Deviation of directions of rakes of thrust-type earthquakes along the MAT from subduction direction of the Cocos plate

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The Cocos plate is subducting beneath the North America plate along the Middle America Trench (MAT), and many subduction zone earthquakes have occurred there.In this study, we investigated relation between subduction directions of the Cocos plate and directions of rakes of thrust-type earthquakes.We extracted thrust-type earthquakes from the Harvard CMT catalogue, amouting to 184 events with Mw ranging from 4.8 to 8.0, which occurred from 1976 to 2010, and depth ranges from 10 to 50km. Plate motions of the Cocos plate with respect to the North America plate are determined by the plate motion models, such as NUVEL-1A and MORVEL.Directions of rakes of thrust-type earthquakes which occurred in this region are rotated by counterclockwise 5~15 degree from directions predicted from the plate motion models.Furthermore, in order to select earthquakes which occurred on the plate boundary more rigorously, we extracted 32 earthquakes which occurred at depths less than +-10 km from the upper surface of the subducting plate. Using a rose diagram, although we investigated whether directions of rakes of these earthquakes are dependent on depth of hypocenters, Mw, time, and the region, we could not find any dependency.

In order to consider the cause of the difference between subduction directions determined by the plate motion models and the directions of rakes of thrust-type earthquakes which occurred on the plate boundary along the MAT, it may be important to compare the result with those which occur in the regions with forearc sliver and oblique subduction, such as Nicaragua, Cascadia, the Nankai Trough, and Indonesia.