



Microbialite development patterns in the last deglacial reefs from Tahiti (French Polynesia; IODP Expedition #310): implications on reef framework architecture

C. Searđ (1), G.F. Camoin (1), Y. Yokoyama (2,3), H. Matsuzaki (4), N. Durand (1), E. Bard (1), S. Sepulcre (1), and P. Deschamps (1)

(1) CEREGE, UMR 6635, Aix-Marseille Université, CNRS-Collège de France-IRD, Europôle Méditerranéen de l'Arbois, BP80, F-13545 Aix-en-Provence cedex4, France (seard@cerge.fr), (2) Ocean Research Institute and Department of Earth and Planetary Sciences, University of Tokyo, 1-15-1 Minami-dai Tokyo 164-8639, Japan, (3) Institute for Research on Earth Evolution (IFREE), Japan Agency for Marine-Earth Science and Technology (JAMSTEC), Yokosuka 237-0061, Japan, (4) Department of Nuclear Engineering and Management, University of Tokyo, 2-11-16 Yayoi, Tokyo 113-0032, Japan

The widespread occurrence of microbialites in the last deglacial reef frameworks (16-6 Ka BP) implies that the accurate study of their development patterns is of prime importance to unravel the evolution of reef architecture through time and to reconstruct the reef response to sea-level variations and environmental changes.

The present study is based on the sedimentological and chronological analysis (14C AMS dating) of drill cores obtained during the IODP Expedition #310 « Tahiti Sea Level » on the successive terraces which typify the modern reef slopes from Tahiti. It provides a comprehensive data base to investigate the microbialite growth patterns (i. e. growth rates and habitats), to analyze their roles in reef frameworks and to reconstruct the evolution of the reef framework architecture during sea-level rise.

The last deglacial reefs from Tahiti are composed of two distinctive biological communities which were characterized by a similar scenario of development throughout the sequence, involving a diachronous development and a lack of direct competition. The initial frameworks were formed by coralg communities including seven assemblages characterized by various growth forms (branching, robust branching, massive, tabular and encrusting). The microbial communities developed in the primary cavities of those frameworks, a few meters (1.5 to 6 m) below the living coral reef surface, where they heavily encrusted the coralg assemblages to form microbialite crusts. The offset between the growths of coral assemblages and microbialites ranges from 100 to 500 years.

The development of microbialites was controlled by the volume and the shape of the primary cavities of the initial reef frameworks determined by the morphology and the packing of coral colonies. The most widespread microbialite development occurred in frameworks dominated by branching, thin encrusting, tabular and robust branching coral colonies which built loose and open frameworks typified by a high porosity (> 50%). In contrast, their growth was minimal in compact coral frameworks formed by massive and thick encrusting corals where primary cavities yielded a low porosity (~30%) and could not host a significant microbialite expansion.