Geologic structure and active tectonics of the both coastal and sea bottom areas in the Nishikubiki district, Niigata Prefecture

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The Nishikubiki district occupies the northwestern part of the North Fossa Magna region, one of the major Neogene sedimentary basin system in the juncture belt between the Northeast and Southwest Japan Arcs. Additionally, the coastal district and offshore area are located in extension of the tectonic belt along the Eastern Margin of Japan Sea, which is characterized by the well-developed folds and faults structures with the axial trends in N-S to NE-SW directions. This paper discusses the latest development of these geologic structures and the active tectonics of the Nishikubiki district.

The restudy of stratigraphic correlation of the oil survey well drillings in the North Fossa Magna region clarified that the initiation of NNE-SSW folding activity was within the early Pliocene, and that N-S folding and faulting started at the early middle Pliocene (4Ma). According to the analysis of time and space distribution of marine terraces in the coast, the NNE-SSW trending folds are inactive for the last 300,000 years. The NE-SW trending structure is the latest because the NE-SW structure cuts off the N-S one in the offshore area as depicted by bathymetric topography, while active faults in a N-S trend exist in the western margins of the Takada Plain and the Chikuma mountains. Therefore, the older (4Ma) N-S direction and the younger (middle Pleistocene) NE-SW trending structures have been coexisted in the north Fossa Magna and the offshore area.

Temporal correlation of terraces formation elucidated that the coastal area of the Nishikubiki mountains have uplifted at 0.36m/ky in the western part, 0.68m/ky in the eastern part since the last interglacial period (125,000 years ago). For the main factor of the tilting, a cumulative displacement associated with seismogenic dislocation of the active fault along the western margin of Takada Plain is possible. However, according to the results of repeated leveling by GSI, the eastern part is elevated relative to the western part during the last 100 years, while the fault did generate no earthquake. Such a geodetic rate of tilting is larger than the geological rate of tilting inferred from the development of marine terraces. It is considered that one of the causes of the difference is due to the NE-SW trending active folds in the offshore area and related faults beneath the coastal area as shown by Okamura (2003). Consequently, mechanism of the uplift with tilting can be interpreted as a complex behavior of seismogenic activity of the thrust fault exist in the western margin of Takada Plain, non-seismogenic crustal movement in a geodetic timescale and active folding in a NE-SW trend along the offshore area of Nishikubiki, which parallels the Shinanogawa seismic belt.