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Oceanographic and climate changes during the Mid Pleistocene uncovered from Bering Sea and Pacific Ocean sediment cores

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The Mid Pleistocene Transition (MPT), ~1.2–0.6 Ma ago, marks the shift from small amplitude 41 kyr to large amplitude ~100 kyr glacial-interglacial cycles, characterised by global cooling, ice sheet expansion and ocean circulation changes. As there was no long term shift in Earth's orbital insolation to account for the lengthening glacial cycles and global cooling, the ultimate cause of the MPT is still under debate, with hypotheses focussing on the carbon cycle, ocean circulation, ice sheet dynamics and sea ice changes at high latitude. At the approximate mid-point of the MPT, the so-called 900-kyr event of Marine Isotope Stages (MIS) 22–24 marks the onset of the first 100-kyr cycle, stepwise ice sheet build up on Antarctica, and a fall in deep ocean $\delta^{13}\text{C}$ signifying a reorganisation within the global carbon cycle. However, there is still a paucity of high resolution proxy records over the 900-kyr event with which to characterise these paleoceanographic changes, particularly in the subarctic North Pacific which is a region of upwelling CO_2 -rich water and sea ice.

Here we present new high-resolution (~500 yr time-step) proxy records of deep and surface ocean changes from sediment core U1343 in the Bering Sea (IODP Expedition 323) [1] over the MPT, focussing on the time period 1.04–0.84 Ma ago (MIS 28–21). Previous work has shown IODP cores from this region to be excellent archives of Pleistocene paleoceanographic change [2,3]. Our results indicate a significant shift occurred in the cyclicity of primary production, sediment accumulation and deep sea stratification in the Bering Sea, from the 40-kyr glacial cycles into MIS 22. We review available records from the Pacific and Atlantic, and compile a detailed picture of the leads and lags in high latitude cryosphere expansion, ocean stratification, sea surface temperature changes and glacial lengthening.

References:

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[3] Knudson K and Ravelo AC (2015) *Paleoceanography* 30:1287-1304

