

Initial tsunami height estimated by observing tsunami ionospheric hole

*Yuto Tomida¹, Masashi Kamogawa¹, Tatsuya Kanaya¹, Atsushi Toyoda²

1.Department of Physics, Tokyo Gakugei University, 2.Nuclear Safety Research and Development Center, Chubu Electric Power Co., Omaezaki, Japan .

Low frequency acoustic waves, termed infrasonic waves, are excited by sudden displacement of ground and sea surface of mega-scale earthquake (EQ) and tsunami. When the waves reach ionosphere, they disturb the ionospheric plasma. The plasma variation has been detected by measurement of total electron contents (TEC) between a satellite of Global Positioning Systems (GPS) and a receiver on the ground. In addition to the waves, a TEC depression lasting for a few minutes to tens of minutes also occurred above the tsunami source area, termed tsunami ionospheric hole (TIH), in the mega-scale EQ with tsunami. The largest of the TEC depression appeared 10 to 20 minutes after the main shock. In this paper, we show the quantitative relation between an initial tsunami height and a depression rate of TEC caused by the TIH. Accordingly, the ionospheric TEC measurement is applicable to an early warning system of tsunami, when it takes more than 20 minutes for the tsunami to arrive coastal area.

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