



Real time validation of GPS TEC precursor mask for Greece

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It was established by earlier studies of pre-earthquake ionospheric variations that for every specific site these variations manifest definite stability in their temporal behavior within the time interval few days before the seismic shock. This self-similarity (characteristic to phenomena registered for processes observed close to critical point of the system) permits us to consider these variations as a good candidate to short-term precursor. Physical mechanism of GPS TEC variations before earthquakes is developed within the framework of Lithosphere-Atmosphere-Ionosphere Coupling (LAIC) model. Taking into account the different tectonic structure and different source mechanisms of earthquakes in different regions of the globe, every site has its individual behavior in pre-earthquake activity what creates individual “imprint” on the ionosphere behavior at every given point. Just this so called “mask” of the ionosphere variability before earthquake in the given point creates opportunity to detect anomalous behavior of electron concentration in ionosphere basing not only on statistical processing procedure but applying the pattern recognition technique what facilitates the automatic recognition of short-term ionospheric precursors of earthquakes. Such kind of precursor mask was created using the GPS TEC variation around the time of 9 earthquakes with magnitude from M6.0 till M6.9 which took place in Greece within the time interval 2006-2011. The major anomaly revealed in the relative deviation of the vertical TEC was the positive anomaly appearing at ~04PM UT one day before the seismic shock and lasting nearly 12 hours till ~04AM UT. To validate this approach it was decided to check the mask in real-time monitoring of earthquakes in Greece starting from the 1 of December 2012 for the earthquakes with magnitude more than 4.5. During this period (till 9 of January 2013) 4 cases of seismic shocks were registered, including the largest one M5.7 on 8 of January. For all of them the mask confirmed its validity and 6 of December event was predicted in advance.