



Ionospheric GPS TEC anomaly prior to 22 November 2004, New Zealand earthquake

Zakharenkova I.E. (1), Shagimuratov I.I. (1), A. Krankowski (2), Tepenitzina N.Yu. (1), Koltunen E.M. (1)

(1) West department of Institute of Terrestrial Magnetism, Ionosphere and Radiowaves Propagation, Kaliningrad, Russia (zakharenkova@mail.ru);

(2) Institute of Geodesy, University of Warmia and Mazury, Olsztyn, Poland

In this paper the analysis of the ionospheric total electron content (TEC) behavior prior to the strong New Zealand earthquake of 22 November 2004 is presented. The earthquake magnitude was about 7.1. The epicenter position was (46.7°S, 164.8°E); the depth of seismic focus was 10 km.

To detect pre-seismic anomaly in the ionosphere we used GPS TEC measurements provided by IGS stations located in the considered region. Diurnal variations of TEC over individual stations during 10-days interval prior the earthquake served as initial data in this analysis. The significant decrease of electron content was found out 1 day prior the event. The maximal effect took place during day-time on 21 November 2004.

To estimate spatial size of the anomaly we used global TEC maps provided by IGS community. Global TEC maps have also demonstrated occurrence of large-scale TEC depression over the region of earthquake preparation. The analysis of differential TEC maps has shown that TEC decrease reached the value of 10-12 TECU, it is equal 40% relatively to the non-disturbed conditions. To verify locality of the anomaly we considered parameter of global electron content (GEC) proposed by E.L. Afraimovich. GEC parameter enabled to find out that the observed anomaly had well pronounced local character which didn't become apparent in global scale.

Recently the similar negative anomalies as seismo-ionospheric precursors were found

out by us for strong Turkey earthquakes of 1999 and by J.Y. Liu for several Taiwan and Sumatra earthquakes. In accordance with previous investigations this strong anomaly was identified as seismo-ionospheric precursor.