

Seismo-ionospheric Study of the iSTEP Project

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To find recognizable and reliable earthquake precursors, a project entitled integrated Search for Taiwan Earthquake Precursor (iSTEP) granted by Program for Promoting University Academic Excellence (91-N-FA07-7-4) has been carrying out during 4/1/2002-3/31/2006. In the phase I of the iSTEP project, we have observed pre-earthquake anomalies of the P-wave velocity, geomagnetic total intensity, surface deformation, and ionospheric electron density. The II phase of the iSTEP project (8/1/2006-7/31/2009) shall include four sub-projects: seismological variation; crustal deformation; lithosphere-atmosphere-ionosphere coupling; and statistics for earthquake hazard. The seismo-ionospheric study of the iSTEP includes the pre-earthquake ionospheric anomalies (PEIAs) and co-seismo-ionospheric disturbances (CSIDs). Empirical evidence of the PEIAs is reported by statistically investigating the relationship between variations of the plasma frequency at the ionospheric F2 peak foF2 and earthquakes with magnitude greater than M5.0 during 1994-1999 in the Taiwan area. The PEIA, defined as the abnormal decrease in the ionospheric foF2 during the afternoon period, 1200-1800 LT, occurs within 5 days before the earthquakes. The odds of earthquakes with PEIA increase with the earthquake magnitude, but decrease with the distance from the epicenter to the ionosonde station. These results indicate that the PEIA is energy related. Meanwhile, the ionospheric total electron content (TEC) derived from ground-based receivers of the global positioning system (GPS) is introduced to investigate the temporal and spatial features of the PEIAs as well as propagations of the CSIDs.