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Electrodynamic model of the atmosphere ionosphere coupling
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The numerous powerful natural and artificial phenomena influence to the ionosphere and stimulate an appearance of plasma and electromagnetic disturbances. The ionosphere is disturbed from below by earthquakes, volcanic eruptions, typhoons, thunderstorms, explosions. Disturbing factors of these processes are the atmospheric perturbations, electric currents, electromagnetic radiations, and increase of radioactivity level, charge aerosols transport. Numerous observations of anomalous plasma and electromagnetic phenomena in the ionosphere above the regions of seismic and meteorological activity are evidence that intense processes in these regions influence the state of the ionosphere during periods of from several hours to several dozens of days. An analysis of satellite data showed the presence of electromagnetic perturbations over a broad spectral interval, electron density fluctuations in the ionosphere, changes in the ionic composition and temperature of the plasma in the upper ionosphere, the anomalous IR radiation flux and the increase of DC electric field. These perturbations are localized within a magnetic field tube conjugated with the epicenter of an impending earthquake and typhoon. Simultaneously with electromagnetic and plasma phenomena in the ionosphere, an increase in the concentration of soil gases and aerosols, an increase in atmospheric radioactivity heating of the lower atmosphere, sharp changes in its electrophysical parameters were observed.

The key role in atmosphere-ionosphere interaction belongs to electromotive force (EMF) in the lower atmosphere. The external current of EMF is excited in a process of vertical atmospheric convection and gravitational sedimentation of charged aerosols over seismic and typhoon region. Aerosols are injected into the atmosphere due to intensified soil gas elevation in the lithosphere during the enhancement of seismic activity. As a basis for the theoretical modeling it will be used a mechanism of the electric field generation in the ionosphere by the EMF excited in closed global atmosphere-ionosphere electric circuit due to emission of charged aerosols, radioactive substances into the atmosphere and their transport by atmospheric convection during enhancement of seismic activity. Calculations show that the electric field of the current that flows in the ionosphere can reach values of several tens of mV/m observed on satellites. As a result the instability of acoustic-gravitational waves in the lower ionosphere is developed. This results in the formation of horizontal conductivity inhomogeneities, the generation of field ? aligned currents into the magnetosphere, and the formation of plasma layers in it. The interaction of conductivity inhomogeneities with electromagnetic field of lightning discharges results in the emission of extremely low-frequency radiation into the magnetosphere observed on satellites and magnetic field oscillations in the ultra-low-frequency range. Electric field strengthening in the ionosphere modifies vertical profile of its E, F and D layers related to plasma drift and ionosphere heating by electric current. At definite conditions the seismic related DC electric field can reach the breakdown value in some region of the atmosphere at altitudes over epicenter of seismic activity. Atmospheric turbulence leads to appearance of the random electric discharges. Comparison of the calculation results performed by above mentioned theory and the satellite observation data confirm above mentioned mechanism. One can consider that disturbed region is a source of other phenomena. Namely, there are scattering of the electromagnetic waves on the conducting canal of discharges, the glow of discharges region, the growth of ozone number density and the atmosphere heating of disturbed region.

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