79028

CRUISE REPORT

R/V GILLISS 7903 Leg VII

September 9-11 - September 9-16, 1979

Mahlon Ball
U.S. Geological Survey
Woods Hole, MA 02543

Submitted Jan. 8, 1980

Vessel: R/V GILLISS, Rosentiel School of Marine and Atmospheric Sciences, Univ. of Miami, 4600 Rickenbacker Cswy., Miami, Florida 33149

Cruise Number and Leg: GS7903, Leg VII

Project: Petroleum Geology of U.S. Atlantic and Gulf Margins, 9450-01798

Area of Operations: Florida Straits, Southwestern Bahamas, Santaren and Nicholas Channels, in the vicinity of Cay Sal.

Dates of Start and End of Cruise with ports: September 11, 1979, Miami, Florida, September 16, 1979, Miami, Florida

Names and Affiliations of Scientific Party and Ships Captain:

A. Scientific Party:

Mahlon Ball, Chief Scientist, USGS
Dick Sywlester, Chief Scientist, USGS
Bob Bowles, USGS
Barry Irwin, USGS
Janet Burke, USGS
Al Goodman, USGS
Ken Parolski, USGS
Wayne Bock, Chief Scientist, RSMAS
Dave Mason, USGS
Chuck Holmes, USGS
Ron Miller, USGS
Jack Hampson, USGS
Kathy Kent, USGS
Betsy Coward, USGS
Tom Obrien, WHOI

B. Ships Captain: Robert Hagen

Purpose of Cruise:

Leg VII was planned to obtain gravity, magnetic and reflection seismic data over the Destin Anticline in the northern part of the MAFLA or western Florida Shelf region. These data would have increased our ability to assess the hydrocarbon potential of this huge, partially tested structure. Unfortunately, hurricanes David and Frederick forced postponement of this work. The former storm caused delays in our departure and the latter chose to stall over the work area during what was left of our cruise.

An alternate plan had to be devised. Fortunately, there are a number of interesting marine geologic problems in Florida-Bahamas waters. We availed ourselves of the University of Miami's entree in this region to obtain geophysical data in Florida Straits and Santaren and Nicholas channels, North of Cuba, in the vicinity of Cay Sal, Bahamas. Our measurements recorded two anticlinal structures with dip reversals spanning several kilometers. These structures are large enough to constitute possible hydrocarbons exploration targets and they occur in water depths less than 500 m which is within currently drillable depths.

Navigation System:

The United States Geological Survey's Integrated Navigation/Gravity System is built around a Western Geophysical Survey and Data Management System. The Western system uses a Hewlett-Packard 2112 minicomputer and Western designed interface circuitry to take data from six navigation sensors and output the accurate position of the vessel. The sensors are of two types: 1) Velocity output--range-range loran, bottom lock (pulsed) sonar, doppler (continuous) sonar, gyroscope and 2) Position output -- Navy Navigation Satellite receiver, hyperbolic loran. The two usual methods of navigation are: 1) Dead reckoning between satellite fixes using one of the velocity sensors (the recommended mode, with range-range loran the recommended sensor) and 2) Using the continuous data from hyperbolic loran. One of the attractive features of the Western system is that all important navigation parameters from all six sensors are recorded every 20 seconds. Thus, the cruise can be replayed once the tapes are ashore and track lines can be drawn using the sensors with the best data in a given area. For the U.S. Geological Survey, knowing the precise location of where we were at a certain time is more important than getting to a precise location.

List of Scientific Equipment Employed

A. Gravity System:

A Bell Aerospace BGM-3 gravimeter is integrated with the navigation system. Roll and pitch signals from the gyroscope (Sperry MK-29) are used to keep a stable platform (designed by J. Dean of Woods Hole Oceanographic Institute) parallel to the earth's surface. The gravimeter is mounted on this platform and sends raw gravity data to a Hewlett-Packard 9825A calculator. A navigation/gravity interface unit (designed by P. Parks, formerly of U.S.G.S.) transfers navigation data to the HP 9825A. The reason the satellite fix-dead reckoning mode of navigation is preferred is that it gives smoother, more accurate short term velocity data. Velocity is one of the factors needed to correct the raw gravity data. Another reason for wanting smooth velocity data is that gyro velocity is compared with system (ship's) velocity in the 9825A and a correction factor sent back to the gyroscope (via the nav/grav interface) to correct the long term drift of the gyro wheels. All gravity related data are passed to the nav/grav interface and then to the Western system where they are recorded on the same tape as the navigation data. Therefore, gravity processing can be part of the post-cruise processing. The improved velocity data can be used to derive more accurate gravity readings and perhaps, someday, we'll be able to use gravity to improve the navigation.

A second complete gravity system is carried on U.S.G.S. cruises. A Lacoste and Romberg sea-going gravimeter and recording system is used for back-up and cross-checking one system against the other for continuous confidence that both are operating properly. L&R data are recorded on its own data collection system, and L&R raw gravity is recorded through the Western Data Management System.

List of Scientific Equipment Employed (Cont.)

B. Multichannel reflection seismic system with W.H.O.I. 1200m streamer and bolt air gun. The guns were 15m off the stern and the near phone was 230m astern. Shot point interval was 50m. The streamer is composed of alternating active and inactive segments 50m long. Twelve fold data were recorded in SEG-Y format.

C. High resolution reflection seismic system, 3.5 Hz and 5 cu. in. air gun.

D. Varium magnetometer

Tablulated Information

A. Number of days at sea - 6

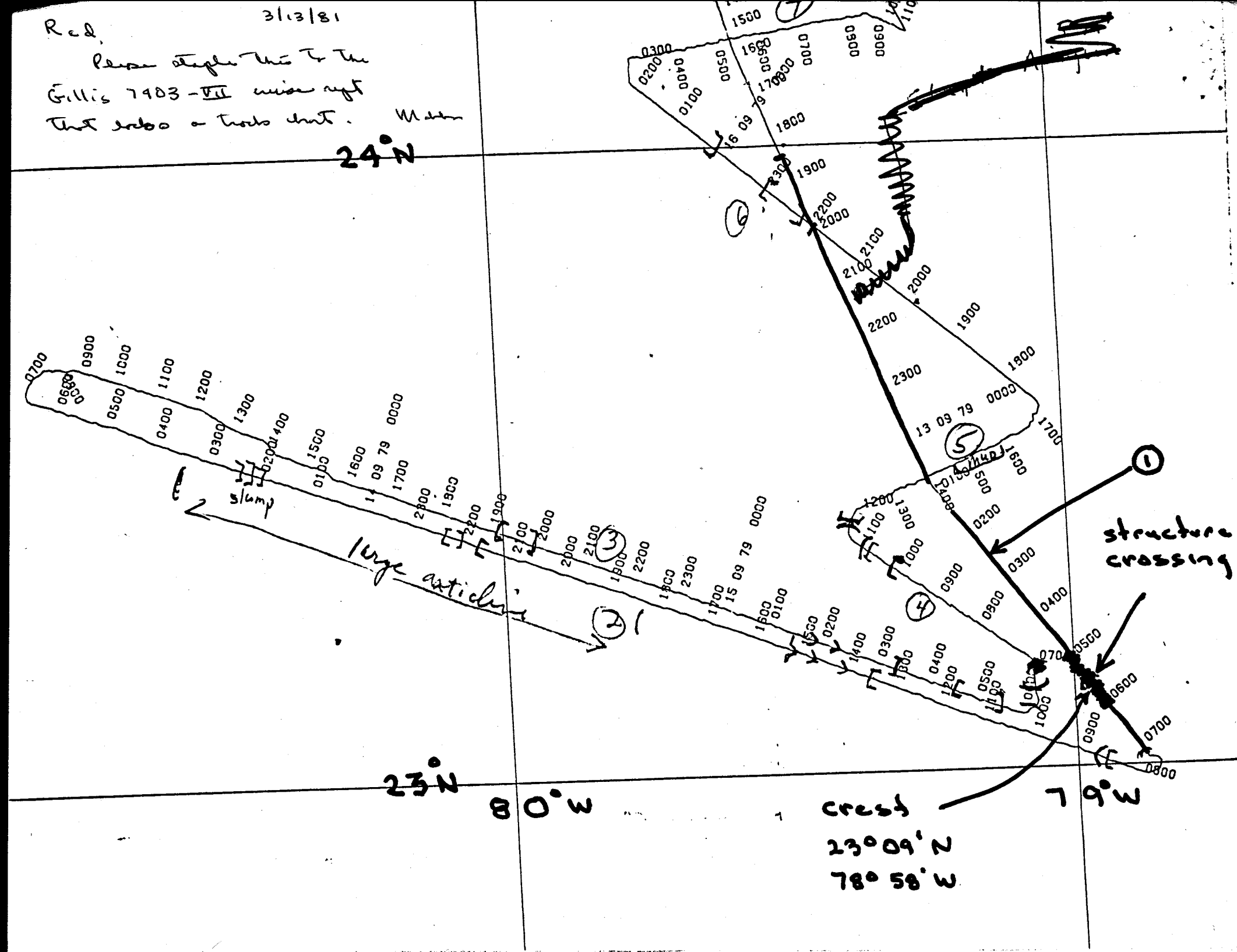
B. Number of Km

1. Gravity Data = 550

2. Mangetic Data= 400

3. Reflection Seismic Data= 550

Track Chart


3/13/81
Rcd.
Please staple this to the
Gillis 7903-VII mission report
that is also a track chart.
24°N
23°N
80°W
79°W
large anticline
structure
crossing
crest
23°09'N
78°58'W