

**ATOLL DOLOMITE: A BY-PRODUCT OF  
ENDO-UPWELLING CIRCULATION**

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Endo-upwelling is a geothermally driven convective process operating within the upper parts of the volcanic foundation and the overlying carbonate pile, in ocean atolls. By this process deep oceanic water, rich in CO<sub>2</sub> and dissolved nitrates, phosphates and silicates is drawn into the pile, circulates slowly upward through the atoll's porous-permeable interior and emerges at the reef crest to support the primary productivity of the surficial algal-coral community.

Continuous operation of the endo-upwelling process also requires: a) heat from the volcanic foundation; b) an external impermeable apron on the atoll's submerged flanks to confine the convective flow within the pile; and c) a porous cap from which water exiting the atoll plumbing system either returns to the ocean or enters the lagoon.

Subsurface data confirm the operation of endo-upwelling at Enewetak Atoll, Marshall Islands, since at least the Early Miocene; at ODP Hole 866A on Resolution Guyot, Mid Pacific Mountains, during the Oligocene; and at Mururoa Atoll, Tuamotu Archipelago, since at least the Early? Pleistocene. The distribution, petrography and geochemistry of Mururoa dolomites and associated high magnesian calcite cements indicate that they are formed by endo-upwelling Antarctic Intermediate Waters (AIW) that enter the

carbonate pile below 500m; the geochemistry of Enewetak dolomites indicates that they are of similar origin. The strontium isotopic data obtained from ODP hole 866A indicate dolomite formation in the subsurface carbonate rocks some 80 m.y after the formation of the guyot.

Upward circulation of large volumes of deep oceanic waters controls the dissolution-replacement-cementation regime of the atoll plumbing system and provides Mg<sup>++</sup> for dolomitization.

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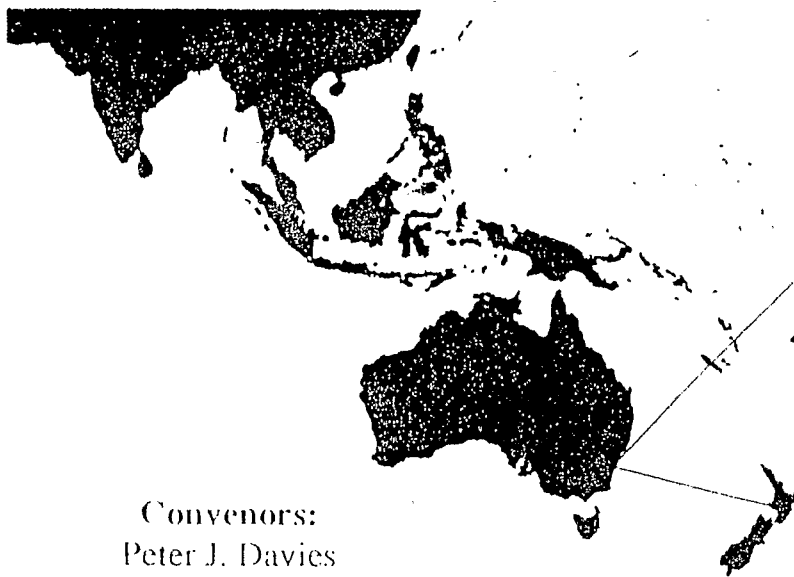
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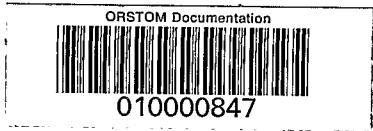
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