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Re-evaluating tropical Atlantic LGM planktonic foraminifera assemblage-based sea-surface temperature reconstructions

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A large fraction of the estimates of LGM sea-surface temperatures are based on planktonic foraminifera assemblages and calculated using transfer functions. Despite the wide depth distribution of planktonic foraminifera in the upper ocean, transfer functions for foraminifera assemblages are usually calibrated against 10m SST. Recent work has shown that calibrating foraminifera assemblages against different depths can yield markedly different reconstructions, and that 10m reconstructions are rarely the most plausible as they typically don't explain the most variance in a time series of fossil data. These problems are most severe in the tropics. The tropics also have many LGM assemblages without good modern analogues, and the thermal profile of tropical CMIP5 LGM grid boxes lack analogues in the CMIP5 PI ocean.

In view of these issues, we recalibrate the Atlantic planktonic foraminifera training sets against different depths, and reconstruct LGM temperatures. We show that the direction of east-west gradient in tropical LGM temperature anomalies is dependent on the calibration depth. If the most applicable calibration depths are deeper in the western tropical Atlantic than the eastern, as suggested by analysis of time series, we can reconstruct uniform cooling in the tropical Atlantic, greater than that previously reconstructed. We compare our new reconstructions with CMIP5 LGM temperatures.