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Climate-induced variability of sedimentary mercury depositionin the southern Scotia Sea, Southern Ocean, over the last 35 kyr

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High-resolution sedimentary records of mercury (Hg) in the southern Scotia Sea, Southern Ocean, reveal the close link between climate change and Hg deposition on orbital timescales. Hg levels and fluxes in core sediments were higher during the glacial period than during the interglacial period, despite the latter having higher biological productivity. This suggests that increased productivity does not necessarily enhance Hg sequestration, challenging previous assumptions of a positive association. This orbital-scale variation in Hg appears to be driven by the availability of dissolved Hg for scavenging by organic matter in the water column. During the sea ice-free interglacial period, enhanced microbial and photochemical Hg reduction likely enhanced oceanic Hg evasion, thereby lowering dissolved Hg concentrations and reducing Hg scavenging into sediments. Thus, in polar sedimentary archives, negative excursions in Hg records likely indicate warm periods with high productivity and ice-free conditions. Isotopic evidence, marked by a shift in Δ^{199}Hg signals from highly positive values in interglacial sediments to near-zero values in glacial sediments, suggests that interglacial Hg primarily originates from the atmosphere, while glacial Hg is derived from the bedrock erosion in the surrounding area. Our findings indicate the variations in Hg deposition in Antarctica are closely linked to biogeochemical processes (e.g., oceanic emissions) driven by sea-ice dynamics and biological productivity. This study contributes to the debate concerning positive linkages among climate warming, productivity, and Hg sequestration, particularly in productive ocean regions like the Southern Ocean.