TIMING OF MICROBIAL ENCRUSTATION ON CORALS DURING THE LAST DEGLACIAL SEA-LEVEL RISE, IODP EXPEDITION # 310 OFF TAHITI

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The rapid sea-level rise accompanying the last deglaciation is recorded by coral reefs characterized by extraordinarily voluminous microbial crusts (up to 80%) on the slopes of Tahiti. For reconstructing the exact course of deglacial sea-level rise and sea-surface temperature, the taxonomy of corals and geochemical tracers in their skeletons are currently studied by Science Party members of the IODP Expedition # 310. However, for reliable reconstructions, these parameters have to be distinguished from others including water energy, nutrient levels, light intensity, wave-base levels, and erosion of the hinterland. To gain this broader information, components other than corals need to be studied. In this respect, the microbialites are a potential archive for a wide range of environmental parameters but their paleoenvironmental significance is not sufficiently understood so far. Hence, our study aims at adding to the calibration of microbialites in order to unravel their environmental record.

Corals encrusted by coralline algae followed by microbial crusts, the so called microbialites, represent the typical repetitive sequence of the Tahitian deglacial reef-succession. The microbialites show two main growth patterns: an initial laminated structure and a successive dendritic to thrombolitic habit. Microbioerosion patterns in the microbialites and the underlying corals yield a record of environmental parameters – specifically with respect to relative light availability and palaeobathymetry – prior and during encrustation. Traces found in microbialites, coralline algal crusts and in the corals have been produced by phototrophic (e.g. cyanobacteria, chlorophytes, rhodophytes) as well as heterotrophic (e.g. bacteria, fungi, sponges, polychaetes) boring organisms whereby the quantity of microbioerosion in the coral skeletons is noticeable higher than in the coralline algal and microbial crusts. Preliminary results show that key-ichnotaxa for the shallow euphotic zone are very scarce or absent whereas most boring traces encountered are more typical representatives of fossil and recent deep-euphotic to even dysphotic (<1% surface illumination) environments. Traces of heterotrophic boring fungi and bacteria which are usually characteristic of the aphotic zone were frequently encountered. However, this seemingly "aphotic ichnocoenosis" has been detected mainly in the abundant cavities created by boring sponges or inside the coral porosity, reflecting the possibility for the local development of such an ichnocoenosis also in shaded niches of photic environments.

The information extracted from structural analyses as well as microbioerosion patterns will help to resolve the relative timing of the growth of oligotrophic zooxanthellate corals and the initial incrustation by the microbialites that tend to flourish in eutrophic conditions.