

Crustal movement of the Andaman Islands during the 2004 Sumatra earthquake, analyzed from ASTER data

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The Andaman Islands is scattered along the Sunda trench in the northeastern Indian Ocean. It is located on northern outside of the seismogenic fault inferred from teleseismic data of 2004 Sumatra earthquake. However the distribution of aftershocks suggests that the source area might be extended around this area. In order to estimate an accurate source fault, we examined the crustal movement of the Andaman Islands based on satellite image photo interpretation.

We analyzed ASTER (Advanced Spaceborne Thermal Emission and Reflection) data, which was derived from the satellite sensor developed by ministry of economy, trade and industry for the purpose of earth observation. Acquired image photos were taken at four different time between before and after the earthquake (a: 11 Jan. 2002, b: 1 Jan. 2004, c: 2 Dec. 2004 and d: 3 Jan. 2005). Comparing between these data, crustal movement can be identified from horizontal shoreline change and tide level.

Along the western coast of all islands, it is recognized that the land area increases obviously after the earthquake. Although the fringing coral reefs developed along the islands had been distributed beneath low tide level during a and b, they are apparently above middle tide level after the earthquake (d). This emergence phenomena indicates that the western coast of the islands was abruptly uplifted during or several days after the earthquake. Amount of uplift is estimated to be at least 1 m considering with tide level change.

Contrastively, no emergence of coral reef can be detected in the eastern coast of South Andaman, Havelock Island and Neill Island. Reef edge which had been clearly exposed even in high tide level during c was submerged after the earthquake (d). This means subsidence of these areas, and amount of it is probably at least 0.5 m.

Summarizing the above results, crustal movement of the Andaman Islands during the 2004 Sumatra earthquake is east dipping tilt accompanied with uplift of western coast and subsidence of east coast. To obtain quantitative data, we will measure the vertical displacement of the islands by field survey.