

Vertical Magnetic Field Measurements of the Schumann Resonances

Intended for the Distant Electromagnetic Environment Produced by Lightning session

Colin Price (Department of Geophysical, Atmospheric, and Planetary Sciences, Tel Aviv University, Ramat Aviv 69978 Israel, cprice@flash.tau.ac.il), and Eli Galanti

The Schumann Resonance (SR) is an electromagnetic phenomenon in the atmosphere produced by global lightning activity. The resonances appear in the extremely low frequency (ELF) range, between 5-45 Hz. The resonance peaks are produced by the constructive interference between electromagnetic waves that travel a number of times around the globe (in the Earth-ionosphere waveguide) before decaying into the background noise. The first three modes of the Schumann resonances occur around 8, 14 and 20 Hz, and have been modeled and observed for many decades. Normally, measurements of the SR involve the vertical electric field (E_z), together with two horizontal magnetic components (H_x and H_y). This is due to the theoretical assumption that at far distances from the source, and after travelling around the globe, the horizontal E-field, and vertical H-field are zero.

We have carried out measurements of 3 magnetic components of the SR field in Israel, and show that while the H_z field is significantly weaker than the horizontal fields, the SR spectra is still clearly seen in the vertical magnetic field (see Figure). In this study we have analyzed the vertical magnetic SR fields (peak amplitude, peak frequency, and spectral width) and show the similarities and differences to the horizontal components.

