SUNDALAND MOTION DETECTED FROM GEODYSSEA GPS MEASUREMENTS : PART I - IMPLICATIONS FOR MOTION AT SUNDA TRENCHES

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The deformation pattern obtained from GEODYSSEA GPS measurements shows that a set of stations located in Vietnam, Malaysia, Borneo, Eastern Sumatra and Java have small relative motions. To a first approximation, these stations belong to a rigid block hereafter called the "Sundaland block". Since Sundaland stations are tied to stations belonging to different tectonic plates, GEODYSSEA solution can be used to constrain the kinematics of this block with respect to surrounding plates. We first put GEODYSSEA solution in an Australia reference frame by minimizing the misfit with NUVEL-1A global plate model at Australian sites (COCO, KARR, YAR1, WAME and TIDB). The residual motion (adjusted solution versus NUVEL-1A) is small for all stations (within one to two sigma's) except for TIDB (Tidbinbilla) on the Eastern coast of Australia. We then invert the motion at 12 Sundaland stations (in the adjusted solution) and find that the Sundaland block is rotating clockwise with respect to Eurasia around a pole located South of Australia. The motion is towards ENE and is ranging from 1.2 cm/yr to 2.2 cm/yr from Eastern Java to Northern Sumatra. The mean residual motion (adjusted rigid rotation versus observed vectors) is about 3 mm/yr and the azimuth is adjusted within less than 10 degrees.

We discuss the implications of this Sundaland motion for the subduction of Indian and Australian plates beneath Java and Sumatra. Slip vector azimuths of interplate thrust earthquakes along the Java trench consistently show a 10 degrees westward deviation with respect to the predicted NUVEL-1A Australia-Eurasia motion. This discrepancy is fully resolved if Sundaland motion is included. Subduction velocity is reduced along the entire subduction system with respect to NUVEL-1A predictions. In an India reference frame, Sundaland is moving due south so that the motion is pure dextral strike-slip north of Sumatra. The predicted velocity of India at the latitude of Myanmar is close to the rate of opening of the Andaman Sea, suggesting low subduction rate along the Andaman front.

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