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TECTONIC HISTORY OF THE AUSTRAL-TUBUAI AND SOUTHERN COOK ISLANDS

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Radiometric ages were obtained from rocks dredged from Macdonald and Marotiri seamounts in the southern portion of the Austral-Tubuai-Cook volcanic chain. These studies confirm the recent age of Macdonald and provide ages of 3.51 ± 0.20 m.y. and 4.00 ± 0.19 m.y. for Marotiri seamount. The rocks dated include a vesicular clinopyroxene-olivine phyric basalt from Macdonald and an olivine basalt and an alkalic microgabbro from Marotiri. These seamounts are the youngest edifices dated in the Austral-Cook chain, and when combined with the previously published dates for this chain, the date for Marotiri supports a progression in volcano ages along the chain. It is important to note, however, that the age pattern for the Austral-Cook chain is significantly different from a simple progression of volcanism along the chain, such as that documented for the Hawaiian Ridge, for example. Studies by Dalrymple et al. (1975) indicated a progressive increase in ages from Tubuai through the Cook Islands. Subsequent studies by Turner and Jarrard (1982) yielded younger ages for some of the Cook Islands. Thus, the age data indicates that the Austral-Cook chain has had a complex volcanic history. The oldest volcanism from each seamount fits a linear progression of ages, from 20 m.y.b.p. to the present, with renewed volcanism occurring between 3-9 m.y. after the shield building stage of volcanism. Volcanism on some islands in the southern Cook and Tubuai Islands, however, appears to be almost continuous from 10-14 to 0.5 m.y.b.p.

The Austral-Cook chain is not a simple, single chain of volcanoes. Two separate chains are identifiable, each being copolar with the Hawaiian Ridge. These two chains either represent two separate hotspots, or a single hotspot that has developed two conduits to the surface. The young volcanism in the western part of the chain has been attributed to a "hotline" mechanism. We suggest, however, that hotspot volcanism can be perturbed by hotspot/lithosphere interactions to produce the observed age patterns.

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