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Magma source evolution beneath the Caribbean oceanic plateau: New insights from elemental and Sr-Nd-Pb-Hf isotopic studies of ODP Leg 165 Site 1001 basalts

A. C. Kerr (1), D. G. Pearson (2), G. M. Nowell (2)

(1) School of Earth and Ocean Sciences, Cardiff University, Park Place, Cardiff CF10 3YE, UK (2) Department of Earth Sciences, Durham University, South Road, Durham, DH1 3LE, UK (kerra@cf.ac.uk / Tel: +44 29 208 74578)

Ocean Drilling Project Leg 165 sampled 38m of the basaltic basement of the Caribbean plate at Site 1001 on the Hess Escarpment. The recovered section consists of 12 basaltic flow units which yield a weighted mean Ar-Ar age of 80.9$\pm$0.9 Ma (Sinton et al., 2000). The basalts (6.4-8.5 wt.% MgO) are remarkably homogeneous in composition and are more depleted in incompatible trace elements than N-MORB. Depleted initial radiogenic isotope ratios (εNd +11.1 – +11.9; εHf +15.2 – +16.9; $^{87}Sr/^{86}Sr$ 0.7025 – 0.7028; $^{206}Pb/^{204}Pb$ 18.34 – 18.50; $^{207}Pb/^{204}Pb$ 15.42 – 15.51; $^{208}Pb/^{204}Pb$ 37.64 – 37.90) reveal a long-term history of depletion. Although the Site 1001 basalts are superficially similar to N-MORB, radiogenic isotopes in conjunction with incompatible trace element ratios show that the basalts have more similarity to the depleted basalts and komatiites of Gorgona Island. This chemical composition strongly implies that the Site 1001 basalts are derived from a mantle plume depleted component and not from depleted ambient upper mantle. Therefore the Site 1001 basalts are, both compositionally and tectonically, a constituent part of the Caribbean oceanic plateau. Mantle melt modelling suggests that the Site 1001 lavas have a composition which is consistent with second-stage melting of compositionally heterogeneous mantle plume source material which had already been melted, most likely to form the 90Ma basalts of the plateau. The prolonged residence ($>$10m.y.) of residual

mantle plume source material below the region, confirms computational model predictions and places significant constraints on tectonic models of Caribbean evolution in the late Cretaceous, and the consequent environmental impact of oceanic plateau volcanism.