

Holocene relative sea-level changes and sedimentary environment in the Toyooka Basin, Hyogo Prefecture

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The Toyooka Basin located in the northeastern part of Hyogo Prefecture, is an alluvial basin developed along the lower reach of the Maruyama River flowing into the Sea of Japan. The latest Pleistocene to Holocene deposits in this Basin can be divided into the Lower Gravel (LG), Lower Sand (LS), Middle Mud (MM), Upper Sand (US), and Upper Mud (UM) in ascending order. The thickness of the latest Pleistocene to Holocene deposits is about 40m (Tanigawa, 2009). In this study, we performed analyses of sulfur contents and diatom assemblages of core sediments. The results were used along with the eruption age of tephra layers and ¹⁴C dating of core samples to derive sedimentary environments and relative sea-levels. Relative sea-levels were estimated to be about -30m altitude at the fall of the U-Oki volcanic ash (10,700calBP), between -3.6 m and -4.0 m at about 7,900calBP, and about 0m at about 6,800calBP.

The K-Ah volcanic ash (7,300calBP) lies in the middle part of the MM (at about -20 to -25m altitude), around a central part of the Toyooka Basin. In contrast, at a locality 9km upstream of the basin center, the K-Ah lies at about -1.2m. The silt layer below the K-Ah is confirmed to be marine facies by diatom analysis. Therefore a relative sea-level at the fall of the K-Ah volcanic ash (7,300calBP) was estimated to be above -1.3m which is an altitude of the boundary between the K-Ah and silt layer. At that time, the Toyooka Basin is considered to have been an inner bay with a maximum water depth of about 20m. In the upper reach beyond this locality, no marine facies is intercalated in the latest Pleistocene to Holocene deposits.

In most of alluvial plains in Japan, the relative sea-level at about 6,000 to 7,000calBP was about 1 to 3m above the present sea-level. However, the Toyooka Basin seems not to have experienced such a sea-level highstand during the mid-Holocene time. The estimate of about 0.5m at about 3,300calBP (Sato et al., 1994) is the highest sea-level previously known in the Holocene period. These facts suggest that the regional uplift due to hydroisostasy occurred in a different mode and/or with lower rate in the Toyooka Basin. Otherwise, the Toyooka Basin may have been subjected to local subsidence that compensates the regional uplift due to hydroisostasy.