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A comparison study of Mg/Ca-, alkenone- and TEX₈₆-derived temperatures for the Brazilian Margin during Marine Isotope Stages 6–5

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The reconstruction of accurate sea-surface temperatures (SST) is of utmost importance due to the central role of the ocean in the global climate system. Yet SST-proxies might be influenced by a number of environmental processes that may potentially bias the accurate reconstruction of the target variable. Here, we investigate the fidelity of SST reconstructions for the Western Tropical South Atlantic (WTSA) for Marine Isotope Stages (MIS) 6–5, utilizing a core collected off eastern Brazil at ~20°S. This interval was selected as previous SST estimates based on Mg/Ca ratios of planktic foraminifera suggested a peculiar pooling of warm surface waters in the WTSA during MIS 6 despite glacial boundary conditions. To ground-truth the Mg/Ca-based SST data we generated SST reconstructions from the same core using both, alkenone and TEX₈₆ paleothermometers. Comparison with alkenone-based temperature estimates corroborate the previous Mg/Ca-based SST reconstructions, supporting the presumed warm-water anomaly during MIS 6. In contrast, while core top samples indicate that TEX₈₆-derived temperatures represent annual mean SST, the TEX₈₆-derived paleo-temperatures are up to 6°C colder than Mg/Ca- and alkenone-based SST reconstructions. We interpret the periods of anomalously cold TEX₈₆-temperatures as a result of a vertical migration of the TEX₈₆ producers (heterotrophic marine Thaumarchaeota) to deeper water depths in response to an increase in food availability during phases of enhanced fluvial suspension input.