## Do coccolith clumped isotopes record sea surface temperatures? A laboratory culture and sediment trap perspective.

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Coccolithophores produce skeletal carbonate or coccoliths, which accumulate as sediment. These sediments are an interesting target for paleoclimate reconstructions using carbonate clumped isotopes, as they are widespread across a broad range of latitudes in the Cenozoic. In the last few years many discrepancies among  $\Delta_{47}$ -temperature calibrations have been resolved across the range of paleoclimate-relevant temperatures (Anderson et al., 2021). However, small differences, on the order of 1-2°C, still persist between temperature calibrations. These discrepancies need to be addressed to enhance the accuracy and robustness of paleoclimate reconstructions (Meinicke et al. 2020; Daeron and Gray 2023).

We will present data from cultures of coccolithophores grown in the laboratory with a temperature range of 6-27°C and from sediment traps with a global distribution covering a temperature range of 20°C. The three cultured species cover a range of growth rates, growth conditions, and species-specific carbon and oxygen vital effects to evaluate if environmental conditions influence their clumped isotope composition. Our culture results indicate that are no species or genus-specific effects on the  $\Delta_{47}$ temperature relationship in coccolithophores and we find that varying environmental parameters other than temperature also do not have a significant effect.

The sediment trap results show that the relationship found for laboratory grown coccolith calcite between  $\Delta_{47}$ -temperature also holds true for ocean-derived coccoliths. Using the culture-based calibration we demonstrate that the coccoliths approximate the temperatures from the estimated production depth better than that of the mixed layer depth, complete photic zone, or the sea surface.

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Meinicke, N., S.L. Ho, B. Hannisdal, D. Nürnberg, A. Tripati, R. Schiebel, and A.N. Meckler. (2020), *Geochimica et Cosmochimica Acta* 270, 160-183.