Geophysical Research Abstracts
Vol. 20, EGU2018-4902-2, 2018
EGU General Assembly 2018

Last interglacial hydroclimate and temperature seasonality reconstructed from tropical Atlantic corals

William Brocas (1), Thomas Felis (1), Paul Gierz (2), Gerrit Lohmann (2), Martin Werner (2), J. Christina Obert (3), Denis Scholz (3), Martin Kölling (1), and Sander R. Scheffers (4)

(1) MARUM - Center for Marine Environmental Sciences, University of Bremen, Bremen, Germany, (2) Alfred Wegener Institute Helmholtz Centre for Polar and Marine Research, Bremerhaven, Germany, (3) Institute for Geosciences, Johannes Gutenberg University Mainz, Mainz, Germany, (4) Marine Ecology Research Center, Southern Cross University, Lismore, Australia

Reconstructions of last interglacial (∼127-117 ka, LIG) climate help further constrain the natural response and variability of the climate system during a warmer climate. However, the seasonal temperature and hydroclimate changes of the tropical ocean are not well known for this time interval. Using precise ^{230}Th/U dating methods, we present well preserved fossil shallow-water corals from the southern Caribbean Sea (Bonaire) that lived between 130 and 118 ka ago. Annual banding with a corals skeleton enabled construction of time windows of monthly resolved paired Sr/Ca and δ^{18}O proxy records. We use coral Sr/Ca to reflect sea surface temperature (SST) seasonality and assess alongside coral δ^{18}O in order to isolate the δ^{18}O of seawater ($\delta^{18}O_{seawater}$). This offered insights into LIG tropical Atlantic hydroclimate seasonality. Similar to modern SST seasonality of ∼2.9 ˚C was reconstructed during the early (130 ka) and late LIG (120-118 ka), whereas during the mid-LIG, significantly higher than modern SST seasonality of 4.9 ˚C (at 126 ka) and 4.1 ˚C (at 124 ka) was found. At 124 ka, our longest coral record of 37 years, also yields significantly higher than modern coral δ^{18}O and $\delta^{18}O_{seawater}$ seasonality as well as a 2-month phase lead of the coral δ^{18}O vs. Sr/Ca annual cycle.

These results are indicative of a mid-LIG southern Caribbean hydroclimate that was distinctly different from today. Our coupled atmosphere-ocean general circulation model simulation reveals our coral proxy findings to be consistent with the evolving amplitude of orbitally induced changes in the seasonality of insolation throughout the LIG. Cumulatively, our coral δ^{18}O, $\delta^{18}O_{seawater}$ and model findings indicate a northward expansion of the South American Intertropical Convergence Zone (ITCZ) into the southern Caribbean Sea during the mid-LIG. This is consistent with the broad spatial coherence of ITCZ migratory dynamics during the mid-LIG, and highlights the importance of regional aspects in proxy and model estimates of hydroclimate seasonality during the LIG.