THE IDENTIFICATION OF PRIMARY BASALT MAGMAS IN OCEANIC SETTINGS: SOME EXAMPLES FROM RAROTONGA AND SAMOA IN THE SOUTHERN PACIFIC

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The identification of primary magmas in various tectonic settings is hampered by the complexity of processes that modify magma compositions as they pass through the upper mantle and crust, and particularly as they undergo various degrees of fractionation, assimilation and mixing in high level magma chambers. Thus primary compositions are only rarely, if ever, erupted at the surface. The relative simplicity of the tectonic setting of ocean islands should make them the best location to identify the composition of primary basaltic magmas, but even here, the volcanic rock suites show a range of compositions which provide evidence for complex differentiation processes in the lithosphere and crust above the primary source. Detailed studies of rock suites from Rarotonga and Samoa, two hot-spot related volcanic systems, show a number of chemically distinct series each of which link to different primary basaltic magmas. This variety of primary magmas in oceanic hot-spot settings must be generated by variation in the parameters of the melting process and also in the composition of the mantle source. Felsic rocks of phonolite and foidal phonolite composition associated with these basaltic suites are also distinctive and can be linked to particular parental magmas. Evidence from peridotitic nodules in basalt from Samoa suggests that phonolitic melts are also present in the mantle underlying oceanic volcanoes and that these too may play a significant role in modifying the compositions of primary magmas in oceanic basalt systems.