Geophysical Research Abstracts, Vol. 8, 09752, 2006
SRef-ID: 1607-7962/gra/EGU06-A-09752

Oblique whistler propagation in the ionosphere - results of the first application of oblique impulse propagation model on DEMETER burst recordings

P. Steinbach (1), O.E. Ferencz (2), Cs. Ferencz (2), J. Lichtenberger (2), D. Hamar (2), J.J. Berthelier (3), F. Lefeuvre (4), M. Parrot (4)

(1) Research Group for Geoinformatics and Space Sciences, Hungarian Academy of Sciences, Budapest, (2) Space Research Group, Institute of Geography and Earth Sciences, Eötvös University, Budapest , (3) CETP/CNRS St Maur, France, (4) LPCE/CNRS Orleans, France

The dispersion of fractional-hop whistlers crossing the ionosphere is determined by the propagation characteristics, physical conditions along their paths. Low-Earth-orbit (LEO) satellites provide a unique opportunity to monitor the ionosphere by recording and analyzing whistlers with different dispersions. Although this approach is an effetive way to derive ionospheric parameters and their spatial and temporal distribution, despite the numerous satellite experiments fractional-hop whsitlers have been poorly analyzed and applied as remote sensing technique in the field of ionospheric research.

The dispersion values of the vast majority of whistlers recorded on board of LEO satellites appear to fall into distinct clusters. The largest of these dispersion values are thought to correspond to one-hop whistlers excited in the magnetic conjugate region and reached the satellite position after long plasmaspheric propagation along geomagnetic field lines. Whistlers exhibiting the smallest dispersion are widely accepted as fractional-hop ones reaching the satellite almost vertically. As an unexplained phenomenon a large number of whistlers, forming a clear cluster in the dispersion distribution may not be classified into any of these categories.

Fractional-hop whistlers recorded on board the DEMETER satellite were possible to model and interpret applying our full-wave impulse propagation model describing obliquely propagating signals on a basis of ionospheric and magnetic field standard model. The results yielded a basically new picture of ionospheric whistler propagation. Dispersions of fractional-hop whistlers themselves exhibit bimodal distribution, vary-

ing with magnetic latitude of the satellite. The diverse dispersion values correspond to different propagation directions from the lower ionosphere to the satellite and thus different angles between the direction of the propagation and the geomagnetic field along the path. Realistic, UWB modeling of a great number of whistlers appeared on the DEMETER ICE VLF recordings, acquired at large latitudinal range proved that the angle of oblique propagation is responsible for diverse dispersions of fractional hop whistlers. The most probable 3D propagation directions of the fractional-hop whistlers in the ionosphere in the vicinity of the satellite can be determined at a given magnetic latitude.