



Modification of low-latitude ionosphere associated with seismic event

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This paper investigates the features of spatial-temporal modification of equatorial ionosphere for American longitudinal region prior to the strong Peru earthquake ($M=7.5$) of 25 September 2005 that was registered at 01.55 UT ($LT=UT-5h$). Geographical coordinates of the epicenter was ($5.67^{\circ}S, 76.41^{\circ}W$), geomagnetic - ($4.55^{\circ}N, 355.33^{\circ}$). The possible influence of the earthquake preparation processes on the main low-latitude ionosphere peculiarity – the equatorial anomaly – is discussed.

In the last years the monitoring of the ionospheric effects of different origin is related with using of global navigating systems (GPS / GLONASS) signals. By means of measurements of the signals temporal delays it is possible to do the mapping of total electron content (TEC) in a column of unit cross section through the Earth's ionosphere and investigate its temporal evolution depended on the variations of electron concentration (NmF2) in the F2 ionosphere region.

To estimate spatial sizes and temporal dynamics of seismo-ionospheric anomaly the global TEC maps (Global Ionospheric Map) were used. These maps at the IONEX format are generated routinely by the IGS community with resolution of 5° longitude and 2.5° latitude and temporal interval of 2 hours. The Latitude-Time TEC plots and meridian sections ($\lambda=75^{\circ}W$) of TEC spatial structure were constructed. Analysis of the LTT maps has shown that modification of the equatorial anomaly occurred a few days before the earthquake. In previous days, during the evening and night hours (local

time), a specific transformation of the TEC distribution had taken place. This modification took the shape of a double-crest structure with a trough near the epicenter; it means the intensification of equatorial anomaly and extension of the anomaly “tail” part into the evening time. The difference of TEC values in crests and trough reached the value of 16-18 TECU. Analysis of GIM TEC for 3 months has revealed that it is rather atypical situation for the given region and season, usually in this time the restored normal latitudinal distribution with a maximum near the magnetic equator is observed.

Then for more detailed study of features of the ionosphere diurnal behavior we consider the regional TEC maps, created with spatial resolution of 1° and temporal interval of 1 h on the base of LPIM (La Plata Ionospheric Model). Measurements of more than 50 GPS stations located in this region were used to create TEC maps. Analysis of LPIM maps confirmed the presence of modification of TEC distribution and enabled to do more accurate estimation of numerical characteristics of the effects observed.

Formerly the similar effects of equatorial anomaly transformation were found out on the base of measurements of ground based vertical sounding as well as topside vertical satellite sounding (Alouette-2, Intercosmos-19). These peculiarities of foF2 behavior were interpreted in frames of adopted model of natural ionospheric processes like “fountain-effect” but stimulated by electric fields of seismogenic origin, - i.e. by process of equatorial anomaly intensification in the near-epicentral area.