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Seismicity analysis in Indonesia region from high precision hypocenter location

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As a complex tectonic region, Indonesia has a high seismicity rate which is related to subduction and collision as well as strike-slip fault. High-precision earthquake locations with adequate relocation method and proper velocity model are necessary for seismicity analysis. We used nearly 25,000 earthquakes that were relocated using double-difference method. In our relocation process, we employed teleseismic, regional, and local P-wave arrival times. Furthermore, we employed regional-global nested velocity models that take into account the subduction slab in the study region by using a 3D model for area inside and a 1D model for area outside Indonesia. Relocation results show shifted hypocenters that are generally perpendicular to the trench. Beneath western Sunda arc, the Wadati-Benioff Zone (WBZ) extents to a depth of about 300 km and depicts a gently dipping slab. The WBZ beneath eastern Sunda arc extends deeper to about 500 km and depicts a steep slab geometry. In the Sunda-Banda transition zone, we found anomalously low seismicity beneath the oceanic-continental transition region. The WBZ of the severely curved Banda arc extends to a depth of about 600 km and depicts a two-slab model. In the Molucca collision zone, seismicity clearly depicts two opposing slabs of the Molucca sea plate, i.e. to the east and to the west. Around Sulawesi region, most earthquakes are related to the north Sulawesi trench and depict subducted slab beneath the northern part of the island.
In Sumatra region, we identified a seismic gap in the WBZ between 70 km and 150 km. Seismicity gaps are also detected beneath particular regions, e.g. Mentawai region, and several parts along the subducted slab. Similar to the Sumatra region, beneath eastern Sunda arc, seismic gap in WBZ is also detected but deeper, i.e. at depths of 150 km to 250 km. Furthermore, we used global centroid moment tensor catalog data available for earthquakes with magnitude 5.0 or greater. In general, focal mechanism solutions for large earthquakes around the Indonesian region are thrusting that is related to subduction processes. However, large strike-slip earthquakes are also present in this region and are related to major strike-slip faults, e.g. Sumatra and Sorong faults. We also analysed the distribution of P- and T-axes of these solutions, and found that most of subducted slabs are under compression, where P-axes are perpendicular to the trench.