



Northern Hemisphere temperature seasonality during the Holocene documented in Red Sea corals

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Reconstructions of the annual cycle of temperature by using marine or terrestrial archives are still a challenge in paleoclimate research. For the Holocene, a trend of decreasing temperature seasonality towards present-day is expected over the Northern Hemisphere subtropics to mid-latitudes due to changes in orbital insolation. Here we use Sr/Ca variations in annually-banded reef corals, a well-calibrated paleothermometer on seasonal timescales. Applying this paleothermometer to a set of up to 20 modern and fossil *Porites* corals from a single reef site in the northernmost Red Sea reveals a trend of decreasing temperature seasonality at the sea surface over the last 6,000 years. Individual coral colonies provide time-windows of sub-seasonally resolved Sr/Ca variations over periods of several years to more than a decade, robustly documenting changes in the annual cycle of temperature.

Consistent with the coral-based results, a transient simulation using the ECHO-G coupled atmosphere-ocean circulation model reveals a similar trend of decreasing temperature seasonality at the sea surface in this region over the Holocene. Next to the direct influence of orbital insolation changes, temperature seasonality in the northern Red Sea/Middle East region is modulated by natural modes of climate variability such as the Arctic Oscillation/North Atlantic Oscillation.