

TO seminar

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From Sumatra 2004 to Tuhoku-Oki 2011: What we learn about Earthquake & Tsunami detection by ionospheric sounding

The recent tsunamigenic earthquakes strongly affirm, one time more after the 26 December 2004, the necessity to open new paradigms in oceanic monitoring. Detection of ionospheric anomalies following the Sumatra earthquake tsunami (e.g., Occhipinti et al. 2006, 2008, 2010) demonstrated that ionosphere is sensitive to earthquake and tsunami propagation: ground and oceanic vertical displacement induces acoustic-gravity waves propagating within the neutral atmosphere and detectable in the ionosphere. Observations supported by modeling proved that tsunamigenic ionospheric anomalies are deterministic and reproducible by numerical modeling (Occhipinti et al., 2006, 2008) via the ocean/neutral atmosphere/ionosphere coupling mechanism.

To prove that the tsunami signature in the ionosphere is routinely detected we show here perturbation of total electron content (TEC) measured by GPS and following tsunamigenic earthquakes from 2004 to 2010, nominally, Sumatra (26 December, 2004 and 12 September, 2007), Chile (14 November, 2007), Samoa (29 September, 2009) and the Far field observations are mainly performed by Airglow measurement and dense GPS networks in Hawaii, showing the propagation of the IGWs induced by tsunamis propagating in the Pacific Ocean (Rolland et al. 2010, Occhipinti et al., 2011).

Observations close to the epicenter are mainly performed by GPS networks located in Sumatra and Chile. The TEC perturbation observed within the first hour after the seismic rupture contains information about the ground displacement, as well as the consequent sea surface displacement resulting in the tsunami. In this work we present all this new tsunami observations in the ionosphere and we discuss, under the light of modeling, the potential role of ionospheric sounding in the oceanic monitoring and future tsunami warning system by GPS, Airglow and OTH radar (Coisson et al., 2011).

All ref. mentioned in this abstract are available at www.ipgp.fr/~ninto