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A 20,000-year record of ocean circulation and climate change from the Santa Barbara basin

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Abstract

MUCH of the evidence for climate-driven fluctuations in ocean circulation during the past 20,000 years has come from studies of the North Atlantic region¹⁻⁶. The extent to which such interactions have occurred in other ocean basins, and any associated teleconnections between basins, is poorly understood. Here we present high-resolution palaeoclimate and palaeoceanographic records from a 20,000-year sedimentary sequence from the Santa Barbara basin, on the eastern margin of the North Pacific Ocean. The sequence shows oscillations of the benthic environment between low-oxygen conditions (laminated sediments) during periods of warm climate, and higher-oxygen conditions (non-laminated, bioturbated sediments) during cool intervals. Age differences between coexisting benthic and planktonic foraminifers indicate climate-related changes in the age and source-and, hence, oxygen content-of basin bottom waters. Relatively young bottom waters are associated with the cooler intervals and are considered to reflect high proportions of intermediate waters derived from proximal sources. Conversely, older bottom waters are associated with the warmer intervals and were derived from more distal sources. These climate-driven variations in ocean circulation appear to be synchronous with the main ocean-climate fluctuations in the North Atlantic region¹⁻⁶, suggesting that a tight coupling mechanism operates between the two basins.