



Main phenomenological features of the TEC variations before Japan March 11, 2011 and Turkey Oct. 23, 2011 EQs and their physical interpretation

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Relative TEC disturbances during March 8-11, 2011 and Oct. 20-23, 2011 periods were investigated for Japan M9.0, March 11, 2011 and Turkey Van M7.1, Oct. 23, 2011 earthquakes, respectively. The effects that could be considered as possible earthquake precursors for both events were revealed.

In case of Japan M9.0 EQ, the most pronounced anomalies happened on March 8, 2011 during 04 UT – 20 UT. They looked as the TEC enhancements of about 40-80% along the geomagnetic parallel on both sides of the geomagnetic equator. The TEC anomalies comprised two ellipse-like regions of about $\sim 20^\circ \times \sim 25^\circ$ (latitude \times longitude) near the EQ epicenter and the magnetically conjugated area. The passages of the sunrise terminator and later of the subsolar point degraded the anomaly and led to its almost full decay in the case of the whole day March 9.

In case of Turkey Van M7.1 EQ, TEC enhancements (see <http://goo.gl/zRW9H>) of about 40-60% were observed during Oct. 20 – 23, 2011 both near the epicenter and magnetically conjugated areas and reached maximum on Oct. 21. They existed from 14 UT to 20 UT and occupied $\sim 10-15^\circ \times \sim 25-35^\circ$ size areas. The terminator approaching was preceded single spot structure formation with consequent anomaly reduction during 22-24 UT.

Therefore, both cases reveal similar behavior: strong long-living structures near the epicenter and magnetically conjugated areas affected by the terminator and subsolar point as in case of the Haiti 2010 EQ we reported earlier. We discuss these TEC anomalies in terms of the electromagnetic lithosphere-ionosphere coupling mechanism, using the 3D global numerical time-dependent UAM (Upper Atmosphere Model) simulation results, and interpret the disturbances as a result of the seismically induced electromagnetic $[E \times B]$ drift of the ionospheric F2-layer plasma.