

High-resolution climate variation during marine isotope stage 11 from a core of Osaka Bay, southwest Japan

NAKANO, Kosuke^{1*} ; KITABA, Ikuko² ; HYODO, Masayuki³ ; KATOH, Shigehiro⁴

¹Department of Earth & Planetary Sciences, Kobe University, ²Research Centre for Palaeoclimatology, Ritsumeikan University, ³Research Center for Inland Seas, Kobe University, ⁴Division of Natural History, Hyogo Museum of Nature and Human Activities

Climate of marine isotope stage (MIS) 11 has been investigated by many researchers, regarded as an analogue for the Holocene. MIS 11 is a super-interglacial characterized by its high sea-level and long duration. To reveal millennial to centennial scale climate changes of this interglacial in comparison with sea-level variations shown by diatoms, pollen analyses were conducted on a 1700-m core of Osaka Bay over a depth range from 162 m to 222 m. The core has an average sedimentation rate of about 60 cm/ka, dated with a linear age model based on the orbital tuning, reinforced by tephrostratigraphy and magnetic polarity stratigraphy. Cold climate shown by dominance of coniferous tree taxa in the latest stage of MIS 12 was replaced by cool climate dominated by deciduous tree taxa mainly composed of *Fagus*, a cool proxy, in the earliest MIS 11. The vegetation in MIS 11 was gradually dominated by deciduous tree taxa. The proportion of *Quercus* (*Cyclobalanopsis*), a warm proxy, increased with sea-level rise and reached its maximum at sea-level highstand of MIS 11.3. After the thermal maximum, *Quercus* (*Cyclobalanopsis*) gradually decreased with fluctuations and coniferous tree taxa such as *Cryptomeria* and *Sciadopitys* increased, both indicating cooling and wetting. After MIS 11.3, the climate shows clear precession-related signals correlated with changes in the diatom sea-level proxies. Pollen taxa, especially *Alnus* and non-arboreal pollen, also show environmental changes. From the latest stage of MIS 12 to the earliest MIS 11, a marsh environment was dominant during the post-glacial sea-level rise. In the early stage of MIS 11, the post-glacial warming is clearly shown by the rapid increase of *Quercus* (*Cyclobalanopsis*), and the warming is interrupted by a short-term cooling that ranges in age from about 416 ka to 413 ka based on the linear age model. The temporal cooling almost coincides with the sea-level fall or stagnation suggested by the diatom sea-level proxies. A similar cooling event has been reported from Europe, Lake Baikal and the Antarctic. Therefore, the cooling event in the early MIS 11 may be global and accompanied by an ice volume increase.

Keywords: Marine Isotope Stage 11, Paleoclimate, Paleovegetation, Pollen analysis, Osaka Bay sediments