

CHEMICAL PROPERTIES AND CONSERVATIVE TRACERS IN INTERSTITIAL WATERS OF THE TAHITI BARRIER REEF : RELATIONSHIPS WITH ENDO-UPWELLING CIRCULATION

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In a 50 m deep hole drilled in April 1990 on the crest of the barrier reef at Tahiti (17°30S-150°W) sampling and analyses of interstitial waters made on a monthly basis (ten data sets) indicate that these waters are nutrient- and CO₂-rich as compared to the adjacent oceanic mixed layer (0-100m) belonging to the oligotrophic gyre of Central Pacific.

From the upper part of the framework down to 20 m depth, free oxygen is present (1.5 ml/l), nitrate abundant (2 mmol/m³) and redox potential is positive (+200 mV). $\delta^{13}\text{C}$ values of ΣCO_2 are in the range 0.1 ‰ / 0.5 ‰ vs PDB i.e. ~1.0 ‰ lower than the surface and subsurface oceanic waters.

From 30 to 50 m depth, anoxic conditions prevail : ammonia (10 mmol/m³) is the quasi exclusive form of inorganic nitrogen and redox potential becomes negative (-150 mV). $\delta^{13}\text{C}$ values of ΣCO_2 drop sharply down to around -4 ‰ / -5 ‰ resulting in part from bacterial oxidation of organic matter.

Silicate concentrations reach about 80 mmol/m³ at 50 m. In addition, dissolved metal concentrations are high in the anoxic waters : Fe content is 300 times the surface oceanic value, Mn 10 times and Cd 20 times. These enrichments may be due to the influence of the underlying volcanic basement which lies several hundred meters below the borehole.

CFC and ¹⁸O are particularly interesting oceanic conservative tracers, with boundary conditions opposite to nutrients-metals ones. ¹⁸O data show very clearly that the interstitial waters do not originate from the open ocean subsurface waters at the same levels. The same information infers from the CFC data. The F12 concentrations are respectively 80 % and 75 % the surface oceanic values at 5 m and 20 m ; a more important decrease is observed below the 20 m level down to 50 m (50 % of the surface value). Therefore the properties of the upper oxic waters can be interpreted as a result of the mixing of the anoxic interstitial waters with Tropical Surface Water (TSW).

Compared with the Tikehau borehole (Tuamotu) the endo-upwelled flux seems to be less important in the Tahiti borehole ; this might be the result of either higher dynamical mixing with the TSW through sea surge effect or greater discontinuities in the reefal structure.

ORSTOM Fonds Documentaire

N° : 35684 ex 1

Cote : B

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International Society for Reef Studies

Annual Meeting, Berkeley, California
13-16 December 1991

Reefs Beyond the Golden Gate

PROGRAM AND ABSTRACTS



Berkeley Marina Marriott Hotel

24 JUL. 1992

ORSTOM Fonds Documentaire

N° : 35684/35685, ex 1

Cote : B

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