Tropical Climate Variability & Coral Reefs - A Past to Future Perspective on Current Rates of Change at Ultra-High Resolution DFG Priority Programme (SPP 2299) Manna Tropical Climate Variability & Coral Reefs

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Programme Research Questions

1. Can we understand the interaction between global climate change and modes of tropical climate variability, and their combined impact on coral reef ecosystems and tropical societies in a warming world?

2. Can we identify and understand rapid changes and transitions, their precursors, and thresholds on seasonal, interannual and decadal timescales during the current and past warm climates – in coral proxy records of climate and environment, coral reef ecosystems, and earth system model simulations?

3. Can monthly climatic and environmental information extracted from coral skeletons by novel geochemical and isotopic analysis tools, combined with advanced statistical methods, earth system modelling and observed ecosystem responses quantify rates of change to project future coral reef ecosystem and tropical marine climate change?

4. What are the future risks associated with the impact of increasing tropical sea surface temperature on dominant tropical Check out climate modes, regional climate extremes, longthe **SPP 2299** term precipitation trends, tropical societies and in website here particular, coral reef ecosystems?



Climate and environmental change in the Andaman Sea since the late Little Ice Age: Sea surface temperature, hydroclimate, and coral response to thermal stress in the northeastern Indian Ocean (IndOC-E)

Thomas Felis & Hana Camelia (MARUM, University of Breme



Frozen in time: ecology of paleo reefs

Sonia Bejarano (ZMT, University of Bremen), Alessio Rovere (Ca'

Foscari University of Venice), Christian Wild (University of Bremen

Patrick Boyden (MARUM, University of Bremen)

Central Pacific inferred from isotopic and trace element analysis of *Porites* spp. microatolls Oliver Knebel (Goethe University Frankfurt)



Reef-scale Climate Protection – screening coral skeletal records for proxy Traces of natural bleaching mitigation by internal waves (ReefCPTrace)

Marlene Wall (GEOMAR, Kiel)

a series



Internal-wave cooling – hope for coral reefs

f site without internal wave cooling \rightarrow severe bleaching

Seasonal Extremes and Rates of Change in Past Warm Climates: Insights from Advanced **Statistical Estimations on High-Resolution** Coral Proxy Records (SEARCH)

Manfred Mudelsee (University of Potsdam)

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Indian Ocean warming from the peak of the Little Ice Age to the 21st century: Zanzibar Island, Western Indian Ocean (IndOC-W)

Miriam Pfeiffer & Saori (Sally) Ito (Kiel University (CAU))





Common Era ENSO variability in the West

Contribution of past and recent climate variability on contemporary patterns of coral bleaching susceptibility (TRACE)

Christian Voolstra & Marlen Schlotheuber (University of Konstanz)

Coping with heat stress: Evaluating the effects of repeated bleaching events on coral biomineralization (STRESS)

> Juan Pablo D'Olivo & Laura Lehnhoff (FU Berlin) Daniel Frick (GFZ Potsdam)







Quantifying post Little-Ice-Age freshwater influences and ocean dynamics in the Central American Sea using a novel tracer combination: 234U/238U– (P)SST – 14C

Norbert Frank, Sophie Warken & Sahra Greve (Heidelberg

The marine Nitrogen cycle in a warming world: Evidence from the past, lessons for the Anthropocene (NITROCENE)

Alfredo Martinez-Garcia & Nicolas Duprey (MPI for Chemistry, Mainz)



Dxygen Deficient Zones (ODZs) are large water masses deprived of O_2 .). ODZs are predicted to expand under global warming with dramatic ological and economical consequences worldwide







Tropical climate variability and the influence of environmental stressors as recorded i **Orbicella and Siderastrea coral skeletons** from Belize

Eberhard Gischler & Diana Diers (Goethe University Frankfurt)



Reconstructing ultra-high resolution climate variability and symbiont bleaching in tropical corals: from past to present (EPIBleach)

eni Anagnostou, Jan Fietzke, Martin Frank, Luisa Meiritz (GEOMAR









DFG Deutsche Forschungsgemeinschaft German Research Foundation

Disentangling species-, colony-, and symbiont-specific effects on coral skeletal characteristics under future environmenta variability scenarios (DiSCoSym)

Maren Ziegler & Wyatt Million (Justus Liebig University Giessen)



Terrestrial sediment flux and upwelling intensity in the anthropogenic era recorded by stable Ba isotopes and rare earth elements in tropical coral skeletons

Ed Hathorne, Martin Frank & Yang Yu (GEOMAR, Kiel)



Seasonal to decadal tropical Sea Surface Temperature variability from corals: timescale dependent fidelity of δ^{18} O and Sr/Ca records

Andrew Dolman (AWI Potsdam



Reef coral calcification and climate dynamics during the Eocene greenhouse (EOCENE)

Thomas Brachert & Phyllis Mono (Leipzig University), Michael Henehan (GFZ Potsdam), Regina Mertz (Johannes Gutenberg University Mainz)



A global assessment of past thermal stress responses in coral skeletal records: applications of the CoralHydro2k database



Coral reefs on the tin island of Belitung: 'reefs of hope' threatened by pollution and runoff (TINBELT)

Dieter Garbe-Schönberg, Miriam Pfeiffer & Takaaki (Konabe) Watanabe (Kiel University (CAU))



Tropical Atlantic-Pacific hydroclimate, variability and teleconnections during the Last Interdiacial and the Holocene – Insights from earth-system modelling and corals (TAPIOLA)

Iniversitv of Bremen)





Wang et al. (2019)