Coseismic and Postseismic Deformation Related to The 2012 Indian Ocean Earthquake using Three-Dimensional FEM

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On April 11, 2012, a Mw 8.6 earthquake struck off the west coast of northern Sumatra approximately 100 km west of the Sunda trench. The 2012 Indian Ocean earthquake, which is the largest intraplate earthquake in recorded history, yields a total seismic moment of 13.6 x 10^{28} dyne cm. Aceh GPS Network for Sumatran Fault System (AGNeSS) observed a predominantly ENE coseismic offset of up to 10 cm while the sites on the Andaman Island and southern part of Sumatra GPS Array (SuGaR) network observed southward and northward, respectively. In order to construct more realistic surface displacement due to complex subduction region, we consider developing inhomogeneous three-dimensional finite element model incorporate subducting slab, three-dimensional velocity earth structure, realistic topography and bathymetry. We infer uniform slip for six fault planes using fault geometry as reported from Hill et al. (2015). In the other hand, the time series of continuous GPS site coordinates clearly exhibit postseismic displacements. We parameterized the displacements time series due to previous earthquakes and remove pre-earthquake trend from the time series. The corrected time series of permanent GPS data shows that the relaxation time in the vertical component displacement is longer than horizontal component displacements. This discrepancy indicates multiple physical mechanisms. We proposed a mechanical model, which refer to afterslip and viscoelastic relaxation, to explain postseismic deformation following to the 2012 Indian Ocean Earthquake.

Keywords: Coseismic, Postseismic, GPS, FEM

