

THE IONOSPHERIC DISTURBANCES OBSERVED PRIOR TO SUMATRA TSUNAMI AND THEIR POSSIBLE ASSOCIATION WITH PRE-TSUNAMI ACTIVITY

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In this work, we present the results from CHAMP and COSMIC satellite measurements of neutral density, temperature, ionospheric density and electromagnetic disturbances in atmosphere and ionosphere registered before and during few Earthquakes/Tsunamis. Three Sumatra tsunamis, SUM1 (26 Dec 2004, 00:58:53 UT, Mw=9.1, 3.31N, 95.85E), SUM2 (28 Mar 2005, 16:09:36 UT, Mw=8.6, 2.074N, 97.013E) and SUM3 (12 Sep 2007, 11:10:26 UT, Mw=8.5, 4.52S, 101.37E). For SUM1 and SUM2, CHAMP measurements of electromagnetic and electron density disturbances in the ionosphere are analyzed. For SUM3, COSMIC measurements of atmospheric and ionospheric disturbances are also analyzed. In first step, disturbances registered during these events are examined. In particular, their timespatial scale and spectral distributions are studied. Knowing these aspects, similar features, though in much reduced magnitudes and possibly in much slower timescale, are searched in the satellite data prior to these events. In this way, we could find disturbances which may be possibly associated with pre-tsunami activities.

We also present computational simulation of possible excitation of disturbances near Earth's surface and in the atmosphere/ionosphere caused by tiny rock deformation in the lithosphere prior to an earthquake/tsunami. In first step, the study pursue an excitation of acoustic wave in the lithosphere caused by rock deformation, its propagation in solid Earth up-to Earth's surface and deposition of momentum and energy at the Earth's surface. In second step, excitation of neutral waves such as acoustic gravity waves (AGWs) caused by deposition of momentum/energy and their propagation in the atmosphere is studied using thermo-hydro-viscous fluid simulation. In third and final step, AGWs interaction with ionosphere is studied using thermo-hydro-magnetic fluid simulation.

Ionosphere, Acoustic gravity waves, Tsunami

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