Holocene coastal changes related to sea level change and artificial effect of the Yumigahama Peninsula, Southwest Japan

Kyouko Kagohara[1]

[1] Edu. & Human, Yamanashi Univ

The Yumigahama Peninsula is entirely a large sand bar topography protruding from the Chugoku Mountains, which divide the sea into the Miho Bay and the Nakaumi. This consist of a series of three beach ridges showing depositional features of alluvial fan sediments from the Hino River. Recently, the Kaike coast near the river mouth is under severe erosion resulting from the construction of many barrier systems to control erosion, and becomes a social problem. Such a chain of beach ridges is associated with depositional process from the sea level change of rapid Holocene transgression and the succeeding oscillation and the medieval artificial effect of so-called Kan-na nagashi of iron mining. I mapped the physical landform characteristics of Yumigahama Peninsula, and reconstructed coastal development of the peninsula using Quaternary techniques. Further, adding the borehole data, I calculated the area, volume and rate of sediment which are valid for the consideration of serious coastal erosion process along the Kaike coast. The results are as follows.

The Yumigahama Peninsula is composed of three steps of beach ridges of the Unchi-hama(U) 6-2 m high, Naka-hama(N) 4-2 m high and Soto-hama(S), 4-2 m high above sea level as previously. The Uchi-hama is emplaced to ca. 6 to 3 ka, Naka-hama to ca. 3 to 1 ka, and Soto-hama to 1 ka to 100 years ago, correlated with the worldwide sea level change and the artificial effect of so-called Kan-na nagashi of iron mining. Based on the topographic mapping, the area of each beach ridge is 1.49*10-7 m2 to Uchi-hama, 2.12*10-7 m2 to Naka-hama,1.88*10-7 m2 to Soto-ham, using GIS analysis by Map Info7.0 software, and each volume is evaluated to be 4.68*10-8 m3 to U,1.16*10-8 m3 to N, 1.45*10-8 m3 to S ,respectively. These values leads to the vertical sedimentation rate in volume estimated to be 1.56*10-5 m3/yr to U, 0.58*10-5 m3/yr to N, 1.61*10-5 m3/yr to S, adopting the formative duration of each ridges on the above geomorphic chronology.

The sedimentation volume of Soto-hama is one third of that of Uchi-hama but is not different in sedimentation rate. This suggests that the artificial Kan-na nagashi in shorter duration matches 6 to 3ka stage in supply of fluvial materials from the Hino River. On the other hand, the sedimentation rate of Naka-hama is below the a half of those of Uchi-hama and Soto-hama. Such indicates that the Naka-hama was slowly formed where the northward coastal sea flows eroded the Uchi-hama deposits and making the new beach ridges by deposition at its terminal.

Assuming that the sedimentation rate is critical between coastal erosion and deposition, the erosion rate of modern Kaike coast is possibly considered as at least averagely 4 m/yr (0.14*10-5m2/yr/ 3.5km long). That almost coincides with the retreating rate (ca.3m/yr) of coast derived from the comparison between 1926 and 1957 topographic maps. It is necessary to confirm the balance between erosion and decreasing amount of fluvial supply by artificial dams in the upstream.