Geophysical Research Abstracts
Vol. 15, EGU2013-410, 2013
EGU General Assembly 2013

Space Weather investigation of guided VLF propagation in the plasmasphere using long term LEO satellite recordings above conjugate regions

Melinda Nagy (1) and Péter Steinbach (2)

(1) Space Research Group, Eötvös University, Budapest, Hungary (nagygmelinda@gmail.com), (2) MTA-ELTE Research Group for Geology, Geophysics and Space Sciences, Budapest (steinb@sas.elte.hu)

Recent study was focusing on characteristics of VLF propagation in the terrestrial plasma environment. LEO satellite recordings exhibit clear appearance of enhanced power in frequencies of artificial VLF transmitters, recorded above the transmitter and around conjugate point.
Geographic distribution of wave intensities at frequencies of selected Navy transmitters, derived by daily averaged electric VLF spectra of the French DEMETER was calculated and plotted during more than six years of satellite operation. The pattern of yielded intensity spots reflect the effect of sub-ionospheric propagation at the source, while longitudinally elongated, elliptic patches are seen in the vicinity of the conjugate region. The conjugate enhanced intensities are permanently present, proving guided, quasi longitudinal propagation in the plasmasphere.
Results of a case study of two, closely spaced selected transmitters, HWU 18.3kHz (46.71N; 1.124E, L=1.6, 400kW), and GBZ/GQD, 19.6kHz (54.91N; 3.28W, L=2.6, 100kW) are presented. In contrary to preliminary expectations, conjugate patches, calculated independently in two frequencies are mostly overlapping in the plots. Their midpoints fall between the conjugate footprints, suggesting plasmaspheric propagation in similar or same shells.
The shape and position of the conjugate patches vary with geomagnetic activity. However, no obvious relation between the characteristics of fitted ellipses and geomagnetic indices has been found yet.
Furthermore, comparison of conjugate power values allowed to study effects on VLF amplitudes, like actual structure of the plasmashere, or wave-particle interactions between man-made signal and radiation belt energetic electrons. Preliminary results of this study are useful inputs in a complex space-weather description.