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Temperature variability in the Southern Indian Ocean: insights from the new Mount Brown South ice core water isotope record

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The last millennium is a critical time-window for understanding natural variability in the climate system and contextualizing anthropogenic climate warming. Observational climate records are available for, at best, the past few hundred years and thus high-resolution proxy records are an important tool for extending global observational records. Observational records in Antarctica are particularly sparse, largely limited to 1957 onwards. High-resolution ice cores can therefore provide a critical tool for extending the observational record across Antarctica and to help better constrain natural variability in the southern high latitudes. The network of high-resolution cores across Antarctica is continually expanding, however there are several critical regions where climate variability is poorly constrained due to a lack of records. The East Antarctic coastline, in particular the Wilkes Land coastline, stretching from the Adelie Coast to the Amery Ice Shelf has notably few high-resolution long ice core records. We present a new 1000-year reconstruction of temperature variability from the Mount Brown South ice core, a 295-m ice core drilled in 2017/2018, based on the water isotope record. We demonstrate how extreme precipitation events modify the ice core isotope record from a simple representation of mean annual temperature. Using high-resolution measurements of $\delta^{18}O$ and d_{ln} in the ice core, alongside isotope modelling approaches, we reconstruct both local temperature variability and variability in the Southern Indian Ocean. The ice core site is situated in Wilhelm II Land, inland from Davis Station, and comparison to the existing Law Dome ice core record gives insights into the atmospheric circulation patterns that drove climate variability in this region during the last millennium.

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