Slip distribution on Sumatra segment of the Sumatra Andaman Earthquake based on GPS measurements in Sumatra

Fumiaki Kimata[1]; Irwan Meilano[2]; Takeo Ito[3]; Yusaku Ohta[4]; Takao Tabei[5]

[1] Res. Center Seis. & Volcanology, Graduate school of Environ., Nagoya Univ.; [2] Earth and Planetary Sci.,Nagoya Univ.; [3] Environmental Studies, Nagoya Univ.; [4] RCPEV, Graduate School of Sci., Tohoku Univ.; [5] Applied Sci., Kochi Univ.

http://www.seis.nagoya-u.ac.jp/kimata/

Introduction

According to researches of super giant earthquake of 2004 Sumatra Andaman Earthquake, some fault slip models are discussed based on seismic wave, tsunami wave and ground deformation. Of course, there are some differences of slip rates of the fault. However the idea, which there are three main segments, and maximum fault slip over 20 m is estimated in the Sumatra segments.

Depth of the plate boundary beneath Sumatra

The knowledge of the plate boundary depth is very important to discuss slip rates in the plate boundary from the ground deformation observation. For example, when Ohta et al.(2004) discussed the inter plate coupling based on the ground deformation by GPS measurements in the Tokai region, they employ the shallow plate boundary depth estimated from the precise seismic activity. Their results are good consistent with the convergent rates estimated. Their plate boundary depth is shallower of 10 km than previous research.

Unfortunately there was a few precise data of the plate boundary depth beneath Sumatra. After the 2004 Earthquake, seismological observations were down on the ocean bottom. Generally India-Austrian plate is subduction with low unglue in the Sumatra Trench. The dip angles are 11 degrees in west coast of Banda Aceh(Araki et al., 2006;Sibuetet al., 2007), and only 5 degrees in Shimulu Isaland (Planmert et al.,2007).

Where was ruptured?

Based on the bathymetric researches, there are three ideas of rapture zones in Sumatra segments; 1) front deformation, 2) main thrust and 3) upper thrust. Research on delta CFF caused by fault slips by main shock suggests that the main rapture is arriving to near the trough and to the plate boundary depth of 40 km, and aftershocks suggesting normal fault slips were occurred in the close to the trench and it disappeared by after slip (Ohishi and Sagiya, 2007).

GPS measurements in west coast of north Sumatra

We continue the GPS measurements of campaign observation and continuous observation in the west coast of north Sumatra since February 2005. These data are important to understand the slip rates in the faults.

Our results suggest the main slip rates at shallow depth of 20 km in the plate boundary off the Sumatra west coast along the N5, which is just located in the region of low-aftershock activity. In deeper plate boundary hypocenters of aftershocks are concentrated.

Uplift of 7 cm observed at the continuous GPS site in Band Aceh suggests that the after slip of the earthquake should occur in more near field.