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Phosphorus Cycling in Marine and Freshwater Systems II
Presiding: **G Filipelli,** Univ of CA, SC; **K Ruttenberg,** Woods Hole Oceanographic Inst

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PHOSPHORUS PATHWAYS IN ATOLLS: Endo-upwelling input, microbial accumulation and Carbonate-Fluoro-Apatite (CFA) precipitation

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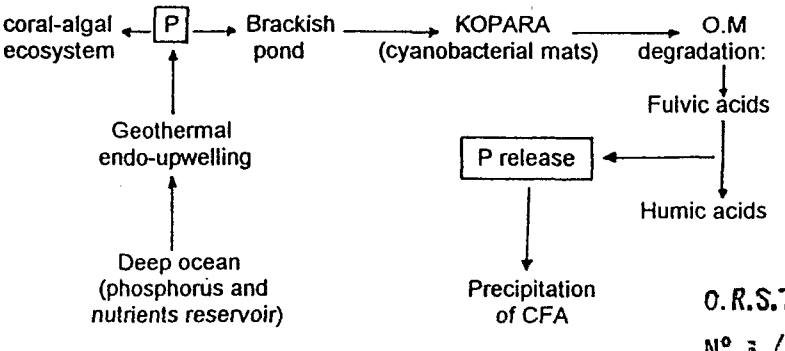
The geothermal endo-upwelling circulation, which brings new nutrients from the deep oceanic reservoir up to atoll reef crest, can be viewed as the necessary and sufficient process controling atoll functioning, from autotrophic algo-coral production to carbonate calcification, early cementation, and diagenetic transformations (1).

Elevated phosphate concentrations from 1 to 3 µM in Phosphate Inorganic Dissolved (PID), measured in reef interstitial waters are also found in small brackish ponds (1-10 µM) occupying the emerged rim of Tuamotu atolls. These ponds are the seat of accumulation of purely microbially originated organic matter that expresses as thick cyanobacterial mats (stromatolites) called KOPARA by native Tuamotu people (2).

The association of phosphorus with microbial organic matter has been demonstrated by Fikri (3) in insular phosphorites and interpreted as the result of the concentration of P by cyanobacterial and bacterial populations. After the death of such organisms, a late oxidation stage release P which precipitates under the form of CFA. Checking this process is now in progress by the way of measuring the P amount in fulvic and humic acids in order to confirm Nissenbaum observations (4) on the liberation of P out of the organic matter, mainly at the moment when fulvic acids transform into humic acids. If such a situation is verified in kopara ponds, it could be generalized to closed atoll-lagoons which functions as mega kopara ponds and where CFA layers are present (e.g. Niau atoll). The very first steps leading to atoll phosphogenesis, viewed as endo-upwelled phosphorus sink (5) and massive CFA accumulation (6), could then be rationally explained.



(1) Rougerie F. and Wauthy B., 1993.-Coral Reefs, vol. 12, 19-30.
(2) Trichet J., 1967.-C.R. Acad. Sciences Paris, 265, 1464-1467.
(3) Fikri, 1991.-Thèse Université d'Orléans, 200 p.
(4) Nissenbaum A., 1979.-Geochim. Cosmochim. Acta, 43, 1973-1978.
(5) Rougerie F, Wauthy B., 1989.-C.R. Acad. Sciences Paris, t. 308 II, 1043-1047.
(6) Bernat M., Loubet M., Baumer A., 1991.-Oceanologica Acta, vol. 14, 4, 325-331.