Geophysical Research Abstracts
Vol. 19, EGU2017-9690, 2017
EGU General Assembly 2017

Using Groundwater physiochemical properties for assessing potential earthquake precursor

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Worldwide studies reports pre-seismic, co-seismic and post-seismic reaction of groundwater to earthquakes. The unique hydrological and geological situation in Israel resulted in relatively deep water wells which are located close to seismically active tectonic plate boundary. Moreover, the Israeli experience show that anomalies may occurs 60-90 minutes prior to the seismic event (Guttman et al., 2005; Anker et al., 2016).

Here, we try to assess the possible connection between changes in physiochemical parameters of groundwater and earthquakes along the Dead Sea Transform (DST) region. A designated network of monitoring stations was installed in MEKOROT abandoned deep water wells, continuously measuring water table, conductivity and temperature at a sampling rate of 1 minute. Preliminary analysis compares changes in the measured parameters with rain events, tidal effects and earthquake occurrences of all measured magnitudes (>2.5Md) at monitoring area surroundings. The acquired data set over one year recorded simultaneous abrupt changes in several wells which seems disconnected from standard hydrological occurrences such as precipitation, abstraction or tidal effects.

At this stage, our research aims to determine and rationalize a baseline for "normal response" of the measured parameters to external occurrences while isolating those cases in which "deviations" from that base line is recorded. We apply several analysis techniques both in time and frequency domain with the measured signal as well as statistical analysis of several measured earthquake parameters, which indicate potential correlations between earthquakes occurrences and the measured signal. We show that at least in one seismic event (5.1 Md) a potential precursor may have been recorded.

Reference:

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