

## ULF/ELF/VLF Network report 2012

In the past year there have been a number of developments in the observations of ULF, ELF and VLF radiation in Israel, as related to Space Weather.

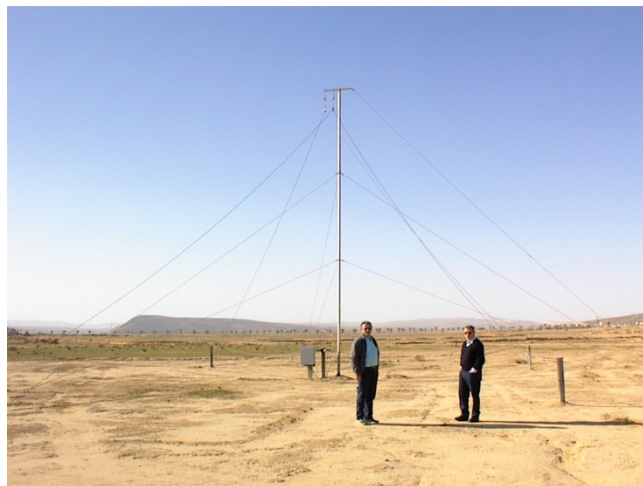
Our ULF sensors in Israel form a chain along the Dead-Sea Rift Valley, from the area of Eilat in the south, to the Dead Sea, and continuing into the north at the Hermon Mountain. During the last year we installed a new ULF station on the Hermon Mountain, although due to high noise levels this station may be moved to a new location in the coming year. The primary use of these sensors is for studying earthquake precursors, although the data also provide information on geomagnetic storms, Ionospheric Alfvén Resonances (IARs), and the Schumann resonances (SR) due to global lightning. These stations have been used to study Solar Proton Events in the last year as we get closer to solar max. The ULF magnetic coils are very sensitive to Space Weather events impacting the Earth's magnetic field.

Our main ELF station at Mitzpe Ramon, Israel, has been working for around 15 years, and we are in the process of reanalyzing and re-archiving all the data from the past 15 years. This station is also sensitive to geomagnetic storms, and has been used to study solar flares and X-ray events in the past year.

Our VLF stations in Israel have been used over the past year to study the narrowband (NB) signals transmitted by navy communication transmitters across Europe, and detected by our receivers in Israel. Since the power, frequency and location of the transmitters are constant in time, the variability in the observed signals is related to the ionospheric parameters along the great circle path, whether due to day-night differences, solar storms, sprites above thunderstorms, or changes in the D-region reflection height. In the last year we have been looking at the link between NB amplitudes and upper atmospheric temperatures. While the lower troposphere has been warming in the last decades, the upper atmosphere has been cooling much faster. We are investigating how the upper atmospheric cooling may impact the VLF NB signals detected at our stations in Israel. Can VLF observations be used to track temperature changes in the upper atmosphere?



ELF vertical electric-field ball antenna located at Mitzpe Ramon, Israel



VLF horizontal magnetic loops located at Sde Boker, Israel.