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Variation in magnetic susceptibility of latest Pleistocene to Holocene succession at Kiso river delta, central Japan

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Applicability of magnetic susceptibility for shallow marine and fluvial sediments is examined based on analysis of latest Pleistocene to Holocene succession. We measured thousands of magnetic susceptibility and grain size distributions for seven drilling cores obtained at Kiso river delta, central Japan.

The cores are drilled at fluvial and delta plains. Deltaic succession contained in the cores is classified into following sedimentary facies, in ascending order: A, braided river; B, flood plain, tidal river and tidal flat; C, bay floor and prodelta; D, delta-front slope and delta-front platform; E, delta plain.

Magnetic susceptibility is measured at 5 cm depth interval using portable magnetic susceptibility meter (SM30, ZH Instruments). Grain size of facies B, C, D and E was measured using laser diffraction particle size analyzer (SALD3000S, Shimadzu Corp.). Detailed age-depth curves of these cores are reconstructed based on densely measured radiocarbon dating.

Profile of magnetic susceptibility change indicates that magnetic susceptibility roughly changes according to sedimentary facies though magnitude of the susceptibility differs among cores. The susceptibility is high at facies B and D, moderate at facies E and low at facies C. Such change appears to be controlled by grain size distributions. It is also recognized that there are lags in timing between change of grain size and magnetic susceptibility.

To evaluate effect of grain size control on magnetic susceptibility, we classified sediments into several clusters by grain size distribution. Ward's method is chosen for clustering operation. Distribution of magnetic susceptibility of each cluster was examined and compared. The median values of magnetic susceptibility increase as median values of grain size increase in case median values of grain size smaller than 0.25 mm (2 phi). In case median values of grain size bigger than 0.25 mm, the values of susceptibility decrease as that of grain size increase.

Variation in magnetic susceptibility among cores and core depth remain in each grain size cluster. These extracted differences should be results of sedimentary processes and backland settings.

Keywords: magnetic susceptibility, grain size, Holocene, Kiso river delta