

Equatorial F region variability before strong earthquakes

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There are many evidences that sometimes the pre-earthquake ionosphere modification really exists. In this connection, the main question arises – how to extract variations caused by the pending earthquake from variations of another origin.

It is known that geomagnetic activity is the main reason of the ionosphere variability (particularly at the F region peak height), whereas solar radiation exerts a much weaker influence [1]. Interaction also exists between the ionosphere behavior and a number of factors combined under the name of “meteorological sources” taking into account the impact from below. There are earth’s surface orography, earthquakes and volcanoes, weather (atmospheric pressure and temperature), etc. The input of these items into ionospheric variability is approximately 15%. Physical mechanism of their action is not sufficiently clear yet. At last, ionosphere modification could be also a consequence of human activity, namely, explosions, active experiments with artificial injections, etc.

Among ionospheric variability caused by the impact from below is a class of the F region disturbances which occur under quiet geomagnetic conditions. Nevertheless, their magnitude is comparable to moderate F region storm effects. Their behavior is quite different in comparison with usual F region disturbances related to geomagnetic activity. It looks like that some kinds of F region quiet time disturbances could be a consequence of earthquake preparation processes.

The aim of this work is to find out, if any, the relationship between earthquake occurrence and quiet time F region disturbance observation a few days before the seismic event. Taking into account specific equatorial ionosphere peculiarities in comparison with other latitudes [2, 3] we restricted our study to the equatorial patterns only. For this purpose we used the available database for Huancayo and Kodaikanal ionosondes and earthquake catalogue containing the list of earthquakes of magnitude $M \geq 6.0$ for areas surrounding these stations. The analyzed period is from 1957 till 1989 and from 1957 till 1987 for the two stations, respectively.

In our analysis, ionospheric disturbances were referred to hourly $(foF2 / foF2_{med} - 1)$ deviations more than 20% during quiet geomagnetic conditions with hourly $ap < 7$ [4]. Usually, the latter provides a

selection of quiet time periods. foF2 is the F region critical frequency, which characterizes the electron density (Nm) at the F region peak height; foF2_{med} denotes 27-day foF2 running median centered near the day in question. So, we considered 40% Nm deviations in quiet geomagnetic conditions.

The obtained results of such kind of analysis will be presented. It seems that observed difference between Huancayo and Kodaikanal disturbance patterns before strong earthquakes could be attributed to some extent to diverse characteristics of seismic activity in South American and Indian zones.

References

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