Correlations Between the Ionospheric Anomaly and Earthquakes Using VLF

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VLF signals are long thought to give away important information about the lithosphereionosphere coupling. In order to establish co-relations, if any, between the ionospheric activities and the earthquakes, we need to understand what the reference signals are, throughout the year. We present the result of the sunrise and sunset terminators as a function of the day of the year for a period of four years, viz, 2005 to 2008 when the solar activity was very low and the data would be primarily affected by the sun and variation would be due to normal sunset and sunrise effects. The terminators are for the 18.2 KHz VTX signal of the Indian Navy as observed from Indian Centre for Space Physics receiving station located in Kolkata. Both the AWESOME receiver and ICSP receivers were used. Any deviation of observations from this so-called the standardized calibration curve would point to influences by terrestrial (such as earthquakes) and extra-terrestrial events (such as solar activities). We present examples of deviations which occur in a period of 16 months and show that the correlation with seismic events is significant and typically the highest deviation takes place up to a couple of days prior to the seismic event. Similar to terminator shift approach, one could try to find effects of seismic activities on the time it takes to lower the D-layer boundary in the dawn (D-layer preparation time or DLPT) and to raise D-lay boundary at dusk (D-layer disappearance time or DLDT) in a period of 16 months. We identify those days in which DLPT and DLDT exhibit deviations from average value. Separately, we compute the energy release by earthquakes. From the distance energy relation, we compute the energy released locally from distant earthquakes and find correlations of the deviations with them. We show that the anomaly in the DLDT and DLPT are correlated with the energy release in earthquakes also.