SUPER-SENSITIVE MAGNETIC OBSERVATIONS AT THE EILAT TEST SITE (FIRST RESULTS).

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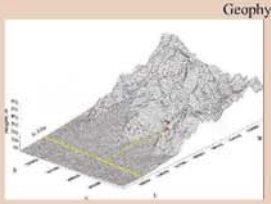
New super-sensitive potassium magnetometer-gradiometer was installed in the geophysical tunnel near Eilat, Israel within the framework of a joint Canada-Israel scientific project sponsored by CIIRDF. The matter of the project is long-term simultaneous short-base magnetic gradiometer measurements together with registration of Radon emanation and seismic monitoring, aiming to search for correlation with tectonic activity and precursor phenomena. The geophysical test site is located in a raised structural block at the western margin of the Arava segment of the active Dead Sea Rift.

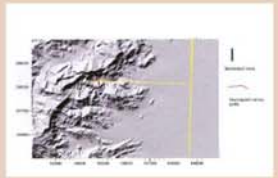
The magnetometer, produced by GEM Systems, Canada, comprises three total magnetic field channels with 0.05 pT/Hz sensitivity and 50 msec sampling period. The analytical setup is installed in a horizontal 170-m long tunnel oriented N-S within the local Precambrian granite-porphyry basement. Two sensors are placed with a 3-m separation ("short-base") at the far end of the main tunnel and the third sensor ("long-base") is located at the far end of a lateral E-W branch, 40-m long.

Records over about half a year show diurnal variations of "short-base" and "long-base" gradiometer readings of about 50 pT and 800 pT respectively. Joint analysis of gradiometer and vector magnetometer (DIDD and Fluxgate) time series reveals a high correlation (about 99%) of gradient variations with external field declination. Such unexpected behavior of the gradient can be explained by induced magnetization of the surrounding rocks. A spatial structure of this secondary field is attributable to main field direction changes inside the tunnel.

Geophysical tunnel in the Amram massif



3D view of the Amram mountain (GIS-data from SOI). A bar shows the tunnel location.

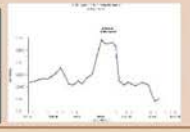


Shaded relief map of the Amram mountain and surrounding area (GIS-data from SOI).

Geology of the area. Precambrian Amram Granite Porphyry is exposed in a structurally elevated block along the western margin of the southern Arava Rift. Major faults of the Rift are 2-4 km to the east of it.

Approach to the Geophysical Tunnel in the Amram massif. (View from the point shown on the '3D view' picture by the red star).

The view on the Amram mountain peak from the point shown on the 'shaded relief map' by the red star.



Magnetic structure of in-situ rocks (performed by Dr. Igor Tunyi from the Slovakia Geophysical Institute) as follows:
Magnetization is hard and stable;
Main carrier of magnetization is hematite;
Main value of magnetic susceptibility K=67.9 10^-6 uSI.

The magnetic anomaly field is produced by the magnetic rocks of the Amram massif. The profile of measurements is shown on the 'shaded relief map'.

Geomagnetic and radon equipment in the geophysical tunnel

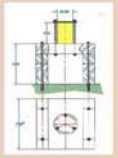
The entrance to the tunnel (view from the opposite mountain).

Low magnetic door (stainless steel + concrete) has been specially designed so to provide no disturbanceto precise magnetic measurements.

Equipment layout in the geophysical tunnel.

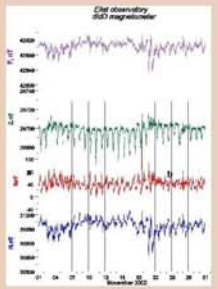
Sensor of DIDD magnetometer. This instrument measures both total magnetic field and its components

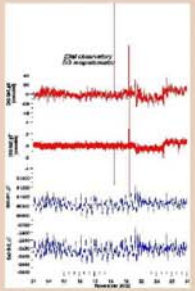
Supersensitive magnetic observations



SuperGrad magnetic sensors are installed on marble tables to minimize long-term drift in readings due to slight displacement of the basement.

Example of one month data acquisition: a) dIdD b) SuperGrad.





SuperGrad recordings (the two blue traces) are correlated to the declination recorded by the dIdD magnetometer. The two red traces show residuals after the elimination of external magnetic variations.