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KY0909 Leg1航海によって得られたスマトラ北西沖外縁隆起帯の精密海底地形の特徴

Detailed bathymetric features of the outer-arc high off northwest Sumatra acquired during the KY0909 Leg1 survey

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The 2004 Sumatra-Andaman earthquake (Mw9.2) generated a huge tsunami with heights of more than 20 meters on average that devastated the west coast of the northern tip of Sumatra. The tsunami generation mechanism remains unresolved, although previous studies have postulated several working hypotheses, most of which suggested a possible coseismic slip on splay faults in the outer-arc-high. Among them, only a hypothesis that a splay fault system, the Middle Thrust, displaced coseismically can explain well features of the Indian Ocean tsunamis observed at regional tide gauge stations and with satellites.
Toward understanding of the tsunami generation mechanism, we conducted a detailed bathymetric survey off northwest Sumatra around the Middle Thrust during the KY0909 cruise in the early November 2009. Our direct scientific objectives of this cruise are to investigate high-resolution geomorphologic features and to understand the regional tectonics of a middle part of the outer-arc-high.
Bathymetric data were collected in an area surrounding the NT05-02 surveyed area using a SeaBeam 2100 multi-narrow beam echo-sounder system equipped with JAMSTEC's R/V KAIYO which has a frequency of 12 kHz, 2o x 2o beam widths, 81 beams, a swath width of 80o. A ping interval of a few seconds with a survey ship speed of 10 knots yielded a detailed bathymetric map with a horizontal resolution of approximately 30 meters at 1000 meters water depth. As the result of our survey, total of approximately 3500 squre km areal coverage was obtained. Multi-beam bathymetry obtained during the KY09-09 cruise is integrated with that acquired during the NT05 02 cruise (NT0502 scientific party, 2005).
A prominent feature in the bathymetry is a series of ridge and trough structures trending along the arc in the direction of NNW-SSE, parallel to the strike of the Sumatra Trench, which is probably controlled by imbricate thrust faults (Seeber et al.,2007). Relative height of this rugged topography, from bottoms of troughs to crests of ridges, is roughly 1000 m. A characteristic distance between bottoms of troughs or crests of ridges is 5-6 km. Seaward facing slopes of the ridges are generally linear and steep.
The morphological structure obtained through the high-resolution bathymetry acquired in the KY0 909 and NT0502 cruises has resulted in the identification of three (3) different units of lineaments. These are Northwest-to-southeast (NW-SE), Northeast-to- southwest (NE-SW), and North-to-south (N-S) lineaments, although a few of lineaments have directions to NNE-to-SSW or ENE-

WSW. From the viewpoint of length, the NW-SE lineament is considered as major lineaments and the N-S lineaments as the second major. The NE-SW lineaments are mostly minor and appear as short lineaments but are distributed very densely in the entire study area. These minor lineaments cannot be identified by previous studies (e.g., Graindorge et al., 2008). The ridge and trough structure is occasionally offset in the normal direction to the trench or the N-S direction. These offset structures are possibly due to oblique subduction of the Indo-Australia plate.

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