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Source Rupture Models and Tsunami Simulations of Destructive October 28, 2012 Queen Charlotte Islands, British Columbia (Mw: 7.8) and September 16, 2015 Illapel, Chile (Mw: 8.3) Earthquakes

Tuncay Taymaz (1), Seda Yolsal-Çevikbilen (1), and Ergin Ulutaş (2)

(1) Istanbul Technical University (İTÜ), The Faculty of Mines, Depatment of Geophysical Engineering, Istanbul, Turkey (taymaz@itu.edu.tr, ttaymaz@gmail.com, yolsalse@itu.edu.tr), (2) Department of Geophysical Engineering, Faculty of Engineering, Kocaeli University, Kocaeli, Turkey (erginulutas@gmail.com)

The finite-fault source rupture models and numerical simulations of tsunami waves generated by 28 October 2012 Queen Charlotte Islands (Mw: 7.8), and 16 September 2015 Illapel-Chile (Mw: 8.3) earthquakes are presented. These subduction zone earthquakes have reverse faulting mechanisms with small amount of strike-slip components which clearly reflect the characteristics of convergence zones.

The finite-fault slip models of the 2012 Queen Charlotte and 2015 Chile earthquakes are estimated from a back-projection method that uses teleseismic P- waveforms to integrate the direct P-phase with reflected phases from structural discontinuities near the source. Non-uniform rupture models of the fault plane, which are obtained from the finite fault modeling, are used in order to describe the vertical displacement on seabed. In general, the vertical displacement of water surface was considered to be the same as ocean bottom displacement, and it is assumed to be responsible for the initial water surface deformation gives rise to occurrence of tsunami waves. In this study, it was calculated by using the elastic dislocation algorithm. The results of numerical tsunami simulations are compared with tide gauges and Deep-ocean Assessment and Reporting of Tsunami (DART) buoy records. De-tiding, de-trending, low-pass and high-pass filters were applied to detect tsunami waves in deep ocean sensors and tide gauge records. As an example, the observed records and results of simulations showed that the 2012 Queen Charlotte Islands earthquake generated about 1 meter tsunami-waves in Maui and Hilo (Hawaii), 5 hours and 30 minutes after the earthquake. Furthermore, the calculated amplitudes and time series of the tsunami waves of the recent 2015 Illapel (Chile) earthquake are exhibiting good agreement with the records of tide and DART gauges except at stations Valparaiso and Pichidangui (Chile).

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