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Seismotectonic uplift process of the Sado Ridge, Japan Sea, using marine terrace height data and dislocation model

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The Japan Sea eastern margin is an actively deformed zone especially in Quaternary, which is characterized by inversion tectonics succeeding to the middle Miocene opening of the sea. The Sado ridge is representative among those of the margin and is of great advantage to the consideration of seismotectonics relating to fault-related folding. Using height data of emerged shoreline topography and calculating the crustal deformation by reverse faulting, we identified possible source faults and parameters, whose movements uplifting Kosado Island on the sea level. Pleistocene marine terraces, Terrace I to VIII in descending order and three levels of Holocene emerged shoreline topography, La, Lb and Lc were recognized along the coast and Kuninaka coastal plain. Terrace V, directly overlain by the Sanbe-Kisuki tephra (SK, 110-115 ka) is assigned to MIS5e, and Terrace IV to MIS7, Terrace VII to MIS5c, Terrace VIII to MIS5a and La to MIS1, respectively. Locally disitributed Lc was generated by coastal uplift by 1802 Sado-ogi Earthquake, similarly La and Lb were probably originated from the other large earthquakes. Deformation patterns of marine terraces and emerged geomorphology show warping and tilting accompanied by uplift, which makes us suppose at least five faults as behavioral segments: Fault A, B, C, D and E. Fault A is an east-bounded fault of Kosado Hills, Fault B, C and D are composed of the Kuninaka-minami fault zone. NNE trending Fault E is newly identified as the source fault of 1802 Sado-ogi earthquake. Calculating cosesimic displacement by setting mean fault slip rate per 1 ka to crustal elastic dislocation model, the resultant of accumulative deformation in hanging walls by these faulting skillfully explain the creation of Kosado Hills geomorphology. Unevenly east distribution of geomorphic divide and height distribution of marine terraces indicate that Fault A was initially active but the Kuninaka-minami fault zone (Fault B, C and D) have been succeedingly activated in middle Pleistocene. Relative height between L1 and La, L1 and Lc similarly shows about 2 meters through Sado-Ogi Penisula and Kosado Hills. This seems to indicate a kind of non-seismic crustal uplift movement over behavioral segments.

Keywords: Sado Ridge, emerged shoreline topography, dislocation model, source fault, fault-related fold, inversion tectonics