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# Did the Mentawai 2010 earthquake produce an ionospheric tsunami that would have helped identify it as a rare tsunami earthquake?

Fabio Manta (1), Emma M. Hill (1), Giovanni Occhipinti (2), Lujia Feng (1), and Benoit Taisne (1)
(1) NTU, EOS, Singapore (fabio001@e.ntu.edu.sg), (2) IPGP, Paris (ninto.a.paris@gmail.com)

On October 25th 2010, an earthquake of Mw 7.8 was generated by rupture of the shallow portion of the Sunda megathrust seaward of the Mentawai islands, Sumatra, Indonesia. The maximum tsunami run-up was ∼16 m (Hill et al., 2012) along the southwestern coasts of the Pagai Islands; the tsunami claimed >400 lives. Previously, on April 2010, a similar magnitude earthquake (also Mw 7.8) occurred near the Banyak Islands, offshore northern Sumatra. This event, however, did not generate a tsunami and caused only minor damages. The main difference between these two events is related to the location of the rupture on the megathrust: for the 2010 Banyaks event it was too deep, and located under the islands, to generate significant uplift of the seafloor; on the other hand, the 2010 Mentawai event ruptured a very shallow portion of the megathrust and resulted in large uplifts of the seafloor. The Mentawai event generated only mild, long-period seismic shaking, and (due to its distance) from the stations, relatively small GPS displacements, and its moderate magnitude meant that it was not immediately identified being capable of generating an outsize tsunami. Did these two events induce gravity waves in the ionosphere that would have been useful to identify the Mentawai event as a tsunami earthquake? In this work, we analyzed the ionospheric responses to both events to look for the presence and magnitude of induced travel ionosphere disturbances (TIDs) in the ionosphere total electron content (TEC). Our results show that the Mentawai earthquake induced waves in the ionosphere that start ∼8 minutes after the mainshock and propagate with the velocity of acoustic waves (∼1 km/sec). Contrarily, the Banyaks earthquake did not produce any recognizable signature in the ionospheric TEC. Our results suggest that the important differences in the style of the two earthquakes can be detected by monitoring variations in the ionospheric TEC.