

# GNSS-TEC-based tsunami early warning system: Tsunami ionospheric hole identification, 2D initial tsunami height estimation, and tsunami simulation

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Tsunami-generated ionospheric plasma disturbances have been measured by the total electron content (TEC) between a satellite and its ground-based receivers in Global Navigation Satellite System (GNSS). TEC depression lasting for a few minutes to tens of minutes, i.e., tsunami ionospheric hole (TIH), is formed above the tsunami source area. According to Kamogawa et al. [Scientific Reports, 2016], the quantitative relationship between the maximum initial tsunami height and the TEC depression rate caused by the TIH was shown. In addition, the largest TEC depressions appeared 10 to 20 minutes after the main shocks. These imply that the TIH measurement using the existing ground GNSS receiver networks were potentially used in an early warning system for near-field tsunamis. Applying our knowledge to space-based early warning system, we are developing the feasible warning system.

In the presentation, we show the procedure of our systems: 1) Identification of TIH from the tsunami-generated ionospheric plasma disturbances. 2) Estimation of 2-D initial tsunami height from 2-D TEC depression rate in the TIH. 3) Tsunami simulation based on the estimated initial tsunami height. In our tsunami calculation, we used JAGURS code [Baba et al., Pure Appl. Geophys., 2015].

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