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Cruise Report - Farnella - USGS - 1985 Legs 1 and 2, Gulf of Mexico

by Bonnie McGregor

INTRODUCTION

As part of a cooperative program between the U.S. Geological Survey and the Institute of Oceanographic Sciences (IOS), U.K., a survey of the Exclusive Economic Zone EEZ) in the Gulf of Mexico was conducted aboard the M/V Farnella The purpose of the cruise was to map the sea floor between approximately the shelf edge and the seaward limit of the EEZ, using the GLORIA (Geologic Long-Range Inclined Asdic) system owned and operated by IOS

Additional geophysical data collected simultaneously with the sidescan data include: 10 kHz, 3.5 kHz, air gun (160 cubic inch chamber) with two channel hydrophone magnetometer. Navigation was principally based on Loran-C, although transit satellite and Global Positioning System (GPS) data were also logged for comparison. All geophysical data were recorded on analogue paper strip charts GLORIA data were recorded digitally on magnetic tape and air gun data were recorded on analogue magnetic tape. A preliminary mosaic of the sidescan data was constructed at

sea at a scale of 1:375,000, using an anamorphic camera to adjust the images to the ship's track. Post cruise image processing and enhancement of the data are planned before construction of the final mosaic.

Leg 1:

Leg 1 focused on the western half of the Gulf of Mexico seaward of Texas and Louisiana abutting GLORIA coverage from a 1982 survey. This portion of the Gulf is dominated by salt tectonics. The area mapped with GLORIA during this leg was 45,000 sq nautical miles.

Depart: Miami, FL August 7, 1985

Arrive: New Orleans, LA September 3, 1985

Participants on Leg 1 included:

B. McGregor, USGS (U.S. Geological Survey) Chief Scientist

D. Blackwood, USGS

B. Mattick, USGS, Data Curator

W. Sweet, MMS (Minerals Management Service, U.S.A.)

K. Benjamin, WHOI (Woods Hole Oceanographic Institute, U.S.A.)

M. Somers, IOS (Institute of Oceanographic Sciences, U.K.)

G. Rothwell,

A. Gray, IOS

Q. Huggett, IOS

R. Walker, IOS

D. Bishop,

C. Jackson, RVS (Research Vessel Services, U.K.)

E. Cooper,

Master of the Farnella - Capt. Roy Hadgraft

Data Summary - Leg

At sea a total of 27 days

Mileage for each type of data collected:

GLORIA sidescan	4430 nm	8195 km
3.5 kHz	4594 nm	8504 km
10 kHz	4594 nm	8504 km
airgun	4430 nm	8195 km
magnetometer	4080 nm	7548 km

Comments Leg 1:

The weather during leg 1 was generally excellent except for two hurricanes. Hurricane Danny resulted in a loss of 13 hours of operation on August 14, 1985, and Hurricane Elena delayed arrival in New Orleans one day, from September 2 to September 3, 1985

The impact that the warm surface water and strong thermocline present in the Gulf of Mexico in the summer would have on the range of the GLORIA system was not realized Although GLORIA was run at a 30 sec repetition rate, 45 Km

swath width, the maximum swath width actually obtained was 8 Km in approximately 1000 m of water. This required reducing trackline spacing, adding additional tracklines and limited the effort in water depths shallower than 1000m.

Initially much time was spent getting all equipment operational. The GLORIA system suffered from logging problems resulting in a loss of approximately 24 hours of data during the cruise. The longest continuous down time period was 12 hours. Dirt particles in the air being pulled across recording heads by the air conditioning system appears to have been the major problem. The air gun system was down a total of approximately 24 hours, due to compressor, streamer, and gun problems. The longest continuous period of time was 7 hours. The magnetometer required 3 days to operational initially but this was partly a result of lower priority. A new computer system was installed for this cruise. Most of the leg was required to get the system operating properly. Navigation had to be plotted by hand the duration of the cruise. Summary data plots for the cruise, however, were completed with the computer system at the end of the cruise.

The data in the western Gulf are very interesting geologically. The Sigsbee Escarpment can be identified on the

sonographs with piles of debris in places at its base. A continuous channel can be traced from the shelf edge through the diapir province of the slope, forming a reentrant in the Sigsbee Escarpment, and then meandering seaward across the rise into the deep water of the Gulf. The fan of the Rio Grande has a braided channel system and features which are interpreted to be bedforms on it. Similar bedforms are present seaward of the Sigsbee Escarpment suggesting that strong bottom currents are present in the region.

Leg 2:

Leg 2 focused in the central Gulf of Mexico on the Mississippi Fan seaward of Louisiana, Mississippi, Alabama, and Florida. The area mapped with GLORIA on this leg was approximately 45,000 sq. nautical miles

Depart: New Orleans, LA September 5, 1985

Arrive: Tampa, FL September 29, 1985

Participants on Leg 2 included:

B. McGregor, USGS, Chief Scientist

D. Twichell, USGS, Data Curator

J. Schlee, USGS

R. Circé, USGS

J. Wagner, LSU (Louisiana State University, USA)

M. Harris, IOS Institute of Oceanographic Sciences, U.K.)

N. Kenyon, IOS

E. Darlington, IOS

C. Jacobs, IOS

R. Walker, IOS

R. Wallace, IOS

S. Williams, IOS

M. Beney, RVS (Research Vessel Services, U.K.)

Master of the Farnella - Capt. Roy Hadgraft

Data Summary - Leg 2

At sea total number of days 24 days

Mileage for each type of data collected:

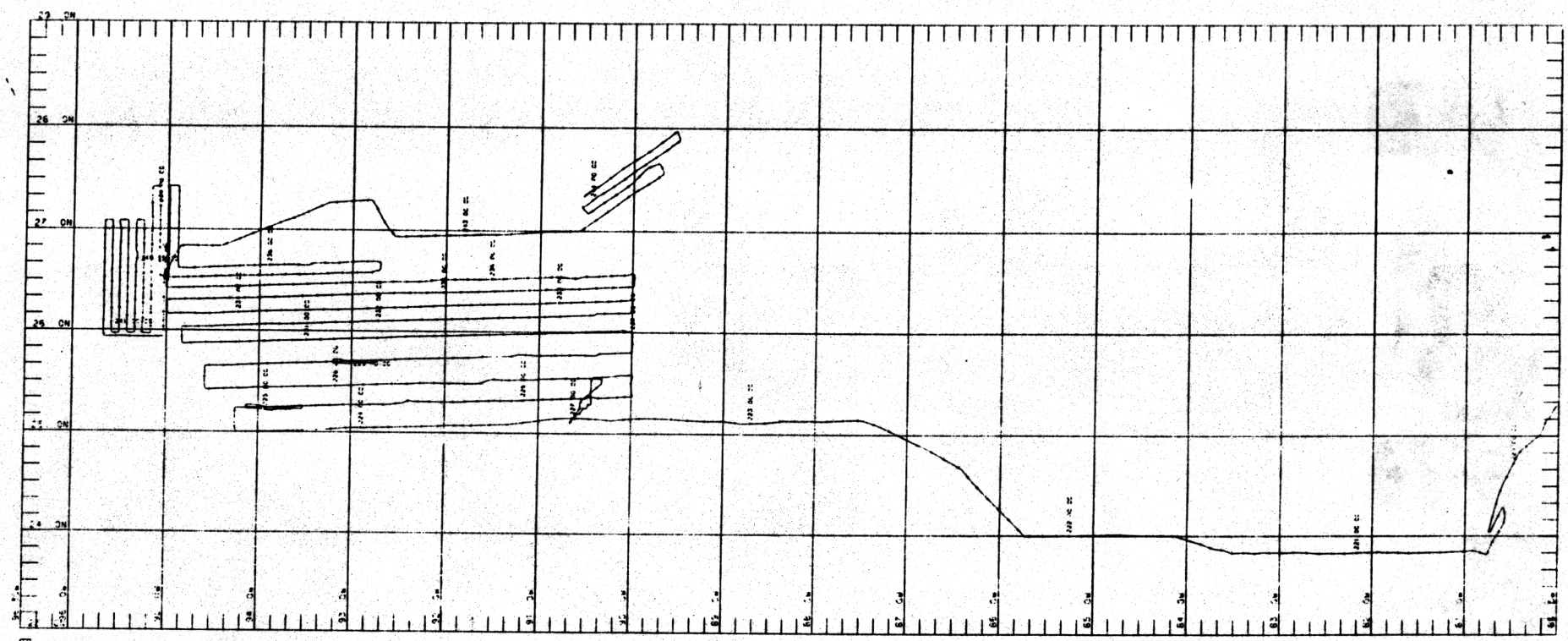
GLORIA sidescan	4520 nm	8362 km
3.5 kHz	4543 nm	8405 km
10 kHz	4594 nm	8504 km
air gun	4330 nm	8010 km
magnetometer	4594 nm	8504 km

Comments Leg 2:

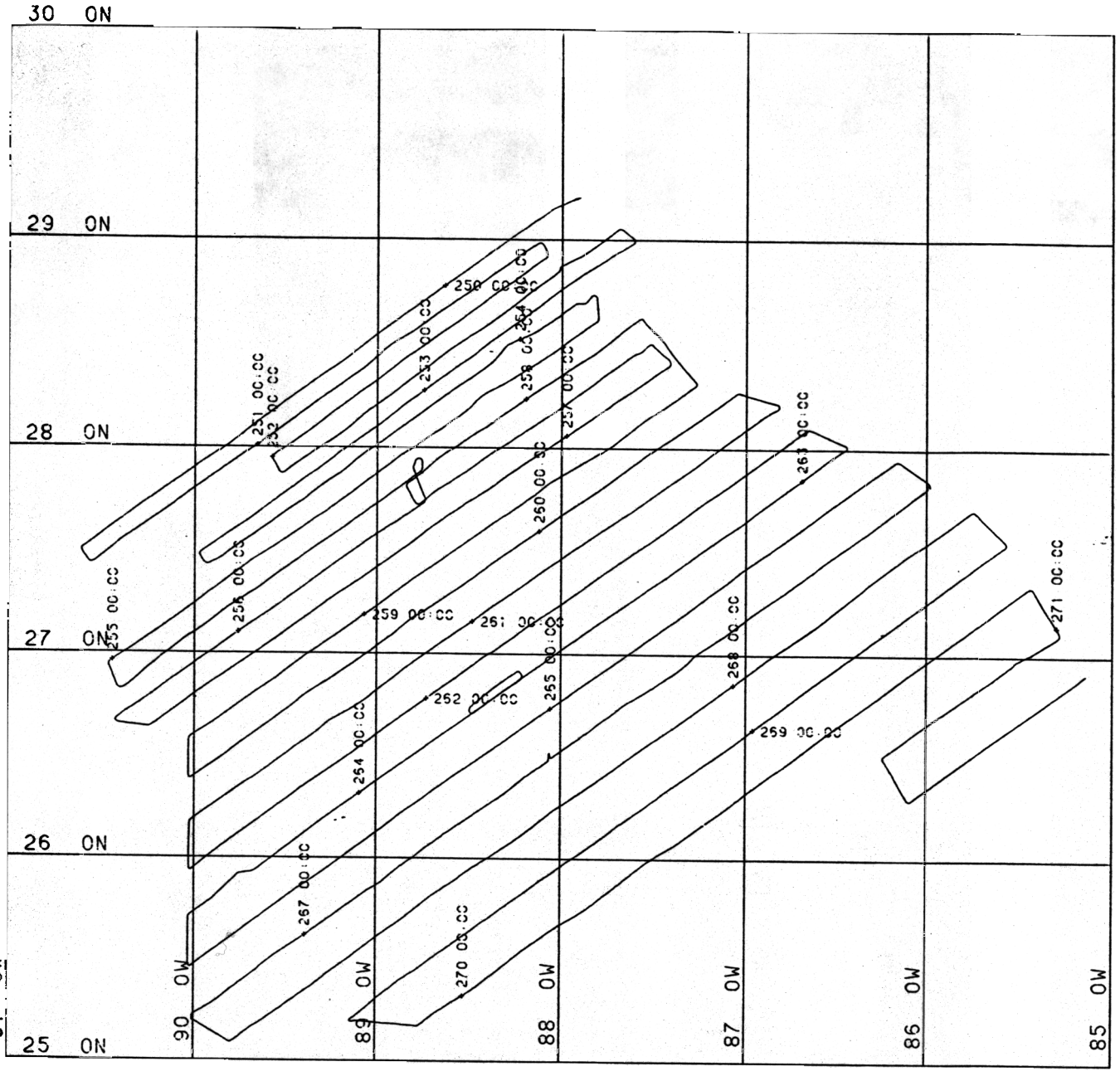
cruise was very successful. Equipment down time was minimal. The warm surface water temperature continued to limit the GLORIA range necessitating closer line spacing

than planned. The presence of the loop current for the last half of the cruise not only provided warm surface water temperatures but also a strong current often approaching 4 knots. The current shear prevented the GLORIA fish from towing parallel to the ship's track, introducing some distortion in the mosaic. In the northeast portion of the Gulf near Desoto Canyon fishing boats with lines set across our proposed track caused a problem requiring several lines to be terminated early. Leg 3A will collect data to cover these data gaps. An additional 8 days will be necessary on Leg 3 to complete the coverage of the Mississippi Fan.

The objective of this leg was to map the surface features in the Mississippi Fan area. Although the channel of the Mississippi could be identified on the mid fan, over much of the fan the channel was obscured by a major submarine slide or slides. Flow patterns were well displayed on the surface and the slide could be mapped to the base of the West Florida Escarpment. Another submarine slide was also present in the Desoto Canyon area. The meandering channel from Desoto Canyon was traced from this slide seaward parallel to the escarpment. Mass wasting appears to be an important process in distributing sediments in the deep water of the central Gulf. The Sigsbee Escarpment was mapped to the east as far as the Mississippi Canyon. Isolated salt diapirs were present to the east of the Mississippi canyon



USGS/TOS EEZ SCAN 85 LEG: MIAMI - NEW ORLEANS Aug. 7 - Sept. 25, 1985



MERCATOR PROJECTION

SCALE 1 TO 2500000 (NATURAL SCALE AT LAT. 26)

INTERNATIONAL SPHEROID PROJECTED AT LATITUDE 0

GRID NO.

TRACK NO.

Track plotted from Loran-C

USGS/IOS FARNELLA 2/85 249/1808 to 271/1800 Sept. 6 - Sept 28, 1985