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MORPHOLOGY, PETROGRAPHY, AGE AND ORIGIN OF FOGO SEAMOUNT CHAIN, OFFSHORE EASTERN CANADA

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The Fogo Seamounts are located approximately 500 km offshore from Newfoundland to the southwest of the Grand Banks of Newfoundland. This complex seamount chain is early Cretaceous in age and is partially buried under later continental slope deposits. It has in the past been ascribed to the passage of a Canary or Azores hot spot. The seamounts are developed along the northeastern transform margin of the Jurassic central Atlantic Ocean. The Narwhal F-99 well was drilled in 1986 on the continental slope into one buried seamount. In this study, we bring together unpublished data on the bathymetry, seismic-reflection character, and distribution of the Fogo Seamounts and interpret new petrographic, geochemical, isotopic and geochronological data from a dredge sample from the central part of the seamount chain and from the Narwhal F-99 well, making comparisons with other offshore volcanic rocks on the eastern Canadian margin.

Petrographically, the seamount samples consist of vitrophyric basalt, with clinopyroxene at Narwhal and kaersutite in the dredge sample. Chemically, the samples are olivine basalt with a low Mg number and low concentration of transition metals. Trace element and REE abundances are similar to those of other early Cretaceous volcanic rocks on the southeast Canadian margin. Three petrogenetic types of mafic magma are recognised in the area. The dredge sample is typical OIB rather alkalic basalts and similar to those in other seamount chains. Rocks at Narwhal and Brant have a greater signature of a depleted mantle source (are more tholeiitic). All have Nd isotopes similar to the Newfoundland and New England seamounts. In Orpheus graben to the northwest, there appears to have been greater crustal contamination, either from the

crust in the region or from mantle previously enriched in crustal contaminants. The dredge sample gave a 40Ar/39Ar age of 130.3 +/- 1.3 Ma (Hauterivian). A K/Ar age from the Narwhal F-99 well of 127 +/- 6 Ma is inconsistent with biostratigraphic zonation, which shows that sedimentary rocks overlying basalt in the well are at least as old as early Berriasian (ca. 143 Ma). Seismic reflection profiles show that a series of coastal transgressions can be recognised above the basalt, with final submergence at the time of the Petrel marker (Turonian).

Distribution of the seamounts, based on bathymetry and in the case of buried seamounts, magnetic and seismic data, shows that there is no clear linear trend, but rather a broad zone within which seamounts have formed. New bathymetric data shows that flat tops to seamounts, resulting from coastal erosion prior to subsidence, become progressively deeper towards the NW, but also show a deepening from the continental slope to the continental rise. This suggests that there is an age progression of the seamounts, with younger seamounts to the SE, consistent with the sparse geochronology, and supporting the interpretation that the Fogo Seamounts formed above a mantle plume. The broad extent of the seamounts on the margin probably results from the influence of a series of upper crustal faults along the transform margin and regional extension may have played an important role in magma generation and transport.