



## **The "CHECREEF" Project ( ESF/EuroMARC Programme): The last deglacial sea-level and climatic changes; coral reef records in the South Pacific**

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The ESF-EuroMARC CHECREEF Project is related to the IODP proposal #519 [1] and the IODP Expedition #310 [2 to 4] concerning the last deglacial coral reef records in the South Pacific (Tahiti and the Australian Great Barrier Reef; see [2] for the general scientific rationale).

The scientific objectives of this Project are threefold:

- To establish the course of the last deglacial sea-level rise with the aims of assessing the validity, the timing, and amplitude of meltwater pulses [5,6], proving or disproving saw-tooth pattern of sea-level rise, and testing predictions based on different ice and rheological models [7].
- To define sea-surface temperature and salinity variations during the last deglaciation when insolation, sea level, and atmospheric CO<sub>2</sub> levels were different from today. The objectives are to: 1) reconstruct interannual-decadal climate variability and seasonality (amplitude and structure) in the South Pacific; 2) reconstruct variability and change in interannual (including ENSO) and decadal-interdecadal (including PDO/IPO) variability; 3) compare the global variation and relative timing of post-glacial warming between the tropical Pacific and the mid- and high-, northern and southern latitudes; 4) determine major changes in tropical sea surface salinity.
- To analyze the impact of sea-level and environmental changes on reef development during the Last Deglaciation, with a special emphasis on the comprehensive reconstruction of environmental changes (e.g. nutrient concen-

trations, pH variations, paleoproductivity, alkalinity, terrigenous and freshwater fluxes), the evolution of the geometry, biological composition, reef growth modes, and the modeling of reef development.

Additional expected results will concern the seawater ( $^{234}\text{U}/^{238}\text{U}$ ) variations for the Late Pleistocene, an improved calibration of the  $^{14}\text{C}$  timescale using coupled  $^{14}\text{C}$ -AMS and U-Th measurements, and an improvement of geochemical climatic and paleoceanographic proxies.

The two study sites, Tahiti and the Great Barrier Reef, are located at a considerable distance from the major former ice sheets and correspond respectively to a volcanic island and a continental margin that are both characterized by slow and regular subsidence rates ( $\approx 0.25 \text{ mm.yr}^{-1}$  in the case of Tahiti [6];  $\approx 0.16 \text{ mm.yr}^{-1}$  in the case of the Great Barrier Reef [8]). They correspond, therefore, to ideal sites providing an unbiased continuous record of last deglaciation events. Both sites are characterized by the occurrence of numerous terraces ranging from 40 to 150 m water depth and at least three distinct submerged reefs (-100 m, -90 m and -60 m) that locally exhibit fine scale morphological details (i.e. elevated reef rims, patch reefs and landward lagoons). In Tahiti, dredging around the island [9] and drilling operations carried out both on the modern reefs off Papeete [10 to 13] and during the IODP Expedition #310 « Tahiti Sea Level » [3 & 4] have confirmed the significance of these features as unique archives of abrupt global sea-level rise and climate change.

The CHECREEF Project will rely on various actions:

1. the study of more than 600 m of reef cores with an exceptional recovery that were retrieved from 37 holes along transects ranging from 40 to 122 m water depth around Tahiti during the IODP Expedition #310 « Tahiti Sea Level » [3 & 4].
2. Investigations including the morphological study and the sampling of the Tahiti reef slopes with the small research submersible JAGO in order to relate distinct morphological features such as eroded reef terraces, wave notches, and drowned reefs to distinctive sea-level positions.
3. A site survey cruise on the Great Barrier Reef to generate high resolution bathymetric and seismic data that will be used to select suitable targets for an IODP drilling expedition corresponding to the part 2 of the IODP drilling proposal #519. Dredged rock samples from the tops of the shelf edge reefs will serve to establish a preliminary chronological frame.

4. Field investigations including systematic freshwater sampling conducted in the vicinity of effective or potential drill sites in both regions in order to understand the impact of freshwater discharge on reef growth and reef alteration.

The achievement of the primary objectives of the CHECREEF Project requires a multidisciplinary approach involving the use of geochemical and biochemical techniques, paleomagnetic analyses, detailed investigation of lithological and biological assemblages and the modeling of reef building.

## 1 Acknowledgements

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