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Where do tropical land temperatures sit on the bipolar see-saw?

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Low latitudes play a key role in the Earth's climate system, receiving the highest amount of solar energy that is redistributed across the globe through atmospheric and oceanic circulation. The last glacial cycle has been characterized by millennial-scale climate oscillations, marked by large and rapid temperature swings in the North Atlantic region accompanied with opposite and smaller temperature variations in the Southern Hemisphere. In the context of these millennial scale climate fluctuations, we seek to understand the tropical climate behaviour, determining whether it followed the Northern Hemisphere pattern or the Southern Hemisphere pattern and atmospheric CO_2.

In this study, nucleation-assisted microthermometry (Krüger et al., 2011) was used to determine stalagmite formation temperatures based on fluid inclusion liquid-vapor homogenization. The method was applied to SC03, a stalagmite from Secret Cave (Gunung Mulu National Park, Northern Borneo), previously studied for changes in precipitation (Carolin et al., 2013). Here we reconstructed a quantitative land temperature record, covering selected Dansgaard-Oeschger cycles during MIS 3 (42-50 ka) as well as during MIS 5a and MIS 4 (60-81 ka). Our preliminary findings suggest that tropical temperature did not follow Northern Hemispheric patterns but there appears to be a relationship with atmospheric CO_2 levels. This aligns with previous findings from the last glacial termination derived from another stalagmite from the same cave (Løland et al., 2022). Additionally, we investigated whether there is any evidence of a significant land temperature change in the period immediately following the Toba super eruption (Sumatra, Indonesia), ca. 73.8 ka. Our study contributes to a broader understanding of the interplay between low and high latitude climate during millennial-scale reorganizations of the global climate system.