

#71006

Cruise Report - M/V UNITEDGEO I

Leg 6 - IDOE

Transatlantic West

25 NOVEMBER to 9 DECEMBER 1971

By James M. Robb

Schedule

- 25 Nov 1971 Depart Monrovia, begin profiling
- 3-4 Dec Profile across Vema Fracture zone
- 9 Dec Terminate data collection
- 10 Dec Arrive Charlotte Amalie

Scientific Party

- Martin F. Kane, USGS, Woods Hole, Chief Scientist
- James M. Robb, USGS, Woods Hole
- Charles J. O'Hara, USGS, Woods Hole
- Frank W. Jennings, USGS, Woods Hole
- Harry Hill, USGS, Menlo Park
- James Nicholson, USGS, Menlo Park
- William Todd, USGS, Menlo Park
- Gerald Evenden, USGS, Denver
- Trevor Hill, United Geophysical Corp., Pasadena, Calif.

Operations

This leg of the 1971 IDOE cruise of the Unitedgeo I was an Atlantic Ocean crossing from Monrovia, Liberia to Charlotte Amalie, St. Thomas, U.S. Virgin Islands (see map attached). Geophysical measurements included continuous gravity, magnetics, and seismic reflection profiles and 18 seismic refraction and wide angle reflection (sonobuoy) profiles. Due to shortage of time diversions from a direct route were minimal; however, the route chosen secured continuous, precisely located profiles across a number of features of interest including three JOIDES drill sites and the Vema fracture zone.

The track was divided into 8 profile lines, with breaks at convenient course changes. Sites for sonobuoy profiles were chosen underway where the sparker profiles showed thick, flat lying sediments and a level basement.

Although the ship and equipment had been operational for more than six months, and several items of scientific gear showed the usage, we found that only minor shutdowns for maintenance and repairs were necessary.

Captain Clem and the crew of the Unitedgeo I were extremely cooperative, and relations between the crew and the scientific party were excellent throughout the passage.

The ITT satellite navigation system, operated by Trevor Hill, was very successful in providing precise fixes. Toward the end of the cruise, however, satellite passes were not well distributed and there were a few periods of up to eight hours without fixes.

Heavy weather with water washing over the after deck caused the shutdown of the generator for sparker power on 8 Dec. Shortly thereafter we were forced to change course to run for shelter, and therefore we were unable to profile across the Puerto Rican trench as planned.

Equipment

1. Edo 3.5 kHz echo sounding system. Giffit recorder and hull mounted transducers.
2. Teledyne sparker system (120 kj) with Raytheon recorder, multi-sensor hydrophone streamer, and four towed sparker units.
3. LaCoste-Romberg sea gravimeter.
4. Varian marine magnetometer.
5. Sonobuoys.

Narrative

The Unitedgeo I left Monrovia for the transatlantic crossing of IDOE, Leg 6 on November 24, 1971. Seismic reflection profiling began about 4.5 miles west of the entrance to the Monrovia Freeport at 1732, November 24. Recording of gravity and magnetic fields began at about 6 miles and 19 miles respectively.

The crossing was broken up into eight lines (see map attached). Line 1 (1732 November 24 to 1800 November 26) proceeded from Monrovia to the site of JOIDES hole 13 on the Sierra Leone rise. It crossed the African continental margin, the Sierra Leone basin and the eastern part of the Sierra Leone rise. On this line, one sonobuoy record was made near the bottom of the continental rise, and a second in the Sierra Leone basin.

Line 2 (1800 November 26 to 0124 November 30) extended from JOIDES site 13 WNW to Longitude 30°W. This line crossed the Sierra Leone rise and the southeastern part of the Cape Verde basin. Five sonobuoys were released along line 2. Two were near JOIDES site 13, two over the flank of the Sierra Leone rise and one in the Cape Verde basin.

Line 3 (0124 November 30 to 1100 December 3) crossed the southern part of the Cape Verde basin, passed over the east flank of the Mid Atlantic ridge, and crossed the crest of the ridge segment south of the Vema fracture zone. Along line 3, two sonobuoys were released; the first over the sediment cover of the southern part of the Cape Verde Basin, and the second over the east flank of the Mid Atlantic ridge.

Line 4 (1100 to 2120, December 3) was directed north across the Vema fracture zone, crossing the great southern ridge, the fracture zone valley and the north wall. About 1.5 seconds of penetration were obtained to basement in the seismic reflection records of the fracture valley. One sonobuoy was released over the fracture valley.

Line 5 (2120 December 3 to 0330 December 4) ran westerly across the crestal section of the Mid Atlantic ridge, crossing the rift.

Line 6 (0330 to 1225 December 4) ran south, recrossing the Vema fracture zone and the site of JOIDES hole 26. Another sonobuoy record was obtained over the fracture valley. The gravity records of lines 4 and 6, when processed, should permit some significant inferences to be made about the structure of the fracture zone.

Line 7 (1225 December 4 to 1054 December 9) was a relatively direct run NNW to the site of JOIDES hole 27. Along the line we changed course slightly to investigate a depression shown on our charts (near 14°N , 54°W), but no significant depression was encountered. Seven sonobuoys were released along line 7, two over the western flanks of the Mid Atlantic ridge, and others over the sediments of the northern Guiana basin. Shortly after crossing JOIDES site 27, worsening weather and heavy seas necessitated closing down the seismic reflection gear at 0525, December 8. At 1054, December 8 we changed course to head for the shelter of the Leeward islands.

Line 7A (1054 December 8 to 2000 December 9) includes only magnetometer and gravimeter data, and passes between Antigua and Barbuda. Collection of magnetometer data ceased at 2000 December 9 when we crossed longitude 63°W on our way to St. Thomas. We left the gravimeter operating, however, until we docked the next morning in Charlotte Amalie, for a land tie.

Results

To date the data have received only shipboard evaluation, and gravity and magnetics records will require computer processing to be usable.

The major result so far is that various geophysical data have been successfully recorded over a number of features. Studies of potential value from this cruise will be:

- 1) To construct structural models of the Vema fracture zone. (These are first gravity measurements there.)
- 2) Correlation of oceanic reflection seismic profiles with JOIDES drilling results over a greater extent than possible heretofore.
- 3) Investigations of the structure of the Sierra Leone Rise.
- 4) Extension of knowledge of sediment distribution and thickness in the deep ocean.
- 5) Crustal sound velocity studies.

USGS IDOE 1971 LEG 6 TRANSATLANTIC WEST

(R.V. UNITEDGEO I)

<u>Line</u>	<u>n. miles</u>	<u>n. miles cumulative</u>	<u>Start-End Time</u>
1	439	439	1732 24 Nov - 1800 26 Nov
2	755	1194	1800 26 Nov - 0124 30 Nov
3	782	1976	0124 30 Nov - 1100 3 Dec
4	89	2065	1100 - 2120 3 Dec
5	65	2130	2120 3 Dec - 0330 4 Dec
6	77	2207	0330 - 1225 4 Dec
7	893	3100	1225 4 Dec - 1054 8 Dec
7A	321	3421	1054 8 Dec - 2000 9 Dec

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 RV. UNITED GEO I
 MARTIN KANE, CHIEF SCIENTIST
 24 NOV - 9 DEC 1971

