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Interstitial Waters in Atolls and Barrier Reefs : Evidences for Endo-Upwelling Circulation

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Measurements of chemical properties of interstitial waters from shallow boreholes in atoll (35 m), lagoonal pinnacle (17 m) and barrier reef (50 m) in french Polynesia indicate positive anomalous concentrations of dissolved organic nutrients and CO₂ compared to adjacent oceanic and lagoonal waters. Passive tracers such as helium-3 and chlorofluoromethane (F12), characterized by opposite boundary conditions, are used as tools to determine the origin of the nutrient rich interstitial waters. Both tracers data indicate that interstitial water properties result from a mixing of two water masses : Tropical Surface Water (0-100 m) and Antarctic Intermediate Water (500-1500 m). They confirm the penetration and upward circulation inside the reef structure of oceanic water with a recharge depth from 700-800 m. These data give new evidences to the geothermal endo-upwelling model in which Antarctic Intermediate Water enters the porous reef framework, is then driven upward by local geothermal gradient and emerges at the reef crest to provide nutrients to the flourishing algal-coral ecosystem.

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