Geophysical Research Abstracts
Vol. 13, EGU2011-12199, 2011
EGU General Assembly 2011

Modeling of ionospheric electromagnetic earthquake precursors

Claudia-Veronika Meister, Benjamin Mayer, and Dieter H.H. Hoffmann

Institut für Kernphysik, Technische Universität Darmstadt, Germany (c.v.meister@skmail.ikp.physik.tu-darmstadt.de, 06151-164321)

The many-fluid magnetohydrodynamic theory is applied to describe modifications and the additional excitation of electromagnetic waves in the ionospheric E-layer by acoustic waves originating from lower altitudes. In comparison with former works here both the stratification of the ionosphere and the background electromagnetic field are taken into account. The altitudinal profiles of the plasma parameters and the electromagnetic field at times without acoustic waves are fitted to recent experimental data. It is shown that in the E-layer usual magnetohydrodynamic waves, as Alfvén and magnetoacoustic ones, are generated. However, by the influence of the acoustic waves and the related modification of the momentum transport between the neutral and charged particles, the amplitudes and propagation directions of the magnetohydrodynamic waves are changed. In the work mathematical expressions for the plasma density and electromagnetic field variations are derived and applied to the case of the appearance of acoustic waves with periods between 20 s and 5 min, which might occur before earthquakes. Besides related temperature fluctuations in the E-layer are evaluated. The results of the model are compared with recently observed changes of characteristic foE- and foEs-frequencies of the ionosphere one-three days before Asian earthquakes.