

Sea-ice conditions in the Okhotsk Sea during the last 550 kyr deduced from environmental magnetism

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Reconstructing past sea-ice conditions in the Okhotsk Sea is important because sea-ice conditions vary in response to global climate changes, which in turn may affect global ocean circulation through intermediate water mass formation. We conducted an environmental magnetic study of six cores from three stations in the central Okhotsk Sea to better understand temporal and spatial sea-ice variations. Inter-core correlations and age estimations are based mainly on geomagnetic paleointensity; an oxygen-isotope stratigraphy is available for one station. Magnetic susceptibility (MS) minima are accompanied by maxima in color b^* , the ratio of the anhysteretic remanent magnetization susceptibility to saturation isothermal remanent magnetization ($k_{ARM}/SIRM$), and the S-ratio, which indicates a higher proportion of biogenic to terrigenous magnetic components. This reflects enhanced ocean productivity. First-order reversal curve diagrams and IRM component analyses support the dominance of biogenic magnetite at MS minima. In contrast, color b^* , $k_{ARM}/SIRM$, and S-ratio values are low when MS is high, which indicates an increased proportion of the terrigenous component that was probably transported as ice-rafted debris (IRD). For the southern two stations, IRD accumulation increased in glacial and deglacial periods, which implies mobile sea-ice conditions even in full glacials. This was succeeded by extremely enhanced ocean productivity in early interglacials, which suggests nearly ice-free conditions. For the northernmost station, on the other hand, IRD accumulation was low in glacials and increased in early interglacials, which indicates perennial sea-ice coverage with little mobility in glacials. Succeeding ocean-productivity enhancement was delayed compared to the southern stations.

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