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Stable isotope distributions in the Benguela System coastal upwelling: imprint of Agulhas leakage

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The water that upwells in the Benguela System is fed by two water masses: Eastern South Atlantic Central Water (ESACW, relatively fresh, partly derived from Indian Ocean water) and Western South Atlantic Central Water (ESACW, saltier). ESACW is transported northward in the eastern South Atlantic Ocean with the Benguela Current, which is part of the return flow of the Thermohaline Circulation (THC).

We present measurments of the carbon-13/carbon-12 isotope ratio in dissolved inorganic carbon ($\delta^{13}C_{DIC}$) and the oxygen-18/oxygen-16 isotope ratio in seawater ($\delta^{18}O_w$) from a section along 23°S through the Walvis Bay coastal upwelling cell. This section was sampled four times at roughly one-week intervals.

Our goal was to test whether or not changes in the contributions of WSACW and ESACW to the upwelled water could be inferred from stable isotope ratios as preserved in carbonate shells of benthic foraminifera. To this end, we combined our data with the observed hydrology of this area and applied an optimum multiparameter analysis. We found that changes in $\delta^{18}O_c$ would probably be too small to be detected in the sedimentary record, but that changes in $\delta^{13}C_c$ could indeed be significant.

We discuss our results in the context of proxy data and climate modelling results, which suggest that changes in the supply of Indian Ocean water to the Benguela Current through the Agulhas leakage may affect the strength and stability of the THC.