

Possible Formation Mechanisms of Wenchuan Earthquake Ionospheric Precursors

*Maxim V. Klimenko^{1,2}, Vladimir V. Klimenko²,
Biqiang Zhao³, Valerij V. Bryukhanov¹*

*¹Department of Physics, Kaliningrad State Technical University,
236000, Kaliningrad, Russia*

*²West Department of N.V. Pushkov Institute of Terrestrial Magnetism,
Ionosphere and Radio Wave Propagation, Russian Academy of Sciences,
236015, Kaliningrad, Russia*

*³Beijing National Observatory of Space Environment, Institute
of Geology and Geophysics, Chinese Academy of Sciences, Beijing, China*

The problems of physical explanation and possible mechanisms of the seismo-ionospheric effects formation are under discussion. The assumption that observable of some days prior to

earthquake the ionospheric effects are caused by the disturbances of the zonal electric field in the near-epicentral area, stated by A.A.Namgaladze, was checked up in numerical calculations with use of the models GSM TIP and UAM and has found the confirmation. There is a question how such zonal electric fields can arise in the ionosphere prior to earthquakes? Now it is no answer to this question. Therefore for understanding of formation mechanism of ionospheric earthquake precursor it is necessary to understand the physics of lithosphere-atmosphere-ionosphere coupling prior to earthquake. There are proposed different mechanisms of such effects, for example, large- and small-scale internal gravity waves, atmospheric electric field, electromagnetic fields and emissions. However, the appearance of local large-scale seismo-ionospheric anomalies in Total Electron Content (TEC) it is possible to explain only by two of the mentioned mechanisms: an atmospheric electric field and/or small-scale internal gravity waves. In this paper the results of numerical calculations of the seismo-ionospheric effects related with strong Wenchuan earthquake are presented. The small-scale internal gravity waves and penetration of vertical electric field are considered as the formation mechanisms. It was done the comparison of calculation results with experimental data of TEC and critical frequency of the ionospheric F2-layer at various stations located close to the earthquake epicenter. The obtained results confirm the proposed mechanisms of seismo-ionospheric effects formation by small-scale internal gravity waves and the penetration of the seismogenic vertical electric field from the atmosphere into the ionosphere.

A. Namgaladze. An influence of the thermospheric wind variations on the enhanced electron density regions in the night-time ionospheric F2-layer and in the plasmasphere. Proceedings of the 6th International Conference "Problems of Geocosmos". – SPbSU, St. Petersburg, 2006 – pp. 91-94.