Variation of Kosa content and grain size in Japan Sea sediments during the past 100 ka based on grain size analysis

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Kosa flux and grain size have information on aridity in Asia and intensity of westeries. Late Quaternary sediments of the Japan Sea are characterized by alternations of dark and light layers, high resolution chronology is established, and Kosa content is estimated from major element composition of the sediments. However, no attempt has been made to estimate Kosa grain sizes. Here, we conducted grain size analysis of 2 cores off Akita, estimated Kosa grain size and content, and reconstructed their temporal variation. The result suggests both Kosa grain size and content increase during glacial stages and show millennial-scale oscillations with lower values in the dark layers. Decreases in the grain size and content suggest wetter climate and reduced winter monsoon in the source area.

Aeolian grain size and its flux have been used as a paleoclimatic indicators to assess changes in the strength of atmospheric circulation, source area aridity, and vegetation cover. In this study, we analyzed the grain size distribution of the hemipelagic sediments of the Japan Sea using 2 piston cores (PC5, PC9) recovered from off Akita, extracted grain size distribution of Kosa, and quantified its content by deconvolution of grain size distributions, in order to reconstruct past changes in the atmospheric circulation intensity in eastern Asia. The extracted coarser grain size component at PC5 was identified as Kosa origin whereas that at PC9 was identified as arc-derived detritus origin. The extracted Kosa grain size was coarser during the last glacial period and finer during interglacial periods including Holocene. It also shows millennial-scale oscillations with the minima coincided with the dark layers. The extracted Kosa fraction is higher during the last glacial period and lower during interglacial periods including Holocene. It also shows millennial-scale oscillations with the minima mostly coincided with the dark layers. Kosa fraction estimated from grain size analysis (Kd) are compared with Kosa fraction estimated from major element composition (Kf). The two estimation show positive correlation which support our interpretation that the coarser grain size component at PC5 is of Kosa origin, although the absolute values of Kd tend to be larger than Kf. Temporal variations of these parameters (Kd, Kf and Kosa grain size) suggested that the millennial-scale variations are caused by changes in atmospheric circulation intensity in eastern Asia, with stronger summer monsoon (wet climate) suggested by lower Kosa fraction and weaker winter monsoon suggested by finer Kosa grain size simultaneously occurred during the period of dark layer deposition in the Japan Sea.