Geophysical Research Abstracts
Vol. 15, EGU2013-5793, 2013
EGU General Assembly 2013

New ELF (Schumann resonance) measurement station in Sierra Nevada, Spain

Sergio Toledo-Redondo (1), Jesús Fornieles (1), Alfonso Salinas (1), Antonio Méndez (1), and Jorge Portí (2)

(1) University of Granada, Department of Electromagnetism, Granada, Spain., (2) University of Granada, Department of Applied Physics, Granada, Spain.

Schumann resonances (SR) consist of ELF oscillations generated by lightning events, which propagate through the whole Earth-ionosphere cavity as transverse (to the radial direction) magnetic modes. Constant lightning discharges produced in the Earth's atmosphere compose the electromagnetic field sources which propagate in the atmosphere, continuously reflecting at the Earth's surface and the ionosphere. In the ELF band, due to the low atmospheric conductivity combined with the high conductivity of Earth's surface and lower ionosphere, waves can propagate several turns around the Earth's perimeter, generating the mentioned resonances. These resonances can be a tool for the study of the parameters of the lower ionosphere, the lightning activity itself, or events inside the atmosphere which are able to modify the electromagnetic properties of the propagating path.

With the aim of studying these capabilities, a new permanent ELF measurement station has been deployed in Sierra Nevada, Spain (37°02'N, 3°19'W). It is located in the heart of the National Park, at 2500 m above the sea level. The environment is almost free of anthropogenic noise, since it is a protected area with restricted access. It is composed of two high sensitivity (1.9 mV/nT/Hz) search coil magnetometers oriented toward NS and EW directions of the horizontal H field. Its dimensions are 1.35 m length and 13 cm diameter. In order to accomplish such sensitivity while keeping small dimensions, the coil has roughly 10^6 turns and employs a μ-metal permalloy core. The data are telemetered every hour to a server in the university. The station began recording the 18th July 2012. It is expected to obtain long-term high-quality samples of ELF natural radio noise due to the combination of high sensitivity and distance to human activity.

In this communication, a detailed description of the new observatory is presented, together with the first results of the measurements. Finally, a new technique to estimate Schumann resonance spectra from the time series is proposed, based on autoregressive model (AR).