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A-II-107-7
ASAF ASHRAF

Core Laboratory
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CRUISE SUMMARY

R/V Atlantis II Cruise 107 Leg 7

Cape Town - Rio de Janeiro

12 April - 16 May 1980

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INTRODUCTION.

The entire South Atlantic mid-ocean ridge system has been practically unexplored in terms of its petrology and geochemistry. An interesting confluence of geochemically different structural features occurs in the region of 36°S. The island of Tristan da Cunha which, from its chemistry, appears to be derived from a rather unique oceanic mantle source, lies about 500km. east of the axis of the Mid-Atlantic Ridge. This island appears to be related, via a province of numerous seamounts, to the Walvis Ridge - a sinuous, offset, aseismic ridge that extends to the west coast of Africa at 18°S. From the limited collection of samples presently available, geochemical variations between these three features are known to exist. However, further sampling and analyses of rocks from the area would allow the petrological, geochemical and isotopic variations to be better established and, together with new information from isotopic, helium, and rare gas studies, would provide a better understanding of the evolution of the magmas and the nature of the suboceanic mantle.

The objectives of cruise AII 107-7 were therefore to dredge at stations along the axis of the Mid-Atlantic Ridge north and south of Tristan da Cunha in order to study any existent geochemical variations and to establish the lateral extent of mantle source heterogeneities associated with the island. In addition, this sampling would add to the available collection

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of rocks from the Walvis Ridge and Tristan da Cunha which would allow the petrological, geochemical and isotopic relationships between these two structural features and the Mid-Atlantic Ridge to be investigated.

A two-day sampling trip to the island of Tristan da Cunha for fumarole and spring sampling for helium and noble gas studies, and for recovery of appropriate rock samples was also planned.

RESULTS.

The cruise track is shown in Figure 1. Underway gravity, magnetic and 3.5 and/or 12 kHz bathymetric profiling were continued along most of this track.

Twenty-five dredge stations and ten hydrostations (to collect bottom waters for helium isotope studies) were completed between 47° and 31°S along the axis of the Mid-Atlantic Ridge. These stations included short (30-50m) reconnaissance magnetic, 3.5 and 12 kHz bathymetric profiles in an attempt to delineate the median valley. The positions of the stations are presented in Figure 2, and the results of the dredge and hydrostations in Table 1. Ice and bad weather forced us to abandon the southernmost stations, and move north to ice-free waters to work at about 43°S. The sampling trip to the island of Tristan da Cunha had to be cancelled because of lost time due to bad weather and ice.

A total of 2595kg. of rock samples were collected, of which 2427kg. were lightly to moderately weathered basalts. Texturally, they ranged from aphanitic to fine-grained and porphyritic, with plagioclase being the dominant phenocryst phase, and olivine occurring in some samples. Thirteen of the dredge hauls contained glass suitable for chemical and isotopic analyses.

Scientific Party

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Richard Kingsley	(co-chief scientist)	URI Graduate School of Oceanography)
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Mark Kurs	(graduate student)	W.H.O.I.
Bill Martin	(graduate student)	W.H.O.I.
Melita Mukherji	(research assistant)	U.R.I.
Dan O'Neill	(graduate student)	U.R.I.
Margaret Sulanowska	(research assistant)	W.H.O.I.
Guy Waggoner	(graduate student)	U.R.I.

TABLE 1

<u>STATION</u>	<u>DATE TIME (GMT)</u>	<u>LOCATION</u>	<u>DEPTH (m) (CORRECTED)</u>	<u>RESULTS</u>
Dredge	1 4/21/80 2035-0200	46 52.8°S 13 38.2°W	2450-2950 (2515-2913)	Dredge lost
Hydro cast	1 4/22/80 0227-0330	46 53.5°S 13 38.4°W	2550	
Dredge	2 4/22/80 1806-2220	46 12.7°S 14 04.4°W 46, 212	2520-2950 (2485-2913)	178.7kg light- moderately weathered glassy basalt. 28.5kg erratics.
Hydro cast	2 4/22/80 2310-0130	46 11.3°S 14 00.6°W 46, 198	2750	
Dredge	3 4/23/80 1730-1910	45 44.2°S 14 48.0°W 46, 1737	2630-2800 (2595-2765)	Dredge empty
Hydro cast	3 4/23/80 0400-0530	46 09.7°S 13 57.8°W	3010	
Dredge	4 4/26/80 0926-1328	42 54.9°S 16 22.2°W 46, 915	2550-3115 (2519-3086)	186kg light- moderately weathered glassy basalt; 3kg breccias; 4kg serpent- inites.
Dredge	5 4/26/80 2240-0220	41 59.4°S 16 07.8°W 46, 99	2960-3200 (2934-3177)	Dredge lost
Hydro cast	4 4/27/80 0300-0443	41 59.5°S 16 05.8°W	2520	
Dredge	6 4/27/80 1412-1715	41 14.9°S 16 36.2°W 46, 248	2200-2640 (2175-2614)	84kg light-moderately weathered glassy basalt; 2kg breccias; 30kg calcareous shells.
Dredge	7 4/28/80 0315-0715	40 26.3°S 16 45.0°W 46, 38	2600-2650 (2597-2627)	445kg fresh-lightly weathered large glassy pillow basalts.
Dredge	8 4/28/80 1635-1945	39 40.9°S 15 59.7°W 46, 82	2930-3300 (2914-3286)	Dredge empty.
Dredge	9 4/29/80 1035-1525	39 41.8°S 16 03.2°W 46, 97	2330-2650 (2314-2633)	8kg light-moderately weathered basalt; 60kg metabasalt; 95kg serpent- inite; 4kg breccia.
Dredge	10 4/30/80 0135-0550	38 52.9°S 16 14.4°W 46, 82	1970-2400 (1954-2384)	25kg lightly weathered glassy pillow basalt.
Hydro cast	5 4/30/80 0607-0810	38 53.7°S 16 11.0°W	2560	

TABLE 1 (cont.)

Dredge	11	4/30/80 1935-0030	38 10.9'S 16 33.7'W	.182	2200-2250 (2184-2234)	0.25kg vesicular basalt; 1kg lithified sediment and Mn crust
Dredge	12	5/2/80 1430-1915	37 45.4'S 17 11.9'W		2350-2570 (2334-2553)	Dredge bag lost.
Hydro cast	6	5/1/80 2000-2230	37 51.6'S 17 07.1'W		2800	
Dredge	13	5/2/80 0015-0345	37 50.0'S 17 08.5'W	.833	2100-2330 (2084-2314)	16kg lightly weathered pillow basalt; 1 kg breccia
Dredge	14	5/2/80 1422-1800	37 11.2'S 17 30.9'W	.187	2240-2470 (2224-2454)	405kg fresh glassy porphyritic basalt.
Hydro cast	7	5/2/80 1820-2020	37 12.9'S 17 28.1'W		2350	
Dredge	15	5/3/80 1435-1915	36 33.5'S 17 35.2'W	.558	2450-2500 (2434-2484)	254kg fresh glassy porphyritic pillow basalt.
Dredge	16	5/4/80 0645-0940	36 04.4'S 18 05.0'W	.073	2300-2640 (2284-2623)	30kg large glassy lightly weathered pillow basalt.
Hydro cast	8	5/4/80 1030-1215	36 02.0'S 18 04.5'W		2620	
Dredge	17	5/5/80 0320-0630	35 16.7'S 15 44.1'W	.278	3150-3650 (3135-3638)	303kg lightly weathered glassy porphyritic pillow basalt.
Dredge	18	5/5/80 1718-2030	34 33.2'S 15 08.8'W	.557	2480-2940 (2464-2924)	408kg lightly weathered glassy porphyritic pillow basalt.
Hydro cast	9	5/5/80 2112-2316	34 34.4'S 15 08.3'W		2915	
Dredge	19	5/6/80 1115-	33 41.9'S 14 10.7'W		-	Lost 4400m wire and dredge
Dredge	20	5/6/80 1730-2100	33 42.8'S 14 15.0'W	.713	1500-2050 (1489-2030)	32kg moderately weathered glassy basalt.
Dredge	21	5/7/80 1745-2245	32 41.2'S 13 41.2'W		2350-2600 (2334-2583)	Dredge empty.
Hydro cast	10	5/7/80 2300-0110	32 41.7'S 14 02.4'W		2425	

TABLE 1 (cont.)

Dredge	22	5/8/80 0135-0645	32 42.7'S 14 05.0'W	2230-2400 (2217-2387)	Dredge empty.
Dredge	23	5/8/80 0848-1330	32 40.6'S 14 01.0'W	2100-2250 (2334-2364)	7kg moderately weathered porphyritic basalt.
Dredge	24	5/9/80 0339-0945	31 41.4'S 13 46.5'W	2800-3200 (2783-3185)	Dredge empty.
Dredge	25	5/9/80 1155-1942	31 50.0'S 13 34.7'W	2350-2380 (2334-2364)	44kg light-moderately weathered glassy basalt.
Hydro cast	11	5/9/80 2030-2230	31 42.8'S 13 42.2'W	3050	

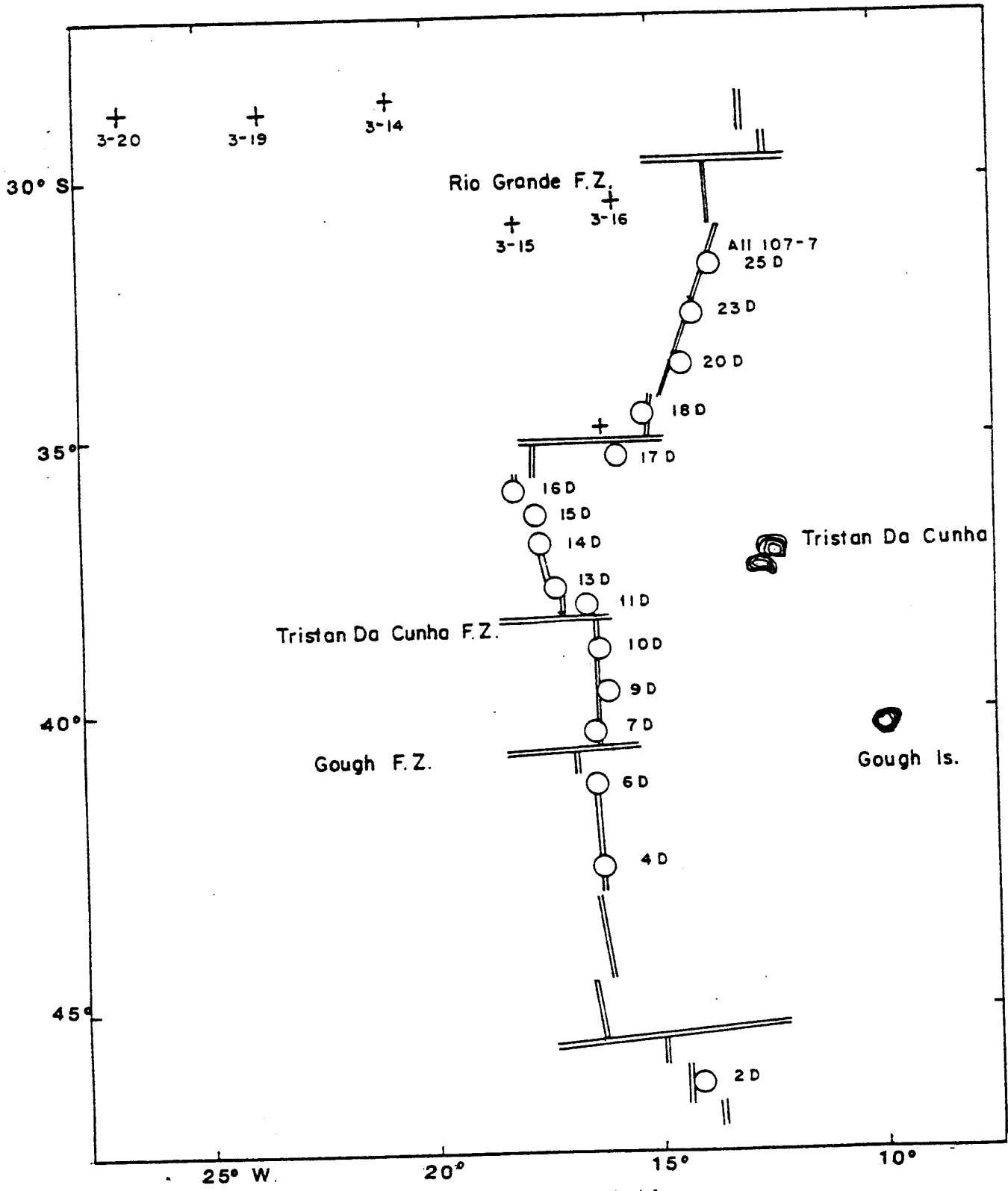


Fig 1. AII 107-7 successful dredge stations.