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Hydrologic variability in the southwest Indian Ocean from Mauritius corals since the late 19th century (and connections to the Indo-Pacific throughflow)

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Sea surface salinity and its hydrological influences are important variables in global ocean and atmospheric circulation. In the Indian Ocean, particularly the Southwestern region, observational records of salinity are not well constrained before the early 2000's making any understanding of decadal to interdecadal changes in sea surface salinity difficult. Current reconstructions of hydroclimate variability associated with ocean currents and salinity variability in the Southwestern Indian Ocean region are limited mainly to the Aguhlas current region, with a limited number of reconstructions capturing wider open ocean variability. Where reconstructions of this nature do exist across the wider southwest Indian Ocean, these records have limited ground-truthing due to short observational records and lack of replication.

Here we present a paired Sr/Ca and $\delta^{18}O$, bimonthly resolved record of a shallow water coral from the southwest Indian Ocean (Mauritius Island, 20.34°S, 57.55°E), extending from 1882 to 1989 to provide invaluable information about hydroclimate in the region. The reconstructed coral Sr/Ca-temperature proxy tracks the SST of the region very well, providing additional confidence to the current coral temperature reconstructions. Our record highlights the strong increasing SST trend across the southwest Indian Ocean, with an increase of +0.55°C since 1883. The paired analysis of Sr/Ca and $\delta^{18}O$allows for the calculation of $\delta^{18}O_{sw}$ (hydrology) at bimonthly resolution, developing the first high-resolution hydroclimate record which extends past the start of the 20th century and captures wider open ocean variability. The coral $\delta^{18}O_{sw}$ record captures Mauritius rainy season (austral summer) precipitation, with a strong relationship between austral summer precipitation at stations on the island during the short period of observation. It is suggested that this relationship to Mauritius's rainy season captures wider-scale precipitation variability associated with the tropical rainfall belt. It is also suggested the non-rainy season (austral winter) $\delta^{18}O_{sw}$ variability is controlled by oceanic processes as Mauritius lies along the South Equatorial Current, one of the major oceanic currents in the Indian Ocean and an important connection between the Pacific and Indian Ocean basins.

By using a network of current coral reconstructions from the wider southwest Indian Ocean, and the newly developed Mauritius coral record we hope to reveal variability in both ocean current variability and precipitation across this important region. Extending these coral records beyond the satellite era will further improve our understanding of the complex interaction between ocean

and atmosphere variability in this region under past, present, and future climate change. This study uses legacy data as part of the DFG-Priority Programme " Tropical Climate Variability & Coral Reefs" (SPP 2299)**.**