GNSS total electron content for ionospheric tsunami early warning

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Tsunami waves can induce Tsunami Traveling Ionospheric Disturbances (TTIDs) of the total electron content (TEC). In this study, we examine the TEC derived by ground-based receivers of the global positioning system (GPS) and identify TTIDs induced by 2004 Indian Ocean tsunami. Simulations of the COMCOT (Cornell Multi-grid Coupled Tsunami) model and analyses of the circle method, the ray-tracing technique, and the beam-forming technique are used to show that TTIDs can be quickly detected and confirmed after the tsunami occurrence. Finally, the ionospheric TEC derived by existing ground-based GNSS (global navigation satellite systems) receiving stations is demonstrated to be useful to support the tsunami early warning system.

Keywords: ionospheric total electron content, tsunami early warning, global navigation satellite system