

GRADUATE SCHOOL OF OCEANOGRAPHY
 UNIVERSITY OF RHODE ISLAND
 KINGSTON, R.I. 02881

Cruise Report

R/V ENDEAVOR

EN-063

Project: PETROGRAPHIC PROVINCES OF THE MID-ATLANTIC RIDGE
 Schedule: Depart Rio de Janeiro, Brazil 24 March 1981
 Arrive Rio de Janeiro, Brazil 25 April 1981
 Funding: NSF Grant No. OCE-79-13805 (Sigurdsson)
 Scientific Party:

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Steven Carey	Graduate Student	GSO/URI
Andrew Davis	Research Associate	GSO/URI
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Benny Loebner	Graduate Student	GSO/URI
Roger L. Roussell	Marine Technician	GSO/URI
Stephen Imms	Marine Technician	GSO/URI
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SCIENTIFIC PROGRAM:

Magmas erupted within the active rift valley of the Mid-Atlantic ridge provide information on the petrology and chemistry of the earth's interior. Systematic sampling along the length of the ridge has been underway in the past 15 years, from the Arctic to the Southern Ocean, and the major remaining gap in this sampling was closed during cruise EN-063. One of the major objectives of this sampling of young lavas from the MAR is the search for petrographic and geochemical provinces along the ridge system. The primary objective of the field program on EN-063 was dredging of young volcanics from the MAR rift valley from 20° to 32° S. Sampling of the ridge to the north of this region had been accomplished during EN-061 and

EN-063

cruise AII-107-7 sampled volcanics south of 32° in 1980.

The planned dredging operations on the MAR were completed in shorter time than originally estimated, in part due to very favorable weather. The gained shiptime was devoted to geologic investigation and sampling of the Rio Grande Rise, en route to Rio de Janeiro.

RESULTS:

A total of 3300 kg of rocks were recovered during EN-063 at 29 out of 34 attempted dredge stations. Average time on station was 4.6 hrs. (range 2.3 to 7.7 hrs.), working in average water depth of 3350 m (range 1050 to 4440 m). Location and recovery at each dredge site is given in Table 1. Maximum recovery in a single dredge was 585 kg. The majority of rocks recovered from the MAR are relatively fresh basaltic lava fragments, often glassy and either aphyric or with phenocrysts of plagioclase and minor olivine. These samples are principally from the axial rift valley, as defined by bathymetry, magnetic anomalies and distribution of seismic epi-centers. Some of the MAR dredges recovered samples of manganese-encrusted and moderately weathered basalt (brownstone). These dredges were primarily from regions where the rift valley could not be unambiguously located and thus represent older weathered oceanic crust. Collectively, the MAR dredging on EN-063 represents sampling along a 1280 km long ridge axis at approx. 50 km spacing.

Reconnaissance surveys (50-60 km) near each dredge station were carried across the ridge axis prior to dredging. Bathymetric profiles show that a rift-valley is often well-defined on this ridge segment, 800 to 1500 m in depth and 10 to 18 km wide. Magnetic surveys show that the rift valley is also characterized by a strong central anomaly of 300 to 600 gamma.

Dredging, magnetic, bathymetric and 3.5 kHz sub-bottom surveys were undertaken on the Rio Grande Rise, after completion of planned studies on the MAR. Four successful dredge stations recovered limestone and other carbonate sediment and weathered igneous rocks. Preliminary results indicate a capping of up to 500 m limestone on the ridge, underlain by basalt and other igneous rocks. One dredge on the adjacent Sao Paulo Rise recovered plagioclase-phyric basaltic rocks.

Magnetic data, 3.5 kHz sub-bottom profiling and bathymetry was collected throughout the cruise, outside the territorial waters of Brazil.

ACKNOWLEDGEMENTS:

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CRUISE TRACK EN-063

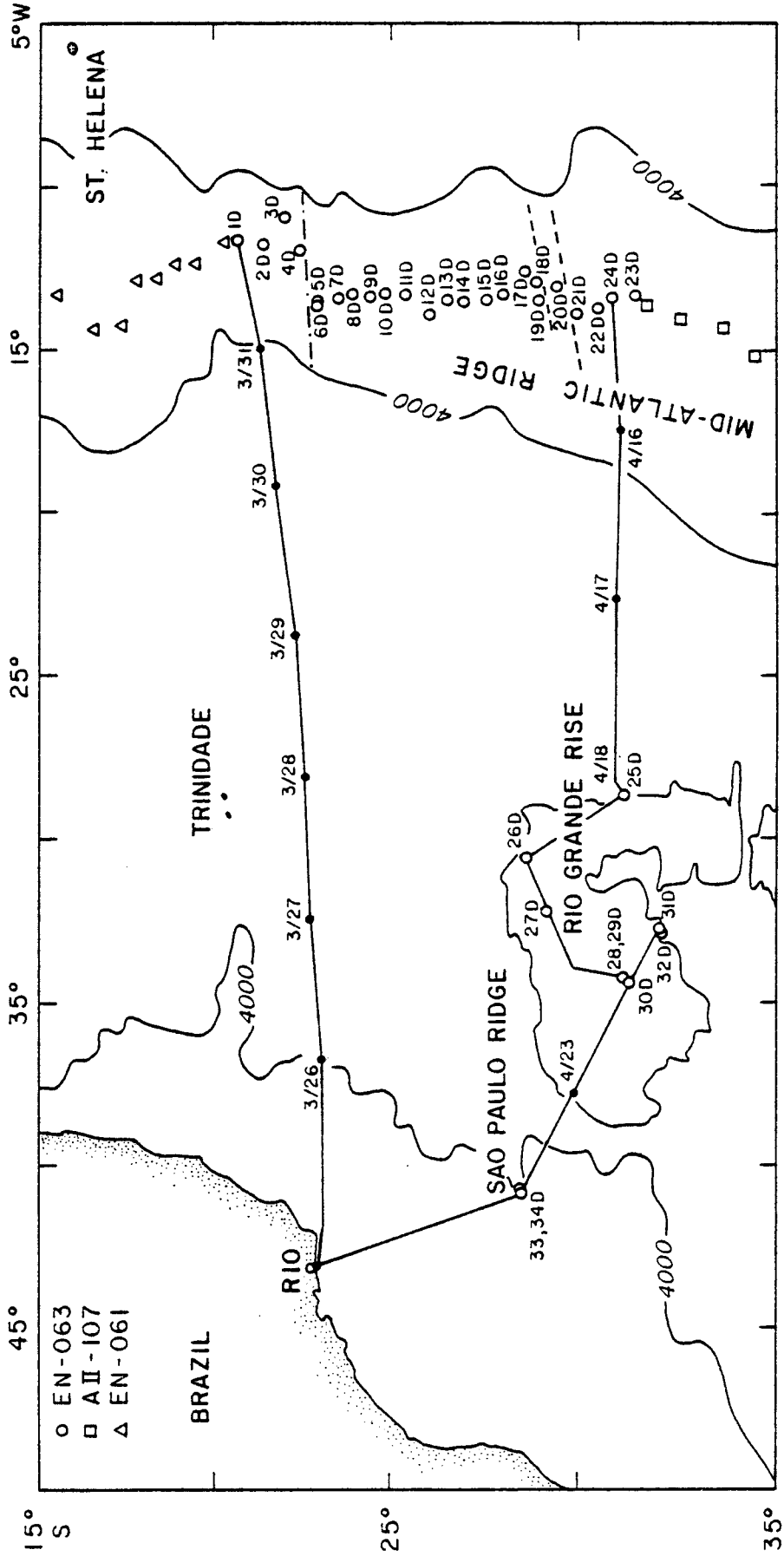


Table 1. EN-063 Dredge Recovery, Mid-Atlantic Ridge

Dredge Station	Date Time (GMT)	Position	Depth (Corrected)	Weight (kg)	Rock Type
1D	3/31-4/1/81 2245-0340	20°47.6'S 11°36.1'W	3500 (3460)	60.5	fresh-lightly weathered glassy basalt
2D	4/1/81 1347-1835	21°29.9'S 11°49.3'W	3500 (3460)	1) 172 2) 2.5	fresh aphyric basalt with glass rinds fresh glassy porphyritic basalt
3D	4/2/81 0834-1330	22°00.3'S 10°57.6'W	4480 (4440)	107	weathered and palagonitized glass fragments with manganese coating
4D	4/3/81 0301-1040	22°23.3'S 11°56.1'W	4250 (4210)	0.01	small fragment manganese coated weathered basalt
5D	4/4/81 0440-0800	22°57.8'S 13°29.2'W	2145 (2105)	59	Various pebbles, some basalt well weathered
6D	4/4/81 1025-1602	22°59.2'S 13°39.1'W	4480 (4440)	0.01	manganese coated gabbroic fragments
7D	4/4-4/5/81 2335-0400	23°29.2'S 13°23.7'W	3670 (3630)	545	1) lightly weathered, glassy basalt 2) plagioclase porphyritic basalt
8D	4/5/81 1740-2242	24°00.4'S 13°17.9'W	3410 (3370)	150	Light-moderate weathered glassy aphyric basalt; rare plagioclase phenocrysts
9D	4/6/81 0815-1415	24°31.2'S 13°21.5'W	4050 (4010)	14	fragments of aphyric basalt with minor glass
10D	4/6-4/7/81 2335-0255	24°57.1'S 13°11.6'W	3145 (3105)	40	manganese coated pillow basalt, minor glass and plagioclase phenocrysts. Coral and carbonate sediment
11D	4/7/81 1548-1944	25°23.9'S 13°16.0'W	3310 (3270)	250	Manganese coated aphyric basalt; Breccia of basaltic glass and carbonate sediment
12D	4/8/81 0505-0800	26°00.2'S 13°53.9'W	2710 (2670)	35	Fresh aphyric glassy basalt
13D	4/8/81 1511-1910	26°31.0'S 13°38.3'W	3975 (3935)	38	1) moderately weathered aphyric-crystal poor basalt with rare glass 2) plagioclase porphyritic, glassy basalt; rare olivine
14D	4/9/81 0129-0551	26°59.5'S 13°31.8'W	3650 (3610)	585	Fresh phenocryst-poor basalt with abundant glass
15D	4/9/81 1233-1745	27°33.8'S 13°26.11'W	3680 (3640)	12	aphyric, glassy pillow basalt; minor porphyritic glassy basalt
16D	4/9-4/10/81 2356-0515	28°00.4'S 13°12.2'W	3450 (3410)	118	aphyric glassy basalt fragments
17D	4/10/81 1343-1810	28°32.7'S 12°32.4'W	3280 (3240)	113	glassy-holocrystalline basalt, plagioclase with pahoe-hoe surface features
18D	4/11/81 0315-0742	28°54.6'S 12°58.2'W	3930 (3890)	22	aphyric basalt with glass rinds
19D	4/11/81 1404-1930	28°57.8'S 13°30.2'W	4180 (4140)	86	manganese coated and altered basalt with weathered glass and carbonate
20D	4/12/81 0759-1227	29°29.1'S 13°03.3'W	3165 (3125)	75	weathered aphyric and porphyritic basalt with altered-oxidized glass and manganese coating, some sediment
21D	4/12-4/13/81 2330-0500	30°01.2'S 13°51.4'W	3490 (3450)	258	plagioclase-phyric basalt with glass rinds
22D	4/13/81 1348-1730	30°29.9'S 13°46.0'W	3165 (3125)	57	fresh aphyric basalt with abundant glass, some coral
23D	4/14/81 1703-2155	31°30.7'S 13°24.5'W	3440 (3400)	78	plagioclase phyric basalt with glassy rinds
24D	4/15/81 0120-0540	30°58.9'S 13°27.5'W	3570 (3530)	188	fresh aphyric basalt with glass rinds rare plagioclase

Table 1. EN-063 Dredge Recovery, Rio Grande Rise

Dredge Station	Date Time (GMT)	Position	Depth (Corrected)	Weight (kg)	Rock Type
25D	4/18/81 0314-0703	30°56.1'S 28°35.3'W	3700 (3660)	Dredge Empty	
26D	4/19/81 0125-0356	28°32.9'S 30°38.7'W	2656 (2616)	Dredge Empty	
27D	4/19/81 1259-1852	29°08.7'S 32°13.2'W	3650 (3610)	8	Cobbles of altered, vesicular basalt and conglomerates with carbonate sediment and manganese coating
28D	4/20/81 1250-1530	31°09.9'S 34°12.0'W	1130 (1090)	Dredge Lost	
29D	4/20/81 1559-1815	31°09.2'S 34°12.5'W	1090 (1050)	15	cobbles of sedimentary (carbonate) origin with manganese coating, live and fossil coral
30D	4/20-4/21/81 2105-0300	31°18.5'S 34°28.9'W	2200 (2160)	32	1) weathered basalt, dense-vesicular with chloritic fillings 2) chalk fragments
31D	4/21/81 1309-1732	32°12.5'S 32°45.2'W	4020 (3980)	Dredge Empty	
32D	4/21/81 1800-2240	32°11.5'S 32°43.0'W	3350 (3310)	40	1) carbonate siltstone and coral, manganese coated 2) one cobble of dense, igneous rock
<u>SAO PAULO RIDGE</u>					
33D	4/23/81 1819-2330	28°24.0'S 41°00.3'W	3933 (3893)	2	manganese encrusted igneous rocks with plagioclase laths
34D	4/24/81 0046-0645	28°24.0'S 40°53.8'W	4000 (3960)	Dredge Empty	