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Sea surface temperature reconstructions of the past centuries using Porites corals: a comparison between the central and the western Indian Ocean

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The main forces for climate variabilities in the tropical Indian Ocean on interannual and decadal timescales are connected to the El Nino-Southern Oscillation (ENSO) and the Indian Ocean Dipole (IOD) and to ENSO-like events, respectively. Corals can be used to reconstruct past changes of environmental parameters such as sea surface temperatures (SST) and can therefore help to visualize changes in past climate variabilities. However, a lack of coral data from the Indian Ocean still limits the understanding of the teleconnections between interannual and decadal climate variabilities in the central and the western Indian Ocean associated with transregional and/or global climate phenomena.

Here, we use three fossil massive Porites coral samples from the central Indian Ocean (Chagos Archipelago) to reconstruct past SST. One sample records 41 years of the later Little Ice Age (1675-1716), the other two samples, dated to the mid-19th century to early 20th century (1836-1867 and 1870-1909), cover 31 and 39 years, respectively. The samples were subsampled at a monthly resolution for trace element analysis. Sr/Ca ratios were measured using an ICP-OES. All records show relatively high annual amplitudes and large interannual variabilities. These patterns can also be observed in the Sr/Ca records of corals from the same time period and the same archipelago presented by Pfeiffer et al. (2017) that partly overlap with our historical samples. Our main goal is to compare conditions of the last centuries in the central Indian Ocean with the western Indian Ocean and to relate it to interannual and decadal climate variabilities associated with ENSO and/or ENSO-like events.

Pfeiffer, M., Zinke, J., Dullo, W. C., Garbe-Schönberg, D., Latif, M., & Weber, M. E. (2017). Indian Ocean corals reveal crucial role of World War II bias for twentieth century warming estimates. Scientific reports, 7(1), 14434.