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Coastal seismotectonics deforming late Quaternary marine terraces in Tobishima Island, the eastern margin of Japan Sea

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The Tobishima Island is on the southernmost ridge of Okushiri Ridge, 1ooo km long and 1oo km wide, with north-south trend along the Japan Sea eastern margin. This zone is under highly shortened crust in and around Japanese Islands. Especially, the area surrounding the Tobishima Island is known as a second type of seismic gap (Mogi, 1979) and known by having high seismic potentials. However, no one has studied paleoseismology based on tectonic geomorphology and earthquake geology. We examined the seismogenic fault geometry and the accumulation of paleoseismic events, deduced from deformation analysis of tehrochronologically age-determined marine terraces and recent emerged shoreline topography. Moreover, we refer to the source fault model associated with recent co-earthquake events, calculating crustal dislocation amounts. Marine terraces are subdivided into four; 1st terrace in elevation of 50?63 m, 2nd-a terrace in 38-5 5 m, 2nd-b terrace in 23-25 m, 3rd terrace in 25-30 m and 4th terrace in 3-7 m, respectively. Recently emerged abrasion platforms and notches are grouped into two levels; L1 in 4-5 m and L2 in 1-2m. Newly identified tephra dispersal is correlated with the Ontake Pm-I tephra (90-100ka), and it indicates that 2nd-a terrace is assigned to MIS5e. Combining terrace configuration and late Quaternary sea level change curves, 1st terrace is correlative with MIS7, 2nd-b with MIS5c, 3rd terrace with MIS5a and 4th terrace with MIS1. Emerged ages of L1 and L2 are still uncertain. Paleoshorelines of 2nd terrace and 4th terrace seem to tilt east (Miyauchi and Yamashita, 1992). Reanalyzing the tilt, their height distribution exactly depicts the anticlinal warping trending north. Those of L1 and L2 also suggest the deformation pattern. Neogene geologic anticline further coincides with it. As a reverse fault is geologically and geomorphologically recognized east of this anticline, this north-oriented warping is considered to show the development of fault-related fold structure. Calculating crustal dislocation by the use of Coulomb3.1 software (Toda et al., 2005; Lin et al., 2004), the deformation mode of L1 and L2 is well fit on the following parameters of fault model, length 47 km, fault dip 55 degrees, top depth 0.5-2.5 km, bottom depth 5-11 km, slip 5m. Mw is estimated 7.0-7.2. Recurrence interval of earthquakes occurring on this fault is assumed to be at longest 2,900 years and mean uplift rate is evaluated to be 0.4 m/ka, deduced from the number of emerged shoreline topography and MIS 5e-correlated marine terrace heights.

Keywords: Tobishima Island, marine terraces, emerged shoreline topography, source fault, fault-related fold