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Seismo-ionospheric electron density and temperature anomalies observed byHinotori satellite

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To study the effect of the earthquake on the ionosphere, we need to take 3 stages. We first need to grab general features of Te and Ne such as on local time, season, solar flux, latitude and longitude (Su et al.,1997,1997,1998). We then tried to understand the various features in more detail, such as Te in the plasma bubble (Oyama et al.,1988), effect of the electric field of the morning overshoot in the equatorial region (Oyama et al.,1999), Te behavior of equatorial ionization anomaly (Oyama et al,1999), annual behavior of Ne/Te (Su et al.,1999), effect of neutral wind upon Te/Ne(Watanabe and Oyama ,1996) regarding tilted magnetic meridian. After we understood features above, we have constructed Te/Ne model

The Te model was made by Oyama et al (2004), and Ne model was made independently by first Isoda and recently by Kakinami. Model input parameters are local time, solar flux F10.7, geomagnetic latitude, and month. Te behavior during geomagnetic disturbance has been studied by applying models. We found that both Te/Ne models are quite reasonable. Especially Te model shows that 50 degrees K deviation at night has geophysical meaning (Oyama et al., 2005). Finally the third step is to find the effect of the earthquake on the ionosphere by using the models, that is, to try to find deviation of Te from the model value because Te is more sensitive than Ne variation. So far we have studied three earthquakes; those are: EQ1. which occurred on 22 November 1981 with magnitude of 6..6, depth of 37 km, and epicenter of 14.09E and 124.35 N, EQ2 which occurred on 11 January, 1982 with magnitude of 7.4, depth of 45 km, and epicenter of 13.75E and 124.36N and EQ3 which occurred on 24 January, 1982 with magnitude of 6.6, depth of 37 km, and epicenter of 14.09 E, 124.35 N.

We found that Te in the afternoon overshoot reduces prior to and after earthquake. To reach this present conclusion, we have checked magnetic disturbance and solar radio flux F10.7. We can not find any reason to cause the reduction of Te except earthquake.

Te follows the model quite well except near afternoon overshoot. The Te model illustrates that Te shows two Te maxima; one in the early morning around 9 LT (morning overshoot) and the second in afternoon around 16 LT (afternoon overshoot). While the observation keep constant value at the point where model Te should elevate and it merges to the model later. Ne observed follows the model value or takes slightly higher values than the model. These features seem to start about 5 days prior to the earthquake and recovers after 5 days.We summarized the deviation of Te from model for the earthquake EQ2 and EQ3. Our conclusions are as follows.

1. Deviation of Te starts about 5 days prior to the earthquake and recovers to the original value after about 5 days. Deviation of Te seems to start earlier and recovery is slower as the magnitude of the earthquake increases.
2. the deviation ranges from 40 degrees to the west and 40 degrees to the east.
3. In latitude wise the range of deviation extends from north to south with steep reduction in high latitude.

Reference

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