Active tectonics of Muroto-off Ashizuri uplifted ridges, southwest Japan

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Topographic highs named the Muroto, the Nishi-Muroto and the Ashizuri Knolls are intermittently distributed along the trench slope break from the southern tip of the Muroto Peninsula to off Cape Ashizuri, southwest Japan. Based on the seismic reflection survey, Okamura et al. (1986, JAMSTEC Deepsea Res.) reported that the Muroto Knoll is characterized by the asymmetric anticlinal ridge with a steep fault scarp on its southeast flank and a gentle slope on its northwest flank, and began uplift no earlier than the early Pleistocene. Crustal movement around the Muroto Peninsula has been investigated using elevation data of marine terrace by many researchers and has continued its activity since MIS-5e. Maemoku (2001, Jour. Geography) measured AMS 14C age of fossil calcareous assemblages indicating intertidal zones and suggested that cumulative uplifting of the Muroto Peninsula area has been attained by activity of the submarine fault off Cape Muroto in addition to inter-plate slip in the Nankai Trough. Moreover, Matsu'ura (2015, Geomorphology) revealed uplift history by detailed elevation and age data of marine terraces and estimated an existence of a westward dipping thrust off Cape Muroto. Information of recent offshore fault activity in addition to these data is important for understanding relationships between uplift events and structural development around Cape Muroto.

In order to detect sedimentation and deformation structures associated with uplift movements, deep-towed subbottom profiler (SBP) survey was conducted during R/V Hakuho-maru KH-15-2 and KH-16-5 cruises. SBP profiles were obtained from the Nishi-Muroto Knoll 45 km south of Cape Muroto and the unnamed knoll (called Minami-Ashizuri Knoll tentatively) 70 km south of Cape Ashizuri by deep-towing of a chirp system (EdgeTech DW-106) at approximately 15 m above the seafloor using ROV NSS (Navigable Sampling System). The Nishi-Muroto Knoll has NE-SW trending two major highs. The north summit shows few reflectors suggesting exposure of old sequence and the small basin at its hoot suggests relative uplift movement to the south summit. Steeply NW-dipping reflectors landward of the south summit and over a 100-meter-high scarp suggests large displacement at the hoot of this summit. The reflectors trenchward of the south summit shows increase of landward dip with burial depth in a piggyback basin. Such increase of dip angle is observed only at the surface sequence (max 15 m) and constant thickness layers are observed below it. This suggests recent beginning of landward tilting deformation. The boundary between the fan-shaped and parallel reflectors is estimated to be approximately 120 ka because it coincides with the horizon of disappearance of pink Globigerinoides ruber in a piston core sample.

SBP survey was also conducted across a NE-SW trending tomographic lineament at the unnamed knoll (called Minami-Ashizuri Knoll tentatively) 70 km south of Cape Ashizuri. The knoll is characterized by the horst structure bounded by a high angle fault and a flexure, which deformed the surface sequence suggesting recent activity. Our SBP survey successfully revealed recent activity along the topographic highs from Cape Muroto to off Cape Ashizuri.

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