

CIRCUM-PACIFIC CONFERENCE AND EXHIBITION

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Atoll-Phosphate Genesis: Role of Lagoonal Biomass and Possible Role of Endo-Upwelling Processes in Phosphate Concentration

Sedimentological and hydrogeological data in Niau, a closed atoll in French Polynesia where P-concentration has been measured, suggest the role played by lagoonal organic matter in P-accumulation and the possible role of "endo-upwelling" processes in P-input in the system.

A 15 m deep core through the lagoonal deposits shows the succession of organic-rich strata in which the P-content can reach up to 1.3% P_2O_5 . Such a pattern suggests that, whatever the source of P within the lagoon (lagoonal water, bird guano, or endo-upwelled solutions, see below), this element is likely to be incorporated in quantitatively important lagoonal biomass whose decay releases phosphorus back to the sediment. An example of such biomass and organic matter is given by the large amounts of cyano-bacterial organic matter that are present in the lagoon of Niau.

A source for island phosphate has recently been proposed to be relatively deep seawater, which would be endo-upwelled from depths of hundreds of meters (~500 m, where P content is approximately $1.5 \text{ mmol.m}^{-3} \text{ PO}_4\text{-P}$) through the permeable reef-body up to its surface (i.e., to its lagoonal waters, where P content reaches 5 mmol.m^{-3} in Niau atoll). The energy necessary for the transport of such solutions would be geothermal (at the bottom of the water column; i.e., close to the volcanic substrate of the reef body) and solar at its top through evaporation.