22. K-Ar AGE OF DEEP-SEA BASALT, BRAZIL BASIN, LEG 39 DEEP-SEA DRILLING PROJECT

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INTRODUCTION

Site 355, in the Brazil basin, South Atlantic Ocean (Figure 1), is located on the magnetically reversed interval between magnetic anomalies 33 and 34, in igneous crust slightly older than anomaly 33 (Figure 2; see also Pitman et al., 1975; Ladd et al., 1973). Extrapolation of the Heirtzler et al. (1968) magnetic reversal time scale for the South Atlantic predicts that the age of the igneous basement at Site 355 is 80 to 85 m.y. Thus far, the oldest basalt recovered from oceanic basement in the South Atlantic is Maestrichtian in age (about 70 m.y.) and is from Site 20, Leg 3 (Maxwell et al., 1970).

As a further contribution to quantifying the magnetic reversal time scale in the South Atlantic Ocean, basaltic rock recovered from the Brazil Basin, interpreted as igneous basement, was dated by the K-Ar method, and the results are reported here.

ANALYTICAL PROCEDURES AND RESULTS

A sample of tholeiitic basalt from Site 355, Core 22, Section 5, 120 cm (from the freshest portion of the core; see Fodor, et al., this volume) was used for the K-Ar age determination. About 10 g of the basalt was crushed, sieved between 0.246 mm and 0.416 mm screens (60-35 mesh), and treated in 10% phosphoric acid for 20 min. Two splits of approximately 0.5 g were used for replicate K_2O analysis and one split of about 1 g for Ar analysis. Both K_2O and argon analyses were carried out at the U.S. Geological Survey laboratories in Menlo Park, Calif.

The argon mass analysis was made by standard isotope-dilution techniques with a Nier-type, 6-inch-radius, 60°-sector mass spectrometer operated in the static mode. The two potassium analyses were by flame photometer using a lithium internal standard. The decay constants used for K^{40} are $\lambda e = 0.585 \times 10^{-10}yr^{-1}$ and $\lambda\beta = 4.72 \times 10^{-10}yr^{-1}$, and an atomic abundance of K^{40} of 1.19×10^{-4}mole/mole.

The analytical results are: K_2O = 0.056 and 0.049 weight percent; radiogenic $Ar^{40} = 6.1822 \times 10^{-12}$ mole/g; percent of radiogenic Ar^{40}/total Ar^{40} = 11.2; the calculated age is 78.1 ±9 m.y.

The precision of the date, shown as the ± value, is the estimated analytical uncertainly at one standard deviation. It represents uncertainty in the measurement of radiogenic Ar^{40} and potassium in the sample and is based on experience with replicated analyses in the Menlo Park Laboratories. The sample having less than 15% radiogenic Ar^{40} (11.2) has an estimated analytical uncertainty of about 12% of its calculated age.

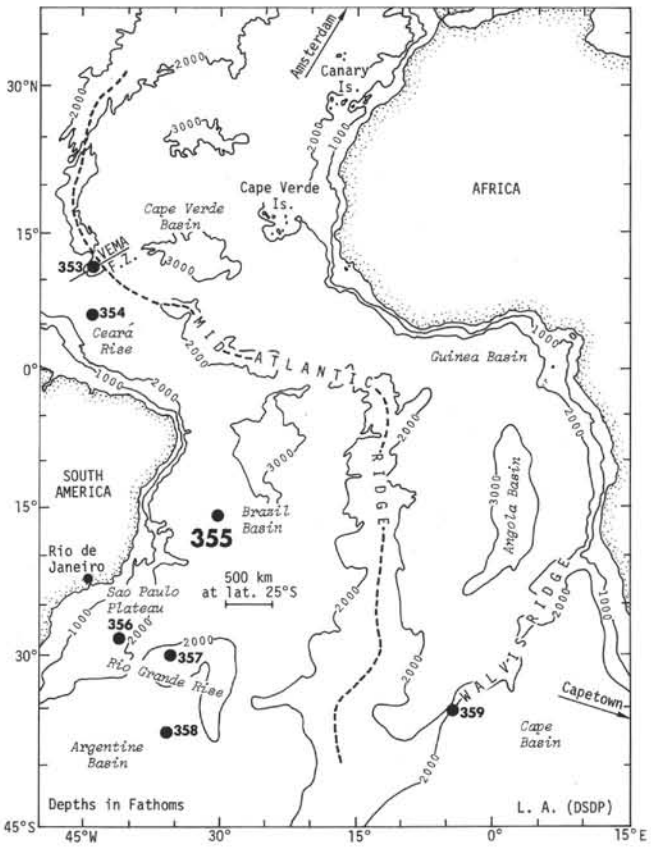

Figure 1. *Map of the South Atlantic Ocean showing DSDP Site 355 and other drill sites of Leg 39B.*

DISCUSSION

The 78.1 ±9 m.y. age determined for the Brazil Basin tholeiitic basalt is the oldest radiometric date determined for basalt from the South Atlantic. On this basis, the rock is Late Cretaceous in age. The analytical uncertainty of ±9 m.y. does not permit a high degree of resolution for either dating the magnetic anomaly or in assigning it to one of the Upper Cretaceous stages. The

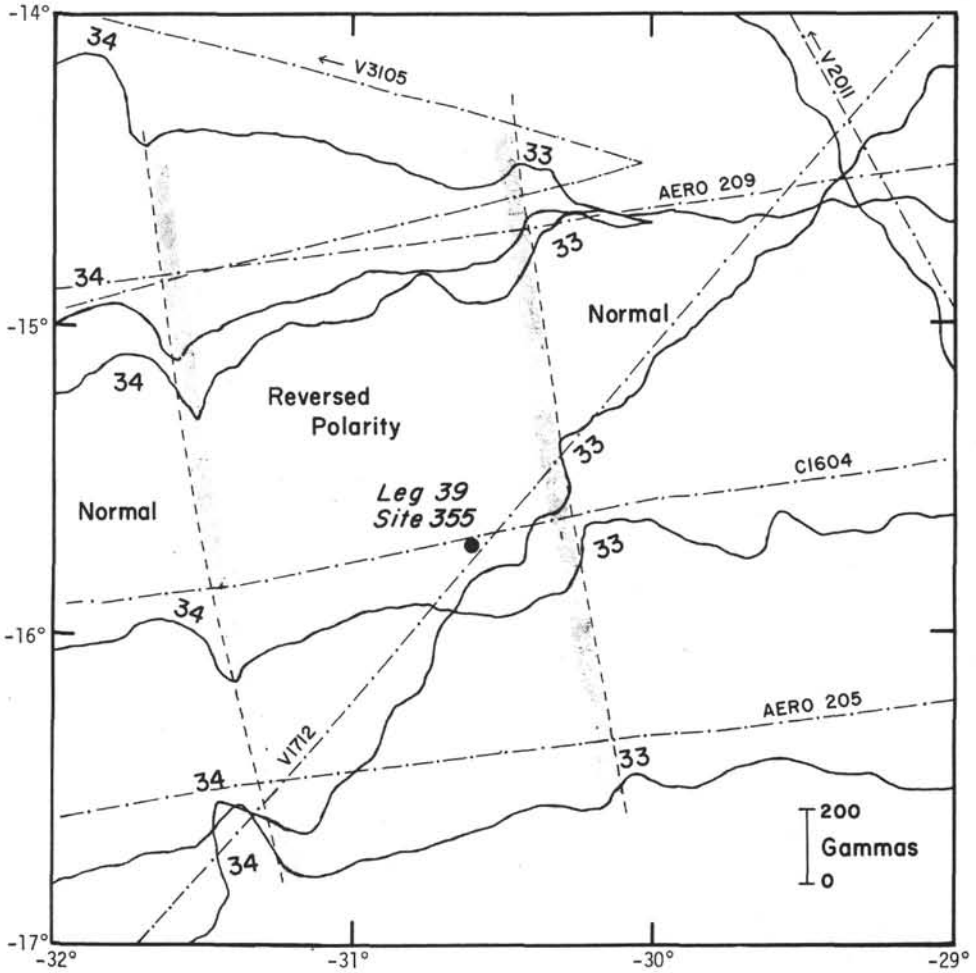

Figure 2. *Map showing magnetic intensity anomalies (solid lines) in the vicinity of DSDP Site 355 and the location of the drill site in the reversed polarity zone (area within shaded margins). The dash-dot lines are traces of shipborne (V; C) and airborne (AERO) magnetic surveys.*

mean value of 78.1 m.y., however, is compatible with the predicted age for oceanic igneous crustal rock located between anomalies 33 and 34—although it is slightly younger than that estimated for anomaly 33 on the extended time scale of Larson and Pitman (1972). The date is also compatible with the 74 to 82 m.y. age based on coccolith stratigraphy (*E. eximius* Zone) for the oldest sedimentary material recovered from the Brazil Basin (see Site 355 report, this volume).

The 78.1±9 m.y. K-Ar age of the Brazil Basin basalt helps define the older end of the Heirtzler et al. (1968) time scale and dates the crustal material associated with anomalies 33 and 34 in the western South Atlantic Ocean.

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