Geophysical Research Abstracts
Vol. 20, EGU2018-13697, 2018
EGU General Assembly 2018

Evaluating combined coral and Tridacna spp. carbonate paleo-SST approaches on recent and last interglacial time scales: A case study from Chumbe Island, Zanzibar

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Paleo-environmental records represent the backbone of past climate variability reconstruction, which is a pre-requisite for future climate projections. Marine carbonate-producing organisms as corals and bivalves record a suite of environmental parameters in their skeletal parts, thus providing geochemical archives of different resolution and robustness. The variability of sea surface temperatures (SSTs) is one of the parameters of increasing socio-economic relevance. Biogenic carbonate minerals record ambient seawater temperatures prevailing during their genesis by isotope (δ18O) and element ratios (e.g. Sr/Ca, U/Ca).
Especially due to their porous structure the susceptibility of fossil corals for early diagenesis and the impact of secondary mineralization processes is often observed as limitation for their archive reliability. In contrast, Tridacna shells provide dense carbonate material, presumably more resistant against geochemical alteration. In order to evaluate their geochemical proxy potential corals and Tridacna shells were sampled at two different sites of Unguja and Chumbe island (Zanzibar, Tanzania), a northern most exposed and a sheltered western lagoonal location.
The northern site only provides strongly recrystallized coral and Tridacna material yielding no reliable U-Th age information, excluding them from SST approaches. Although the coral samples from the western sampling location are also dominated by calcitic mineralogy. The average U/Th age of 112 ky ($\pm$5 ky) BP still corresponds with the last interglacial maximum (Marine Isotope Stage 5e), which is the determined time interval of reef formation. This result points at least for the U-Th systematic on the option of an almost “closed system” behavior during recrystallization for these samples.
The corresponding Tridacna fossils are still preserved in aragonitic mineralogy, suggesting only low diagenetic overprinting and supporting the coral data with reasonable age information around 114 ($\pm$6) ky BP.
In contrast to the highly altered adjacent coral samples, first promising Sr/Ca SST approaches on these Tridacna cover a range from 25 to 37°C and support further efforts on proxy calibration.
Furthermore, current results on a recent to subrecent coral micro atolls from the lagoonal setting will be presented.