Glacio-eustatic variability in the sedimentation pattern over northern Japan during the past 600 ka

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The Japan Sea is a semi-enclosed marginal sea affected by global sea-level fluctuation, expansion of seasonal and permanent sea-ice cover, having a significant influence on the regional climate neighboring Japan Sea. Middle Pleistocene to Holocene sediments of the Integrated Ocean Drilling Program site U1423 situated in the northeastern part of Japan Sea was processed for the grain size analysis, semi-quantitative mineral analysis, and clay mineral analysis to access glacio-eustatic control on sedimentation pattern over Japan Sea during the past 610 ka. The average time resolution per sample is ~10 kyr. The mean grain size data suggest the dominance of silt size fraction over the sand and clay. The end member modeling of grain size data suggests the presence of two different energy conditions that varied with the time and influenced by the glacio-eustatic changes over the Japan Sea. The grain size data are relatively coarser and deposited in the higher energy condition during the glacial periods in comparison to interglacial periods except for MIS 2, 4, and 8. The higher energy condition during the glacial intervals suggesting deposition of grains due to the melting of seasonal/permanent ice sheets in the northern Japan Sea. The eolian dust brought from the Chinese loess deposits are relative finer in size and dominated by a higher proportion of quartz. During the glacial phases, illite and kaolinite (%) show a decreasing trend than the interglacial phases suggesting less terrigenous input. The high illite and decreased smectite (%) during interglacial phases suggest a higher degree of physical weathering. The significant increase in the smectite/(illite+chlorite) ratio suggests a higher degree of chemical weathering of the nearby source area, which varied over time. The overall study suggests the phase-wise variability in the presence of permanent/seasonal ice sheets and East Asian Winter Monsoon strength during the past 600 ka.