AOGS 2006

Detection of Seismic Geoid Changes by the 2004 Sumatra-Andaman Earthquake from Satellite Altimetry

YUTAKA HAYASHI[1], NOBUO HAMADA[2], TSURANE KURAGANO[3], TOSHIKYUKI SAKURAI[3], HIROMI TAKAYAMA[1], YOHEI HASEGAWA[1], KENJI HIRATA[4]

[1] *Meteorological Research Institute, JMA*

[2] *Sapporo District Meteorological Observatory, JMA*

[3] *Office of Marine Prediction, JMA*

[4] *Progam for Deep Sea Research, IFREE, JAMSTEC*

Standard seismological approaches were insufficient for precise knowledge on the 2004 Sumatra-Andaman earthquake of December 26, because of some slow slip on a time scale beyond the seismographical band in the northern part of the fault(Ammon et al., 2005). We focused on geoid analysis with satellite altimetry data to understand the mechanism of it. A coseismic geoid change, which must be approximately equal to an average change in the sea surface height, caused by an earthquake of magnitude 9 could possibly be detected by satellite altimetry, because such change would theoretically be expected to reach the order of centimeters(Sun and Okubo, 1994). However, a coseismic geoid change has never been observed yet. We analyzed sea surface height data by satellite altimetry from Jason-1 and TOPEX/Poseidon, then we estimated that the peak-to-peak change in sea surface height before and after the 2004 Sumatra-Andaman earthquake was 7+/-2 cm, and the positive peak was locaed at 70km east from the Sunda Trench, and the negative one at 110km. Thesea are probably related to the coseismic geoid change caused by that earthquake.— Based on the equations by Sun and Okubo(1994), calculation from long shallow low-angled reverse fault models whose scalar moments were equivalent to an earthquake of an Mw = 9.3, coseismic geoid changes had the following characteristics :(a) The geoid change perpendicular to the trench was more significant than the change parallel to it;(b) One positive peak and one negative peak of the geoid change were found. The positive peak was nearer to the up-dip;(c) The positive peak of the geoid change perpendicular to the trench was almost directly above the upper edge of the high-slipped area; the negative peak was almost just above the lower edge of the earthquake fault;(d) The peak-to-peak geoid change reached several centimeters.—- We concluded that the upper edge of a high-slipped area and the lower edge of the entire slipped area in the fault plane of the SUmatra-Andaman earthquake were possibly located approximately 70km and 110km east of the Sunda Trench. To confirm our results, we must reanalyze sea surface height data from satellite altimetry over a longer period. Details of this research are described in our submitted paper (Hayashi et al., 2006). References: Ammon, C. J. et al., 2005, Science, 308, 1133-1139.; Hayashi et al., 2006, EPS, submitted.; Sun, W. and Okubo, S., 1998, Geophy. J. Int., 132, 79-88.