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Role of CO_2 in tropical Pacific sea surface temperatures during glacial-interglacial cycles

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Tropical sea surface temperatures (SSTs) warmed and cooled in step with the Pleistocene ice age cycles, but the mechanisms are not known. It is assumed that the answer must involve radiative forcing by CO_2 but SST reconstructions have been too sparse for a conclusive test. Here I present a 230,000–year tropical SST stack from the eastern equatorial Pacific (EEP) using two new Mg/Ca reconstructions combined with three earlier ones. The EEP stack shows persistent covariation with Antarctic temperature on orbital and millennial timescales indicating tight coupling between the two regions. This coupling however cannot be explained solely by CO_2 forcing because in at least one important case, the Marine Isotope Stage (MIS) 5e–5d glacial inception, both regions cooled ∼5–6.5 thousand years before CO_2 decreased. More likely, their covariation was due to advection of Antarctic climate signals to the EEP by the ocean. To explain the MIS 5e–5d event and glacial inception in general the hypothesis is advanced that the cooling signal spreads globally from the Northern Hemisphere with an active ocean circulation – first from the North Atlantic to the Southern Ocean with a colder North Atlantic Deep Water, and then to the Indian and Pacific Oceans with cooler Antarctic deep and intermediate waters.