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Southeastern Indian Ocean seawater isotopes ($\delta^{18}O$) Across the Subtropical Front

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Measurement of stable oxygen isotope ratios ($d^{18}O$) of natural waters has been an important tool for understanding both modern and past climate and environmental conditions. Seawater $d^{18}O$ is primarily controlled by Rayleigh fractionation during evaporation and precipitation, making $d^{18}O$ a conservative interior water mass tracer. Seawater $d^{18}O$ data is relatively limited compared to terrestrial locations, particularly in the Indian and Southern Ocean and from subsurface water masses. Better understanding of the $d^{18}O$ variability between water masses is important for interpreting $d^{18}O_{calcite}$ measurements of foraminifera living in the water column that are used in paleoceanographic reconstructions.

We present seawater $d^{18}O$ data collected along two transects across the Subtropical Front (STF) from the Southeastern Indian Ocean and measured using laser absorption spectrometry. We find a > 1.0‰ range in $d^{18}O$ values between surface and bottom water samples and an average $d^{18}O$ difference between subtropical and Antarctic waters of 0.36‰. The $d^{18}O_{sw}$-Salinity regression from the upper 1000 m is $d^{18}O_{sw} = 0.47*S - 16.3$ ($R^2 = 0.6$, $n = 75$, $p < 0.001$). This slope of the regression is comparable to other subtropical oceans and is similar to the slope of the regression from a recently published seawater $d^{18}O$ record from the South Australian Bight (SAB). We suggest that this tight relationship deep into the water column could be due to the proximal locations of the stations to and in the northern rim of the Southern Ocean and that waters that were recently at the surface were captured and mixed downward the prior winter. The $d^{18}O_{sw}$ range in our data across all depths (1.48‰) is larger than the range for the SAB data (0.96‰) and data from the SW Indian Ocean (1.13‰). Most of the $d^{18}O_{sw}$ variability in all the datasets is in the upper ocean and the observed variability in our data is likely due to our cruise track crossing the subtropical front between November and December 2018. Our results will be compared to predicted seawater $d^{18}O$ values calculated based on paired $d^{18}O_{calcite}$ data, measured *in-situ* temperature and salinity measurements, and published foraminifera paleotemperature equations.