

Insolation and Greenhouse Gases Control on the Sea Ice Variations in the Central Okhotsk Sea during the Past 180,000 Years



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Sea ice is a critical and sensitive component of the Earth's climate system, which has declined dramatically in the past few decades. There is limited knowledge about the sea ice variability in the past orbital timescales due to the lack of reliable sea ice proxy in the subarctic regions. Here we reconstruct subarctic Pacific sea ice and summer sea surface temperature (SSST) records during the past 180,000 years by using novel organic (IP₂₅ and TEX₈₆) geochemical proxies in the central Okhotsk Sea, which is the southernmost of seasonal sea ice distribution in the Northern Hemisphere. Okhotsk sea ice variations derived from organic geochemical proxies show significant precession cycles, which corresponds to local insolation maximum. Also, the sea ice variations are bracketed by the high greenhouse gases intervals during Holocene and penultimate interglacial. Our findings suggest that insolation and greenhouse gases level are the major controlling factors of Okhotsk sea ice variation on the orbital timescales. These findings offer new evidence to improve the accuracy of physical model simulations and shed light on the prediction of future subarctic sea ice changes.

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