediction, and is significantly better than random guesses. RTP system searches for premonitory "chains" of seismic events that are defined by a number of parametric conditions, mainly magnitude and distribution in space and time. It is clear that all large magnitude earthquakes follow a premonitory chain; not all chains lead to a large earthquake. The main goal of the RTP system is to separate "dangerous" chains from the rest. This is being done up to now by analysing time dependence of so called "seismic functions" on data from the catalogue (epicentre loci, time of events, magnitude etc.). The currently used algorithms disregard regional geological characteristics. These algorithms are being used for an on-going experiment of prediction-in advance. The experiment is monitoring four seismogenic regions worldwide, the Middle-East being one of them. The two largest earthquakes in this region occurred in the mid 1990s (M7.2 Nueiba, 22/11/1995; M6.9 Paphos, 9/10/1996) were preceded by such premonitory chains; these are the longest chains identified in the region. This work aims at improving the scheme for filtering chains by incorporating new and more advanced pattern recognition algorithms and methods. The improved system will then be calibrated using parameters representing regional geological characteristics; selection of chains that lead to a large earthquake might be further improved by using additional potentially precursory data, such as geochemical, isotopic, hydrological, magnetic and atmospheric measurements. At present, our system is capable of separating chains from a catalogue, evaluating seismic data and calculating values of long-term functions from seismic catalogues data.