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# Migration of summer monsoon front in East Asia during the last 150ky based on N-S Kosa grain size contrast in the Japan Sea

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The Japan Sea sediments contain significant amount of eolian dust (Kosa) derived from inland Asia. Grain size and flux of Kosa transported to the Japan Sea is controlled by the aridity of inland Asia, wind speed, and transport path, which may be controlled by the intensities of summer monsoon and westerly jet. In previous works, we examined the grain size, content, and composition of Kosa within the sediment cores from the northern part of the Japan Sea (KT94-15-PC5, approximately 150km west of Akita) in order to reconstruct the temporal variability of atmospheric circulation in East Asia. Our results show that millennial-scale variations in Kosa grain size and content varied in harmony with D-O Cycles in the Japan Sea during Marine Isotope Stage (MIS) 2 to 5. During glacial stadials, median diameters and contents of Kosa are large (6.8-8.0 μm and 68-85%). During glacial interstadials, on the contrary, median diameters and contents of Kosa are small (5.4-6.5 μm and 53-65%). We concluded that these millennial-scale changes in Kosa contents and grain sizes imply the connection in atmospheric circulation between the East Asia and North Atlantic. However, the data came from only one site is insufficient to separate the effects of monsoon from that of the westerlies.

In this study, we examined another sediment core from the southern part of the Japan Sea (MD01-2407, at Oki ridge), and compare the temporal variation in grain size and composition of Kosa between the northern (KT94-15-PC5) and southern (MD01-2407) part of the Japan Sea. Although grain size and composition of Kosa from the southern part of the Japan Sea also varied in harmony with D-O Cycles, the latitudinal differences in grain size existed between the two sites. Namely, Kosa grain size was much (-1.5 μm) larger during MIS 1, early MIS3, MIS 5.1, 5.3, and early MIS 5.5, about 20,000 yr interval, and slightly (-0.5 μm) smaller during glacial stadial in the southern site. Based on the comparison of the mineral and elemental compositions of Kosa between the two sites, we attributed the cause of latitudinal difference in Kosa grain size to the shift of dust source area. When the Kosa grain size was larger in the southern site, dust source area may shift to central China, and when the Kosa grain size was smaller in the southern site, dust source area may shift to northeast China. Because the variability in terrestrial climate in the Central to Southeast Asia is considered as being controlled by the intensity of summer monsoon precipitation (e.g., An et al., 2000), and the summer monsoon intensity has been also modulated by D-O Cycles (Wang et al., 2001), we expected the latitudinal differences of Kosa grain size to have reflected the summer monsoon intensity. According to this explanation, summer monsoon intensity has varied in accordance with variation in summer insolation in the Northern Hemisphere and D-O Cycles.