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Annual and eddy-induced variability of particle fluxes in the Mozambique Channel (SW Indian Ocean): Implications for (temperature) proxy reconstructions

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The subtropical Mozambique Channel in the SW Indian Ocean displays a pronounced annual sea surface temperature (SST) cycle ranging from 25 ºC to 30 ºC. This annual cycle is also revealed in the remote sensing parameters surface-mixed-layer depth (SML depth), chlorophyll a, and in surface water nutrient concentrations. Superimposed on this annual cycle we find a $\sim$70 day current cycle caused by the migration of warm, anticyclonic eddies with surface velocities that frequently exceed 1.5 m/s. This $\sim$70 day eddy cycle is especially pronounced in SML depth, surface water nutrient and chlorophyll a concentration and less so in SST. To assess the influence of both annual and eddy cycles on the sedimentary depositional signal, we compare particle fluxes and proxy parameters from a 2.5 year sediment trap deployment with (sub-) surface current velocities and remote sensing SST. We find that responses to the annual cycle propagate sequentially at lags of three to six weeks to the deep channel sediment. However, only about 50 % of the variance in e.g. opaline silica, δ^{15}N and foraminiferal δ^{18}O and Mg/Ca of surface dwelling *G. ruber* and *G. trilobus* is related to the annual cycle with up to 30 % of the remaining signal demonstrating a clear $\sim$70 day eddy periodicity. Both the Branched and Isoprenoid Tetraether (BIT) Index and $\delta^{13}C_{org}$ as indicators for marine versus soil organic matter input correlate well with eddy migration through the channel at an r^2 of 0.55. We also observed a good correlation at an r^2 of $\sim$0.5 between (sub-) surface currents and the organic matter temperature proxy TEX_{86}. By finding a strong $\sim$70 day eddy periodicity in a number of particle fluxes at the 2.5 km deep ocean floor we demonstrate that eddies in the Mozambique Channel regularly advect particles and transport them over long distances thereby potentially biasing organic matter (temperature) proxy reconstructions. Foraminiferal temperature proxies exhibit a smaller bias due to relatively fast sinking rates that significantly shorten their transport time and distance as opposed to organic and lithogenic matter.