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Bering Sea deep water ventilation over the last 2 Ma, evidence from foraminiferal assemblages and stable isotopes

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We present benthic foraminiferal stable isotope and assemblage data from the Bering Sea continental slope (U1343, $\sim$2000m water depth), in order to elucidate changes in productivity and deep water ventilation over the last $\sim$2 Ma. The Bering Sea is the third largest marginal sea in the world, connecting the Pacific and Arctic Oceans, but there is still very little known of its palaeoceanographic past. Its open connections to the North Pacific make it an important location to monitor subarctic North Pacific palaeoceanography. Site U1343 is situated near the continental slope, and its high latitude location makes it sensitive to sea ice and glacial meltwater input, which caused large fluctuations in stratification, primary productivity and deep water properties through time. Although there is very little deep water forming in the Bering Sea today, potential intmediate and/or deep water formation in the past may also have affected water properties.

High productivity in surface water adds to the nutrient content of the aged waters entering the Bering Sea at depth from the Pacific, causing oxygen levels in some locations to be significantly depleted and benthic foraminifera tolerant to low oxygen levels and high primary productivity to thrive. Changes in the proportions of the low oxygen and high productivity species (e.g. Bulimina, Globobulimina, Globocassidulina) show large fluctuations through time, with an overall increase from the beginning of the Mid-Pleistocene Transition (MPT) onwards ($\sim$1.2 Ma) indicating more prevalent episodes of low oxygen conditions persisted after this time. Bottom water δ13C(Uvigerina) exhibit more negative values before the MPT compared with eastern equatorial Pacific Site 849, suggesting the presence of aged deep water in the Bering Sea for at least the last 2 Ma. During the MPT bottom water δ13C becomes more negatively offset from the Pacific which, coupled with the presence of lower oxygen benthic foraminifera, suggests a lower oxygen and higher nutrient bottom water mass was present in the Bering Sea from the MPT onwards. This may have been caused by an increase in primary productivity since the MPT, but proxies for productivity and sea ice presence suggest a more likely explanation would be better ventilation of the Bering Sea before the MPT.