Geophysical Research Abstracts
Vol. 21, EGU2019-12503, 2019
EGU General Assembly 2019

Source Characteristics of Destructive Earthquakes with $M_w \geq 7.5$ Occurred During 2017-2018

Seda Yolsal-Çevikbilen and Tuncay Taymaz

Istanbul Technical University, the Faculty of Mines, Department of Geophysical Engineering, TR-34469, Maslak, Istanbul, Turkey (yolsalse@itu.edu.tr; taymaz@itu.edu.tr)

In recent years many devastating earthquakes with $M_w \geq 7.5$ occurred during 2017-2018 as a result of active plate interactions near the major mega-thrust subduction zones. They reveal tectonic complexities and astonishing deformation styles associated with the plate movements. In this study, we determined source mechanism parameters and finite-fault slip distribution models of four destructive earthquakes ($M_w \geq 7.5$) by performing point-source and finite-fault slip inversions. The shapes and amplitudes of long-period and broad-band P- and SH-waveforms recorded by the Federation of Digital Seismograph Networks (FDSN) and the Global Digital Seismograph Network (GDSN) stations in the distance range of 30° - 90° are compared with synthetic waveforms. Finite-fault slip models of earthquakes are estimated by applying a hybrid back-projection method that uses teleseismic P-waveforms to integrate the direct P-phase with reflected phases from structural discontinuities near the source. Overall results indicate various faulting mechanisms at relatively shallow focal depths (h<70 km). For example, the February 25, 2018 Papua New Guinea (M_w: 7.5) earthquake indicates a thrust faulting mechanism associated with the convergence of Australia and Pacific Plates. The September 28, 2018 Sulawesi (Indonesia) earthquake (M_w: 7.5), occurred within the Molucca Sea micro-plate at the eastern part of Indonesia shows a strike-slip faulting mechanism reflecting the complex deformations related to the interactions between Australia, Sunda, Pacific and Philippine Sea plates. Regardless strike-slip mechanism involved, this large earthquake produced unexpected tsunami waves along the coastal planes of Sulawesi. Finite-fault slip models reveal several heterogeneous rupture propagations and slip distributions on fault planes of those earthquakes. In addition, distributions of P- wave first motion polarities recorded at near-field and regional seismic stations are consistent with the best-fitting minimum misfit source mechanism solutions of earthquakes. This study is partially supported by the Turkish Academy of Sciences (TÜBA-GEBIP).