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Evolution of sedimentary environments associated with relative sea-level change in Toyooka Basin, Hyogo Prefecture

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The latest Pleistocene to Holocene incised-valley fills are a good archive of paleoenvironment. Incised-valley fills have high sedimentation rates of several tens to hundreds cm/ka, which are much higher than those of deep sea and lake sediments. Therefore, they have a potential to provide a high resolution paleoenvironment record. In addition, the incised-valley fills have a merit that sediments are easily dated by ¹⁴C dating. Moreover, marine sediments accumulated during transgression record the development of sedimentary environments associated with the relative sea-level change. In recent years, there is a study that showed the early Holocene sea-level jump that was indirectly indicated by the retreat of bay head delta (Rodriguez et al., 2010).

In this study, we aim to reveal the development of the sedimentary environment associated with relative sea-level change in the Toyooka Basin. About 200 borehole cores from the Holocene incised-valley fills in the basin were analyzed for this purpose. The thickness of the sediments is ca. 60 m at maximum. We performed analyses of diatom assemblage, sedimentary sulfur and tephra, and ¹⁴C dating.

The incised-valley fills in the Toyooka Basin consists of the braided river sediments, floodplain sediments, the bay head delta and tidal flat sediments, the prodelta sediments, the delta front to delta plain sediments, and the floodplain sediments in ascending order.

The sediments below the prodelta one have been accumulated during transgression, while those above it have been accumulated during regression. The aggradation was dominated during transgression, while the progradation was dominated during regression. The sedimentation rate has changed by the development of sedimentary environment, with the highest rate in delta sediments during regression. The transgression reached to the site of the southernmost core in the Toyooka Basin at ca. 7,900 cal BP. In this core, the marine facies changed to the freshwater facies before ca. 7,300 cal BP. In the Toyooka Basin, the relative sea-level rise rapidly decelerated at ca. 7,900 cal BP, but still continued to ca. 6,600 cal BP. Thus the regression started coincided with the deceleration, despite the persistence of sea-level rise. As described above, these changes of sedimentary environment are closely related to the relative sea-level change.

Keywords: the latest Pleistocene to Holocene incised-valley fills, relative sea-level change, sedimentary environment, Toyooka Basin