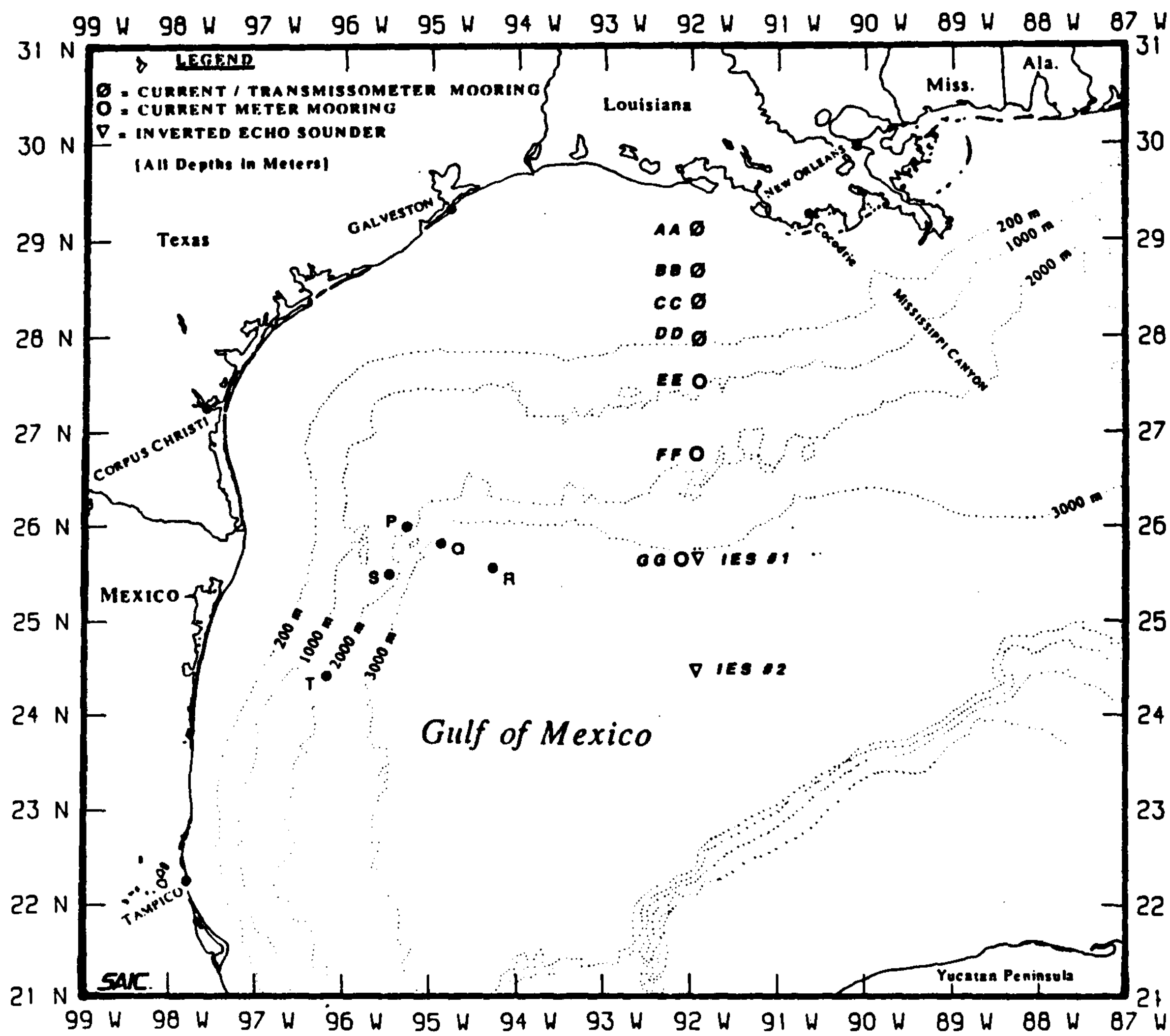
OCS Study
MMS 87-0080

Proceedings
Summer Ternary
Gulf of Mexico Studies Meeting

July 1987



U.S. Department of the Interior
Minerals Management Service
Gulf of Mexico OCS Regional Office

OCS Study
MMS 87-0080

Proceedings
Summer Ternary
Gulf of Mexico Studies Meeting

July 1987

Days Inn Motel
Mobile, Alabama
July 30, 1987

Compiled by
Geo-Marine, Inc.
1316 14th Street
Plano, Texas 75074

Prepared under MMS Contract 14-12-0001-30305

U.S. Department of the Interior
Minerals Management Service
Gulf of Mexico OCS Regional Office

August 1987

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Minerals Management Service
Gulf of Mexico OCS Regional Office
1201 Elmwood Park Boulevard
New Orleans, Louisiana 70123-2394

Attention: Public Information Unit (OPS-3-4)

(Telephone Number: (504) 736-2519)

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ACKNOWLEDGEMENTS

Cover artwork is from an abstract of a paper given by Dr. Evans Waddell, Science Applications International Corporation, at the Minerals Management Service, Gulf of Mexico OCS Region Summer Ternary Meeting, held in Mobile, Alabama on July 30, 1987. The figure is illustrated on page 8 of this report.

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MEETING SUMMARY

Introduction

The Minerals Management Service (MMS), Gulf of Mexico Regional Office, convened the second Ternary Meeting of 1987 on July 30th. These public meetings are held as a forum for information exchange between interested and involved parties. This generally includes MMS personnel, representatives of various MMS funded programs, state representatives, public interest groups, other Federal agencies, and invited investigators working on problems similar to or supportive of those of the MMS.

The meeting is a compilation of presentations given by several speakers. The speakers include both representatives of various MMS-funded studies, as well as invited guests. The purpose of each presentation is to provide information that defines each study's goals, schedule, methodology, present status, and any important or relevant insights recently developed. The meeting is planned so that ample opportunity for exchange of information between speakers and audience is provided. In addition, a sufficient amount of unallocated time for discussion is also made available.

Meeting Agenda and Abstracts

The meeting's agenda is reproduced on page three. Prior to the scheduled presentations, each speaker provides an abstract for distribution so that others have an to become familiar with the material to be presented. This procedure provides the audience an opportunity to formulate questions before each presentation is given, and to attend each presentation with less distraction. These abstracts form the basis for this Meeting Summary Report.

Abstracts included in this volume are copies of those provided by each speaker. No adjustments have been made to the form and substance of these submissions.

Any questions regarding the presented material should be directed to the appropriate speaker. General questions regarding the Ternary Meeting or the Gulf of Mexico Environmental Studies Program should be directed to the Environmental Studies Section in the MMS Gulf of Mexico Regional Office (504-736-2897).

MMS Environmental Studies Information
GULF OF MEXICO OCS REGION
U.S. DEPARTMENT OF THE INTERIOR / MINERALS MANAGEMENT SERVICE

ENVIRONMENTAL STUDIES PROGRAM FOR THE GULF OF MEXICO

SUMMER TERNARY MEETING

July 30, 1987

You are cordially invited to attend an Environmental Studies Program Ternary Meeting on July 30, 1987, in the Audio-Visual Conference Center of the I-65/Airport Days Inn Motel, 3650 Airport Boulevard, Mobile, Alabama, telephone (205) 344-3410. The meeting will present progress reports by various participating contractors on their individual studies efforts.

Also, the Gulf of Mexico Regional Technical Working Group, an advisory body serving the MMS, will hold a business meeting at the same location on July 29. Please contact Ms. Eileen Angelico, at the address below, Mail Stop ORD-5; (504) 736-2959 for further information.

Time	Speaker	Topic
9:00 a.m.	Mr. J. Rogers Pearcy Regional Director Minerals Management Service Mr. Ruben Garza Geo-Marine, Inc.	Welcome
9:05 a.m.	Dr. Van Waddell Science Applications International Corporation	Physical Oceanography Field Measurements Program
9:30 a.m.	Dr. Jerry Ford Florida A&M University	Gulf of Mexico Meteorological Data Analysis and Archiving Project
10:00 a.m.	Dr. Alan Wallcraft Jaycor, Inc.	Gulf of Mexico Circulation Modeling Program
10:30 a.m.	Dr. Karen Wicker Coastal Environments, Inc.	Study of Impacts of OCS Activities on Sensitive Coastal Habitats (Barrier Beaches and Non-Louisiana Wetlands)
11:00 a.m.	Dr. Donald Cahoon Center for Wetland Resources, Louisiana State University	OCS Development and Potential Coastal Habitat Alteration Study (Louisiana Wetlands Loss Study)
12:00 noon	Adjourn	

For further information, please contact Dr. Robert Avent or Dr. Richard Defenbaugh at the following address:

Minerals Management Service
Gulf of Mexico OCS Region
Environmental Studies Section (LE-4)
1201 Elmwood Park Boulevard
New Orleans, Louisiana 70123-2394
Telephone: (504) 736-2897 or FTS 680-9897

ABSTRACT

GULF MEXICO
PHYSICAL OCEANOGRAPHY PROGRAM

MINERALS MANAGEMENT SERVICE
TERNARY MEETING

JULY 30, 1987

SUBMITTED BY:
SCIENCE APPLICATIONS INTERNATIONAL CORPORATION
RALEIGH, NORTH CAROLINA

The MMS-funded Physical Oceanography Field Measurement Program is a multi-year effort to develop an improved understanding of conditions and processes active in the Gulf of Mexico. The objective is to establish a data base of field measurements which can be used by project scientists to describe and better understand key circulation patterns which are of primary importance to OCS oil and gas activity. In addition, the data base and associated process synthesis is available to a concurrent and companion numerical circulation modeling program which is also supported by MMS.

The five program years are structured so that each emphasizes different regions and processes. Program Years 1, 2 and 4 documented conditions in the eastern Gulf of Mexico, in particular the Loop Current and west Florida shelf. Year 3 emphasizes the western Gulf and Year 5 the north central Gulf.

The material below describes activities from these latter two related yet separate program years: Year 3 - the western Gulf and Year 5 - the north-central Gulf.(Figure 1) The link is the characteristics and role of Loop Current eddies on the observed circulation. This is the primary focus of Year 3 and one of the key topics during Year 5.

Analysis of the extensive Year 3 data set has continued. Considerable effort has been devoted to identification of necessary corrections to the AXBT and XBT data sets, developing testing and utilizing an empirical scheme for estimating the dynamic height field from the XBT/AXBT surveys, and analyzing the current data via objective techniques to create an estimate of the circulation field which produced the currents measured at the series of moorings (points in a field). This latter methodology is at present being extended to incorporate multi-variate objective analysis using current data, buoy trajectories and survey results. Preliminary results of the objective mapping of 1000 m. depth currents are shown in Figure 2.

Buoy trajectories relevant to both program years are being obtained. (Figures 3, 4 and 5) One buoy placed in a major Loop Current eddy has, unfortunately, provided relatively sparse and irregular data due to problems with the transmitter. The results will be of marginal use for detailed dynamic and kinematic analyses but has provided information sufficient to resolve some of the general eddy movement. Two EPA/MIT-funded buoys (No. 5837 and 5839) also provided a new set of data. These buoys (drogued at the surface and 78 m.) were apparently placed in a cyclonic feature which was located near the Year 5 mooring when originally seeded. Since then, they have translated to the south and southwest while revolving counterclockwise. At this time, we are unaware of any other cyclones in the Gulf which have been studied with buoys. Such cyclones have been documented as being linked to major LC, anticyclonic, eddies. In the present situation, this cyclone is to the northwest of a major anticyclone evident in the trajectory for buoy 7234.

Year 5 data gathering activities are well underway. Three separate cruises have been conducted. Cruise 1 (Cruise 87-13 in Figure 6) involved initial mooring deployment (current meters, transmissometers and inverted echo sounders) and hydrographic sampling. Approximate mooring positions are shown in Figure 1. Cruise 2 (Cruise 87-15 in Figure 7) was a shelf cruise devoted to optical measurements and selected hydrographic observations. The third cruise was the recently completed initial (shelf) mooring/instrument rotation cruise.

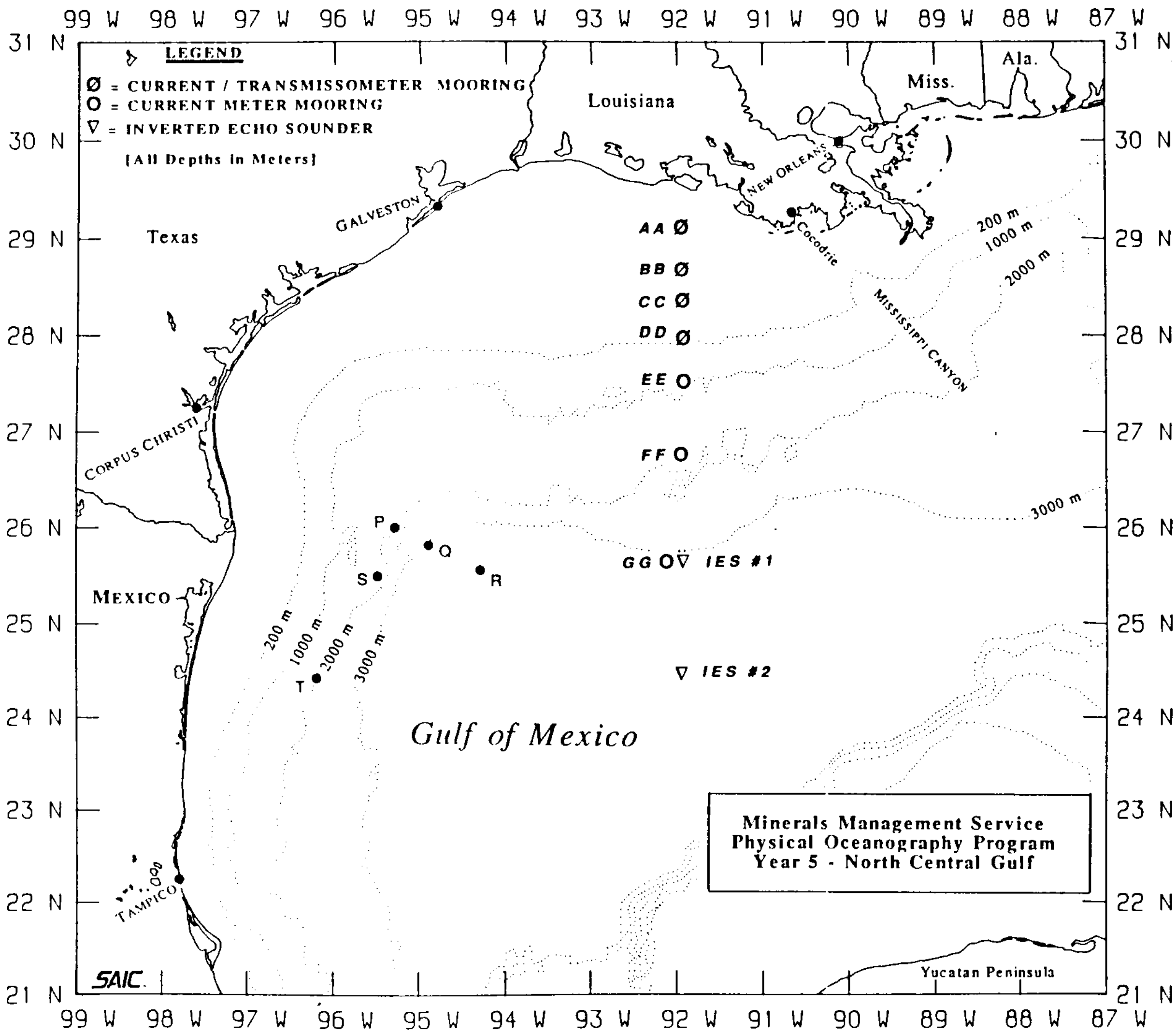


Figure 1. Regional map of the Year 5 study area. The locations of in-situ instrumentation is shown . For a better understanding of how Years 3 and 5 are related, the locations of Year 3 moorings are shown as small dots (Moorings P, Q, R, S, and T).

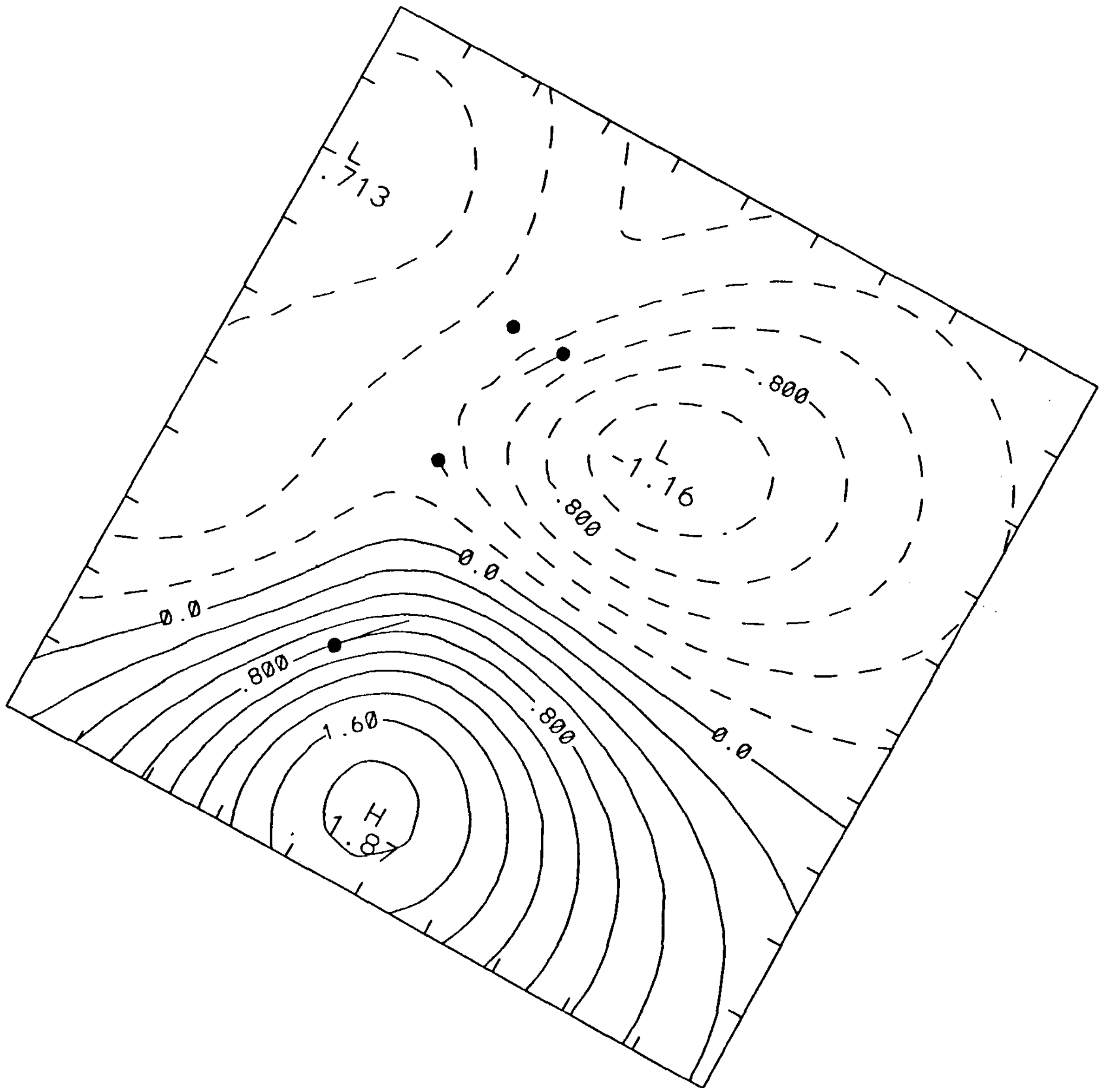


Figure 2. Contours of stream functions determined by an objective mapping of low-pass filtered velocity measurements taken at the the indicated mooring locations and at 1000m water depths on January 23, 1986. The velocity vector is everywhere parallel to the contours. Values have been normalized. North is vertically upward on the page. The area covered by this rendition is 420 km on each side of the plot. Mooring locations are shown by a dot. The magnitude and direction of the normalized velocity vector is shown by a line coming from the mooring position.

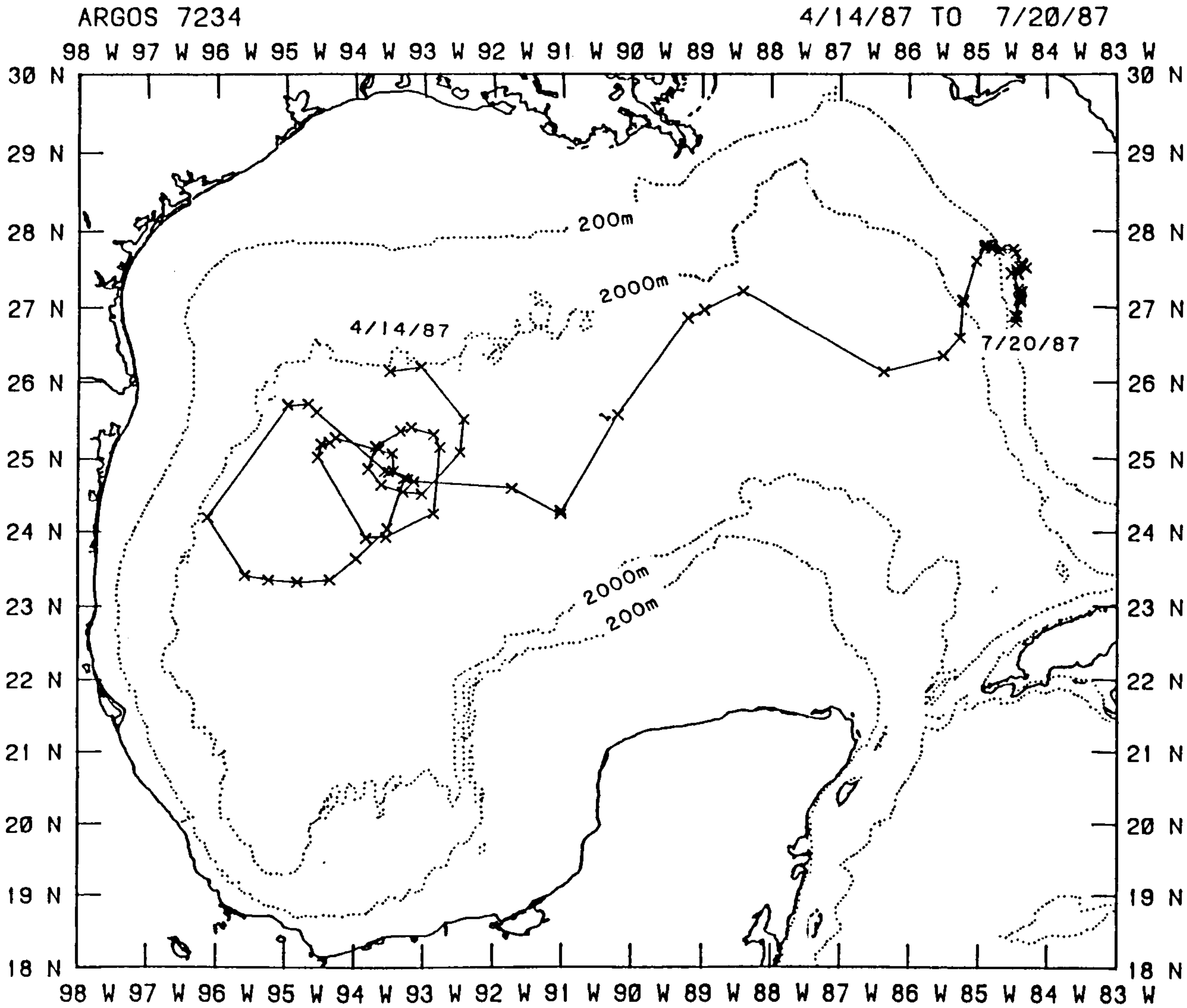


Figure 3. Trajectory for Buoy 7234 which was deployed in a major Loop Currnet eddy. Unfortunately, the transmitter has not operated at all times so the data is considerably less dense than is obtained normally.

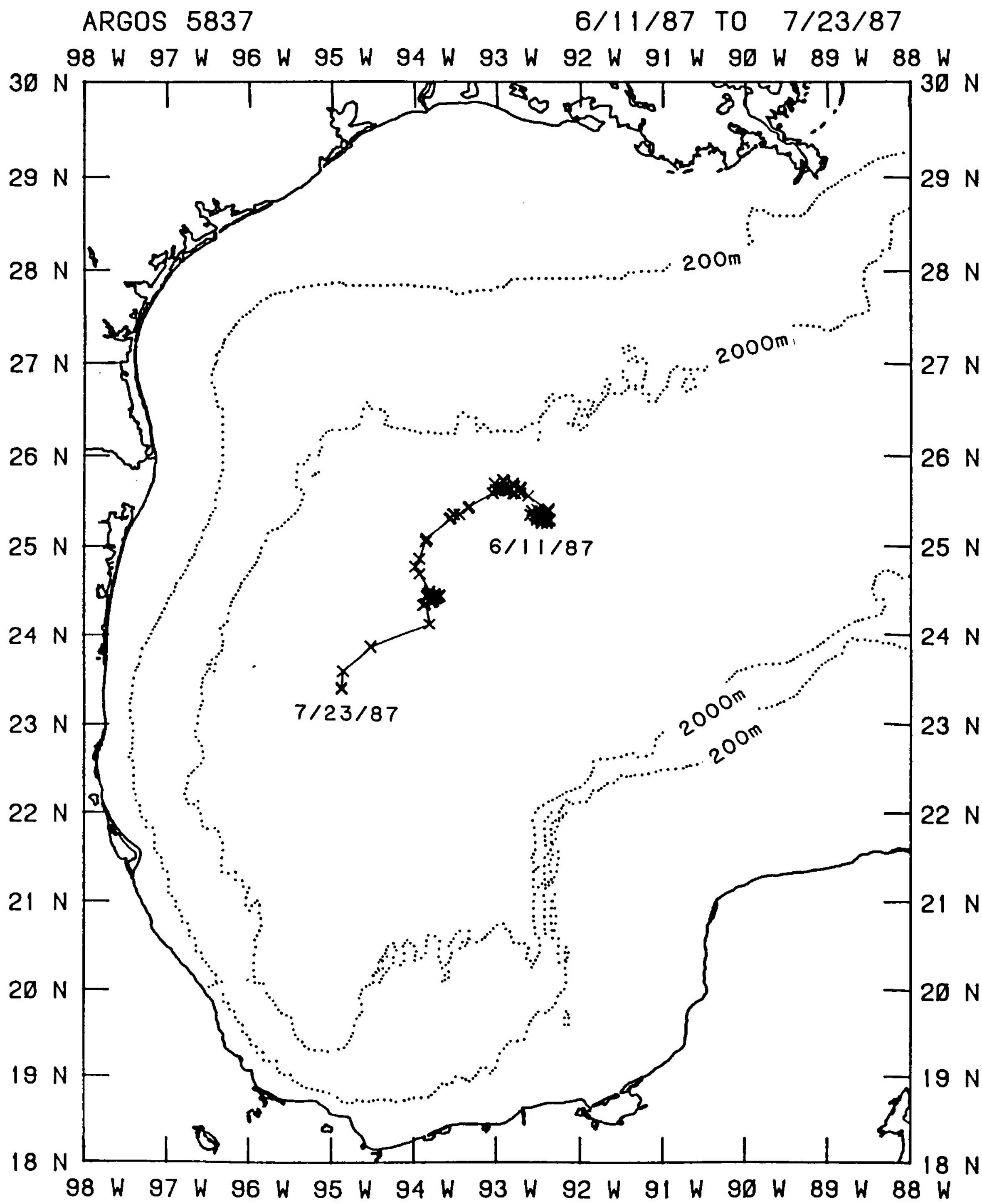


Figure 4. Trajectory for Buoy 5837. This surface drogued drifter was released in a cyclonic feature that is probably associated with the major anticyclone identified in Figure 3.

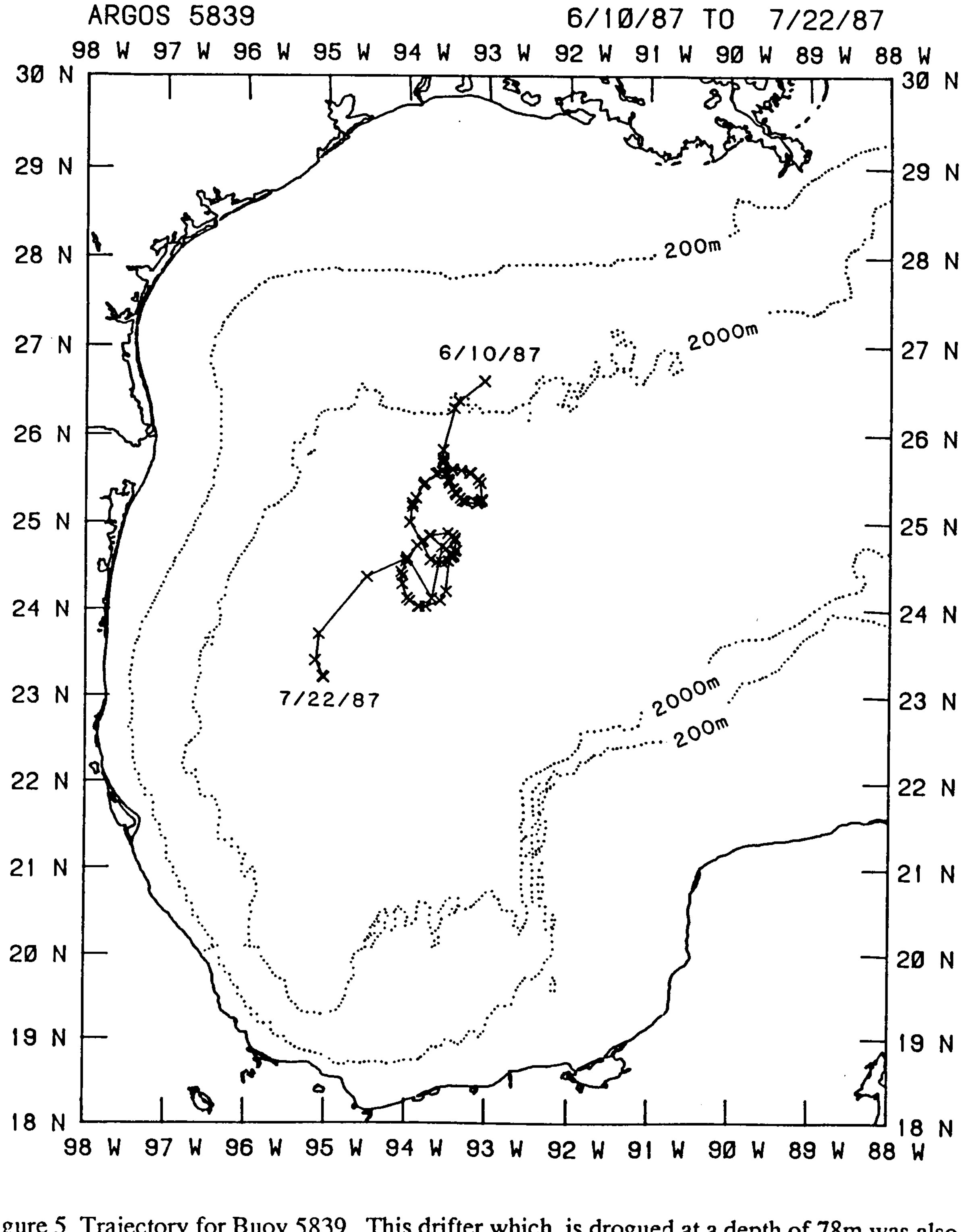


Figure 5 Trajectory for Buoy 5839. This drifter which is drogued at a depth of 78m was also released in the cyclone mentioned with Figure 4.

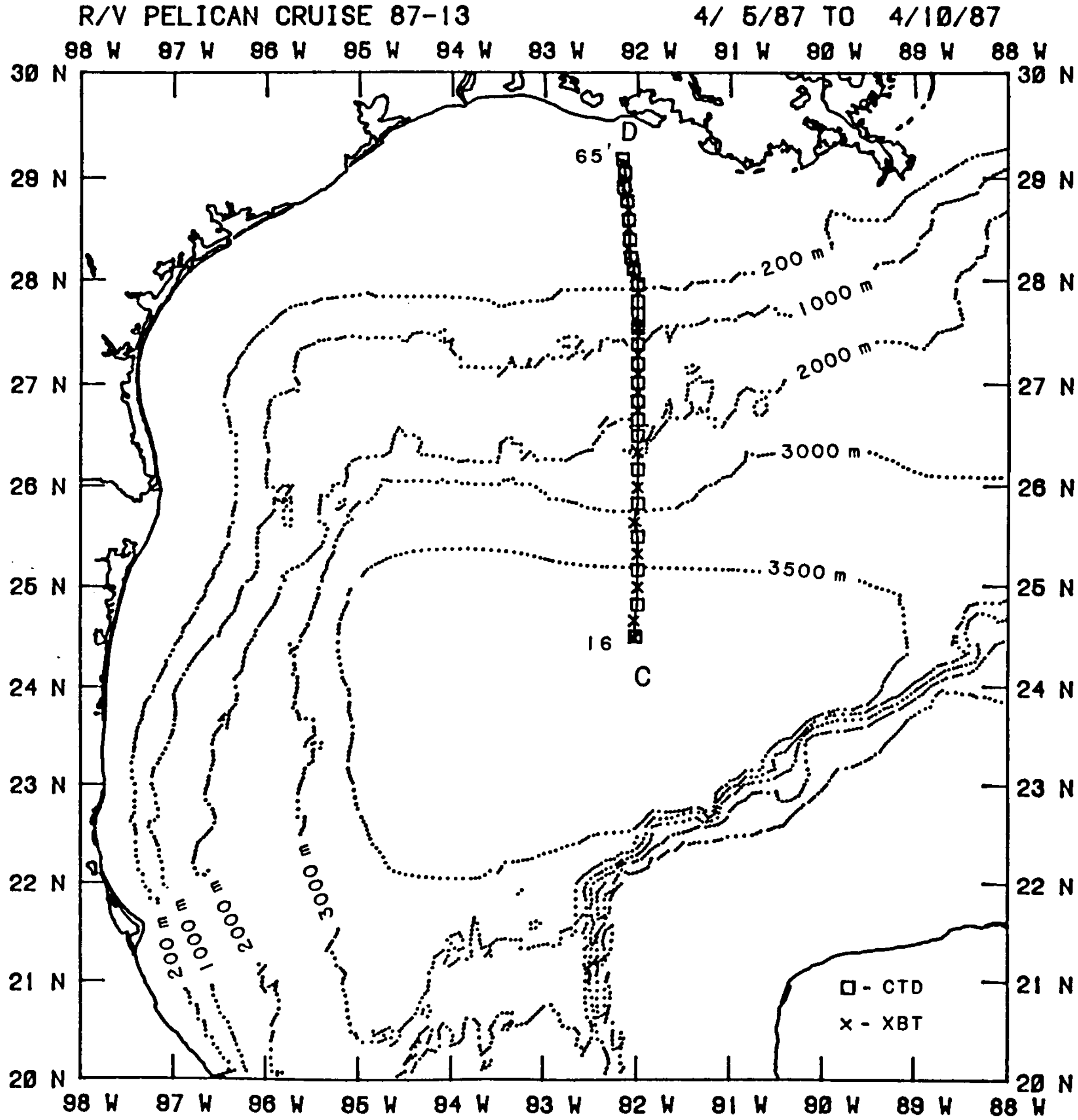


Figure 6. Station location map for the initial cruise during which the in-situ moorings were deployed and the initial hydrographic survey was conducted.

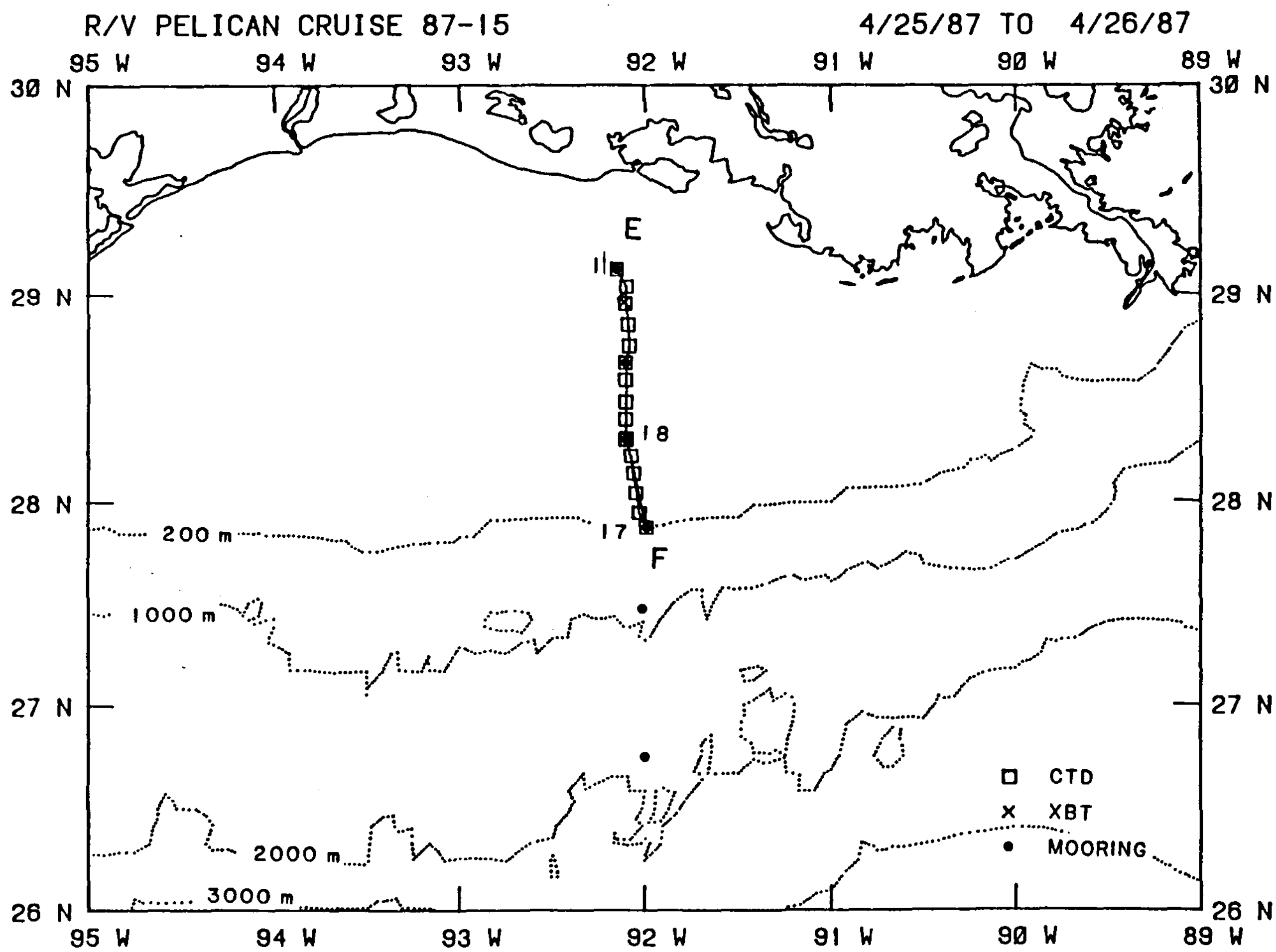


Figure 7. Station location map for the second leg of the initial cruise which was devoted to marine optics and hydrography.

ABSTRACT
FOR
GULF OF MEXICO METEOROLOGICAL DATA BASE AND SYNTHESIS STUDY

Second 1987
MMS Ternary Studies Meeting
July 30, 1987
Mobile AL.

Submitted to: Environmental Studies Group
Gulf Regional Office
Minerals Management Service

Submitted by: Jerry W. Ford
Florida A & M University
Tallahassee, FL 32307

ABSTRACT

GULF OF MEXICO METEOROLOGICAL DATA BASE AND SYNTHESIS STUDY

Introduction

Florida A&M University (FAMU), in conjunction with appropriate subcontractors, is currently under contract with Minerals Management Service (MMS) to obtain, manage, archive, and conduct some analyses of the relevant historical meteorological data sets in the Gulf of Mexico. In addition, FAMU will provide the data and results of preliminary analysis to appropriate MMS funded investigators working in the area.

The project began in the fall of 1984 with a projected completion date of April 1, 1986. A recent modification to permit the inclusion of certain additional data extended the completion date to November 30, 1987. The purpose of this project is as follows:

The compilation of an historical meteorological data base for the Gulf of Mexico:

- In digital format
- In a common format
- Perform a "first order" analysis of the data
- Provide as deliverables:
    - Data Catalog
    - Descriptive Summary

Work In Progress

The data sets presently on hand represent the composite data from a number of studies and observational activities conducted in the gulf over a number of years. These include buoy, ship, and platform data. The data sets collected to date are:

Set # 1 NODC BUOY DATA SET

DESCRIPTION: Buoy data for Gulf of Mexico in standard NODC format. (See figure 1)

Set # 2 NCC SHIP DATA

DESCRIPTION: National Climactic Center ship data for Marsden Squares 81 and 82 (Gulf of Mexico) in TD-1129 format. (Jan. 1970 - Dec 1983)

Set # 3 NATIONAL WEATHER SERVICE COASTAL WIND STATION DATA AIRWAYS SURFACE OBSERVATIONS: 1970 - 1982

DESCRIPTION: Meteorological observations for nine (9) stations around the Gulf. Data provided by NCDC. The following stations are included:

1. Key West, FL.
2. Fort Myers, FL.
3. Tampa, FL.
4. Pensacola, FL.
5. Boothville, LA.
6. Mobile, AL.
7. Port Arthur, TX.
8. Corpus Christi, TX.
9. Brownsville, TX.

Set # 4 TROPICAL CYCLONE DATA FOR THE NORTH ATLANTIC BASIN (HURDAT): 1886 - PRESENT

DESCRIPTION: National Climactic Data Center (NCDC) cyclone track data for the Gulf.

Set # 5 EXTRATROPICAL CYCLONE TRACK DATA

DESCRIPTION: Gulf of Mexico extratropical cyclone track data provided by the University of Virginia, Department of Environmental Sciences.

Set # 6 OCMP STATION DATA (PARTIAL)

DESCRIPTION: Digitized meteorological data from the analog observation records of station 2 of the OCMP study conducted from September 1972 through November 1977. Six (6) of approximately thirty-five (35) digitized tapes on hand.

DIGITIZED TAPE	FROM ANALOG RECORD(S)
EHI 4336 - 1	203W
EHI 4336 - 2	202W, 204W
EHI 4336 - 3	211W-A, 209W, 230W
EHI 4336 - 4	205W, 228W
EHI 4336 - 5	213W
EHI 4336 - 6	214W, 231W

Figure 1. NODC Buoy list

NODC BUOY DATA SET
GULF OF MEXICO

BUOY NUMBER	FIRST DATE	LAST DATE	RECORDS	ORIGINAL LOCATION LAT	LONG
EB02	73/03/21	73/09/29	1,660	27.5N	88.0W
EB04	75/08/13	77/12/29	20,288	26.0N	90.0W
EB10	73/01/01	76/01/20	9,667	27.5N	88.0W
EB12	73/06/22	75/03/07	7,741	26.0N	94.0W
EB31	73/03/08	73/05/22	415	27.0N	86.0W
EB32	73/01/28	75/01/08	971	27.5N	88.1W
EB36	73/03/09	73/04/16	89	26.1N	84.6W
EB44	76/11/20	77/12/31	9,212	26.0N	86.0W
EB52	73/02/28	73/04/25	340	26.0N	83.8W
EB53	73/03/07	73/03/31	92	29.8N	88.3W
EB61	73/02/21	77/05/08	3,232	26.9N	84.6W
EB62	74/11/08	75/01/06	365	29.0N	85.6W
EB71	76/09/19	77/12/09	21,567	29.0N	85.4W
42001	78/04/01	83/12/31	187,445	26.0N	90.0W
42002	78/01/21	83/12/31	202,376	26.0N	93.5W
42003	78/01/01	83/12/31	182,881	26.0N	86.0W
42004	78/12/23	79/02/11	341	27.5N	85.5W
42005	78/12/13	80/05/13	8,764	30.0N	85.9W
42006	79/08/25	80/03/23	27,800	26.5N	96.0W
42008	80/10/01	83/12/31	36,362	28.7N	95.3W
42009	80/10/01	83/08/10	63,682	29.3N	87.5W
42010	81/04/01	82/03/29	7,878	29.7N	93.4W
42011	81/09/16	83/12/31	23,252	29.6N	93.5W
42012	83/08/10	83/12/31	8,472	29.9N	87.1W

Additional Data

As previously reported, in the Winter of 1985 and the Spring 1986 efforts were undertaken to include two additional large data sets in the body of collected data. The objective of this new effort was to convert certain analog data tapes to digital format and, thereby, to add to the body of digitized data two large historic meteorological data sets which have remained in analog format until this time. The analog data sets are the result of two meteorological/oceanographic observation programs conducted by several oil and gas companies in the Gulf of Mexico around the Mississippi River delta from September 1968 through November 1977. These observations are the result of two data gathering programs: Ocean Data Gathering Program (ODGP) conducted from September 1968 through November 1971 (4 years) and consisting of 248 analog tapes (some 14 day some 28 day) with observations of wind speed and direction and atmospheric pressure. The second data set is the Ocean Current Measuring Program (OCMP) conducted from September 1972 through November 1977 (5 years) consisting of 164 tapes (28 day tapes) of wind, wave and pressure data and 159 tapes of current data for a total of 571 analog tapes for the two programs.

Unfortunately, the digitizing of the complete OCMP and ODGP data sets for inclusion in the Gulf of Mexico data base proved to be too costly to be completed at this time. However, funds have been made available to digitize and include in the data base one (1) station (Station 2).

The quality of the analog data in OCMP suggest that some tapes will have no data recorded and not all the recorded data will be usable. Certain criteria have been established for the selection of tapes to be digitized and, for the digitized data, for the inclusion of the data in the analysis phase. The criteria for analog-to-digital (A/D) conversion is:

- If waves and one of wind speed or direction contain zero (0) days of data on a tape then it will not be converted.

For those tapes digitized, the following criteria has been selected to identify tapes which will be analyzed:

- If, on a given tape, the summary indicates that either wind speed or direction have zero (0) days of data then the tape will not be analyzed.

- The combination of several records must contain at least three weeks of possible continuous data.

Those tapes selected for digitizing according to the above stated criteria will be sampled to produce a 20 minute per hour observationally consistent record on 9-track, 6250 BPI magnetic tape in multiplex ASCII format. The original digitized data will be archived and available for future study.

Future Plans

A summary of work to be completed under the terms of FAMU´s agreement with MMS includes these items which remain to be completed:

1. Conduct a "first order" analysis of the data sets:

   The "first-order" statistical characterization and description of meteorological conditions in the Gulf of Mexico. This document will reply heavily on available information (in contrast of requiring extensive new analyses) and will be presented as a reference document for persons having backgrounds which may not include meteorology.

2. Develop the Data Catalog: FAMU will produce a catalog describing the composition of the final composite data set, clearly describing the sources of the information, including the originators address and reference to the literature when available, the general formats of the received data, the periods covered by the acceptable data, and the specific location(s) and identifier(s) of the reformatted data in the archived compilation. FAMU will provide a "descriptive summary" of the results of first level analyses of the data.

3. Develop the Draft Descriptive Summary: The Summary will include the following: Monthly, seasonal, and annual means, extremes and variance of velocity and stress components at each of the station. Using 40 hour low pass filtered data, we will compute basin scale curl of the wind stress (v x t) and evaluate curl calculations--especially in the western/central Gulf--to identify periods of positive and negative vorticity which could influence regional circulation patterns.

4. Develop the Final Descriptive Summary: The catalog and Summary will be provided to MMS in draft form for review. FAMU will make required changes and additions and, as provided for in the schedule of deliveries, will provide a final version.

The time required to complete these items in conjunction with appropriate subcontractors is estimated at 3 to 5 months to include the submission of the required deliverables.

Figure 2. Sources of Data

RESOURCE LIST FOR MMS METEO PROJECT

NAME/ADDRESS	RESOURCE FOR
Dr. Murray Brown Minerals Management Service Gulf of Mexico OCS Region Environmental Studies Section (LE-4) 1201 Elmwood Park Blvd New Orleans, Louisiana 70123-2394 (504) 736-2901 /2897	MMS Project Officer Approves Spending
Dr. Evans Waddell / Robert Wayland Science Applications International, Inc. 4900 Water´s Edge Drive Suite 255 Raleigh, N.C. 27606 (919) 851-8356	Subcontracted to FAMU
Mr. Harold Kilpatric Department of Meteorology Love Building Florida State University Tallahassee, FL 30308 (904) 644-6205	General Meteo. Information
Dr. Jordan FSU Meteorology Library (904) 644-3222	Reference Books
Dr. Shu National Meteorological Center Louisiana State University (504) 388-2395/2396	Oil Co. Wind Data
Dr. Dana Thompson NORDA (Code 324) NSTL, Mississippi 39529	Gulf Buoy Data
Mr. Richard Hein National Climactic Data Center Federal Building Asheville, N.C. 28801-2696 (704) 259-0682	General Wx Data MARSDEN SQUARE Data Coastal Wind Station Data/Tropical Cyclone Data

Figure 2. Sources of Data (Cont)

Mr. Bob Lobel Acting Chief Branch of Environmental Modeling MMS 644 12201 Sunrise Valley Drive Reston, VA 22091 (703) 860-6730	Reference Literature
Pennsylvania State University Department of Meteorology University Park, PA 16802	Reference Material
Mr. Mike McDermit U.S. Naval Postgraduate School Department of Meteorology Monterey, CA 93940 (408) 646-2516	Reference Material Possible Data Set
Ms. Pat Kirk National Oceanographic Data Center NOAA/NESDIS E/OC21 2001 Wisconsin Avenue, NW Washington, DC 20235 (202) 634-7500	NODC Data Base
Mr. Bob Stein NODC/D 742 2001 Wisconsin Avenue, NW Washington, D.C. 20235 (202) 634-7505	Oil Company Data (CONOCO)
Mr. Al Bargeski NODC (202) 634-7500	Gulf Oil Rig Data
John W. Wolfe, Jr., PE Director-Environmental Affairs North American Production CONOCO INC. 600 N. Dairy Ashford Rd. P.O. Box 2197 Houston, TX 77252 (713) 293-2646	
David Peters CONOCO	Meteorologist
John Burgbacher SHELL, N.O.	Meteorologist

Figure 2. Sources of Data (Cont)

Ken Schaudt Oceanographer Marathon Oil Co. P.O. Box 3128 Houston, TX 77253 (713) 629-6600	Meteorologist
John Heideman EXXON Production Research (713) 940-3711	Chief Meteorologist
Thomas Mitchell ARCO Oil Co. Dallas, TX	Chief Meteorologist
Gene Berek AMICO Oil Co. (918) 660-3000	Chief Meteorologist
Tony Fallon CHEVRON Oil Co. (213) 694-7787	Chief Meteorologist
Mike Spalane GULF Oil Co. (713) 754-0321	Chief Meteorologist
George Forestall SHELL Oil Co. (713) 663-2404	Chief Meteorologist
Bob Hamilton Evans/Hamilton 7214 S. Kirkwood Houston, TX 77072 (713) 495-0883	Digitize Data Sets Has ODGP Meteo data
Elgin Landry MMS (504)736-2866	MMS Meteorologist
Bob Quayle Bob Brines NCDC	Marine WX
Francis Mitchell NOAA/NODC E/OC 13 2001 Wisconsin Ave NW Washington DC 20235 (202) 634-7500	

Figure 2. Sources of Data (Cont)

Dr. (Capt) Glenn Hamilton NDBC NSTL,Miss 39529 (601)688-2836	C-MAN data
Dr. Bruce P. Hayden Dept. of Environmental Sciences University of Virginia Charlottesville, Va. 22903 (804) 929-7761	Extratropical Cyclone Track Data:1885-Prest

ABSTRACT
FOR
GULF OF MEXICO CIRCULATION MODELING STUDY

Second 1987
MMS Ternary Studies Meeting
July 30, 1987
Mobile, Alabama

Submitted to: Environmental Studies Group
Gulf Regional Office
Minerals Management Service

Submitted by: Alan J. Wallcraft
JAYCOR
NORDA Code 323
NSTL Station, MS 39529

GULF OF MEXICO CIRCULATION MODELING STUDY

Alan J. Wallcraft

JAYCOR
NORDA Code 323, NSTL Station, MS 39529

INTRODUCTION

The Gulf of Mexico Circulation Modeling Study was started by MMS in October 1983 as an "extremely modest effort building on existing/ongoing modeling efforts in the Gulf of Mexico". The initial requirement was for an existing circulation model with capabilities approaching those required and the ability to deliver an "early simulation run". At the end of the four year program the requirement was for a circulation model of the entire Gulf with horizontal resolution approaching 10km, and vertical resolution (initially less important) approaching:

mixed layer:	1 - 10 m
thermocline:	10 m
deep layer:	100 m

with realistic bottom topography, coastline, and wind forcing, which must exhibit loop-current eddy shedding, and other known regional circulation features.

THE EXISTING NORDA/JAYCOR MODEL (OCTOBER 1983)

This was a two layer, non-linear, hydrodynamic, free surface, semi-implicit, primitive equation ocean circulation model on a beta plane, with realistic coastline, and full scale bottom topography confined to the lower layer. The horizontal grid resolution was 0.2 degrees (20 by 22 km), with a upper layer rest depth of 200 m. The model can be driven by inflow through the Yucatan Strait compensated by outflow through the Florida Strait, and/or by winds.

PROBLEMS WITH THE EXISTING (1983) MODEL

1) Only 0.2 degree horizontal grid resolution - need 0.1 degree.
2) Model is hydrodynamic - thermohaline circulation particularly important during fall and winter, and over shelf areas.
3) Crude representation of the vertical density profile - need mixed-layer physics.
4) Model has full scale bottom topography (which is essential for a good simulation), but the layer interface(s) must not intersect the bottom. Shallowest topography in model is at 500m.

MODEL DEVELOPMENT PLAN

YEAR 1

Use existing 2-layer 0.2 degree Gulf of Mexico model. Find "best" representation of coastline and bottom topography. Initially use seasonal wind forcing and constant inflow, later simulations will use winds based on 12 hourly FNOC surface pressure analysis and time varying inflow.

YEAR 2

Use 2-layer model, but on a 0.1 degree grid, and with lower eddy viscosity. Expect richer flow field, including wind induced flow instabilities. Some experiments will use 1-layer (reduced gravity) model, but all delivered simulations will have 2-layers.

YEAR 3

Develop 3-layer model with bulk thermodynamics. Densities in the upper two layers will be allowed to change locally with time, under control of the equation of state and temperature equation added to model. Initially 0.2 degree simulations, later 0.1 degree grid will be used.

Expect to see thermohaline circulation and improved representation of permanent thermocline. Three layers also better resolve "hydrodynamic" circulation, and thinner upper layer increases accuracy of surface velocities.

In addition modify the 2-layer hydrodynamic and 3-layer thermodynamic models to allow the layer interfaces to intersect the bottom topography. This will allow the minimum bottom depth to be raised from 500m to about 20m. Layer intersection is not generaly found in layered ocean models, and so its successfull implementation is less certain than other phases of the program. However if successfull it will significantly improve the realism of the simulations over the continental shelf.

YEAR 4

Complete 0.1 degree 3-layer simulations. Then couple circulation model results to a mixed layer model (TOPS). TOPS is the Navy's operational mixed layer forecast model. Simplest version of TOPS is one dimensional, with 15+ fixed vertical levels covering upper 500m. It can accept geostrophic currents from any suitable source, the 3-layer model is suitable but the 2-layer (hydrodynamic) is not.

This final coupled model will give detailed vertical density profiles, and greatly improve the simulation accuracy in shelf regions.

PROGRESS

YEARS 1 AND 2

All tasks in years one and two are complete and final reports have been accepted by MMS. It was clear by the end of the second year that the model simulated deep water features, such as the Loop Current and its associated eddies, remarkably well, but it had problems simulating flow in continental shelf regions. Figure 1 illustrates the deep water simulation accuracy, it shows the tracks across the western Gulf of (a) an actual drifting bouy that was seeded in a Loop Current eddy, and (b) a simulated bouy driven by the currents from the ocean model. Figure 2 illustrates the situation in shallow water, it shows the kinetic energy spectra at about (25.8N,84W) on the Florida Shelf in 180m of water. The solid line is from the ocean model and the dashed line is from a bouy moored at that location.

YEAR 3

The lack of realism over the continental shelf is to be expected since the bottom topography is confined to the lowest layer, i.e. in the model the shallowest topography is 500m deep. This model deficiency, and its probable consequences, were clearly stated from the beginning of the project. However it was also apparent that it was not possible to simulate most shelf regions in the Gulf without also simulating the very strong near shelf currents associated with the Loop Current. Three years ago, the only known models that might be capable of simulating both deep and shallow circulation were those with many levels in the vertical. However such models are on the order of 100 times more expensive to run than layer models, and were therefore excluded on the basis of cost. Since that time there has been some success with isopycnic ocean models that effectively allow layers to intersect the bottom topography (Bleck, et. al., 1983). An additional task was therefore added in the third contract year to attempt to develop a version of the layered ocean model that will allow layer interfaces to effectively intersect the bottom topography.

Two dimensional (x-z) versions of a two layer hydrodynamic model that allow layers to intersect the bottom have been tested on sections across the Gulf of Mexico on a 0.2 degree grid. A fully explict model's timestep would be controlled by the external gravity wave speed (about 150 m/s), but here the depth averaged flow is treated implicitly so the timestep depends on the internal gravity wave speed (about 3 m/s). The existing ocean model, with topography confined to the lowest layer, treats both external and internal gravity waves implicitly and can use a timestep 3 to 5 times longer than the layer intersection code. Figure 3 shows the region used for the two dimensional experiments, it is a section across the Gulf of Mexico at 26N on a 20 km grid. The position of each model grid point is indicated by a vertical line below the topography contour, in all the plots data is only available at grid points and straight lines are used to connect data values. The upper layer rest depth is 300 m over deep water, but is less near 98W and 82W where the continental shelf is shallower than 300 m deep. The lower layer is set to be at least 10 cm thick across the entire region, so there is a lower layer over the continental shelf although it is too thin to be seen in the plot. Figure 3 is for 2 days into an experiment to test the ocean model with no applied forcing. The layers are in exactly the same position as at the initial time, and the velocities are zero everywhere. This demonstrates that the model does not deviate from an initial rest state without applied forcing. Figures 4 to 7 show only the upper 450 m of the water column for a gravity wave sloshing experiment where there is no applied forcing but the layer interface is initialized with a single period cosine profile across the region. Figure 4 shows the initial state with about 100m variation in the depth of the interface from east to west, note that the lower layer is again 10 cm thick where the topography is shallower than the expected interface depth. Figure 5 is for day 3 of the simulation, the layer interface is now almost level. Figure 6 is for day 6, the layer interface has moved up or down about 100m at each end to reverse the profile. It is no longer exactly sinusoidal however because gravity waves travel more slowly in shallow water than they do in deep water. The interface is level again between day 9 and day 10. Figure 7 is for day 12, the interface is again shallower to the west as it was on day 0, but the wave is almost square and the model blows up at day 15 as the wave 'breaks'. The conversion of the original wave into a breaking wave is to be expected given than gravity waves travel more slowly in shallow water.

The major difficultly in extending the two dimensional layer intersection model to three dimensions is that a more complicated elliptic partial differential equation must be solved than in the model without layer intersection. Work is in progress to develop a stable efficient solver for the new PDE. Figure 8 show the upper 900m of the bottom topography for the initial 3-D test basin, the layer interface rest depth is 200m so all topography shallower than that depth is effectively in the upper layer. Figure 9 shows the upper layer currents after just 20 days for an experiment using the 3-D layer intersecting code, with the topography shown in figure 8, but with an explict timestep. This model requires a 1 minute timestep, vs 60 minutes (on this grid) for the semi-implict version, and hence it is not viable in practice.

REFERENCES

Bleck, R., C. Rooth, D.B. Boudra 1983: "Wind-Driven Spinup in Eddy-Resolving Ocean Models Formulated in Isopycnic and Isobaric Coordinates", Rosenstiel School of Marine and Atmos. Sc., U. of Miami, Florida.

FIGURES

FIGURE 1: Paths of actual and simulated drifters: (a) NDBC drifter 1599 from November 20, 1980 through May 11, 1981, (b) Path of simulated drifter from model day 1680 to model day 1980 of Experiment 60.

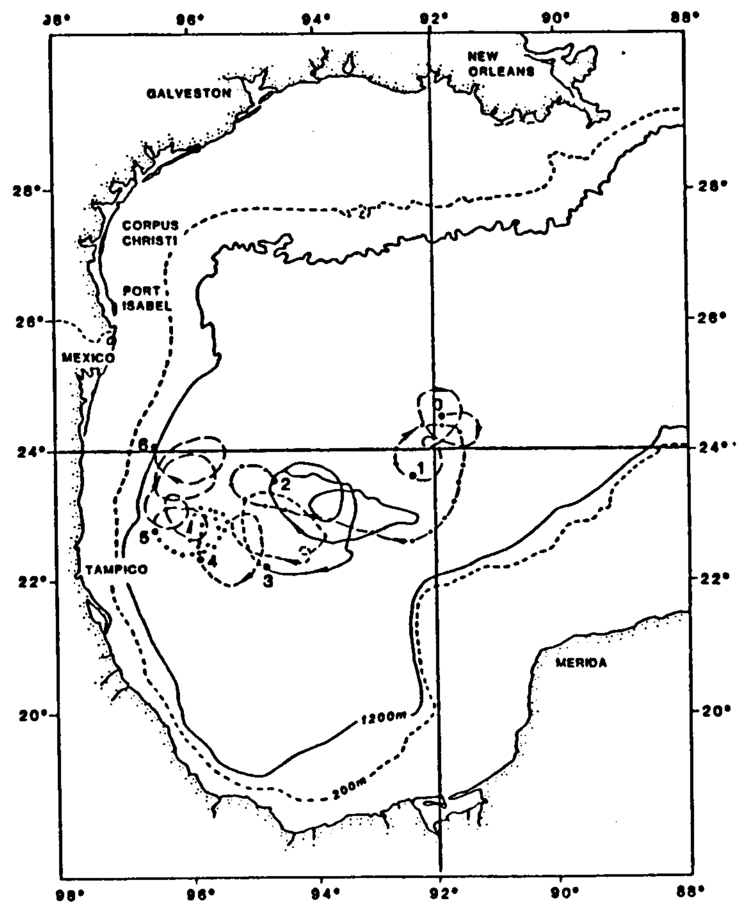
FIGURE 2: Kinetic energy spectra at 100m depth for (solid) ocean model Experiment 201/13.0 at location X, and (dashed) for mooring C. Both at about (25.8N,84W), on the Florida shelf in 180m of water.

FIGURE 3: Layer depths for a two dimensional, two layer, hydrodynamic model with full scale bottom topography that uses Flux Corrected Transport to allow the layer interface to 'intersect' the topography. The figure is for day 2 of an experiment testing the stability of the rest configuration in the absence of external forcing. There has been no change over the 2 days. The lower layer is 10 cm thick at all points where the topography appears to intrude into the upper layer.

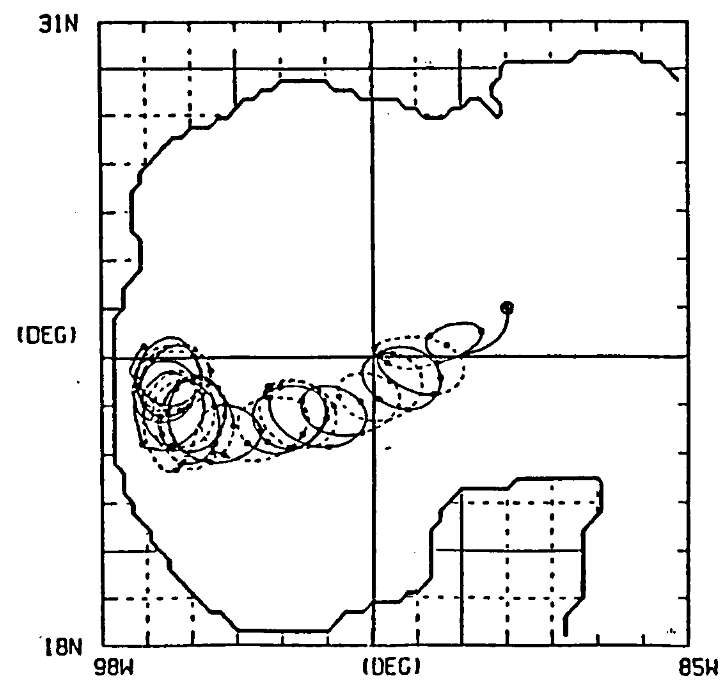
FIGURES 4 to 7: Layer depths for a two dimensional, two layer, hydrodynamic model that uses Flux Corrected Transport to allow the layer interface to 'intersect' the topography. Only the upper 450m of the water column is shown. The figures are for days 0, 3, 6, and 12 respectively. The simulation halted at about day 15 because the interface wave 'breaks'.

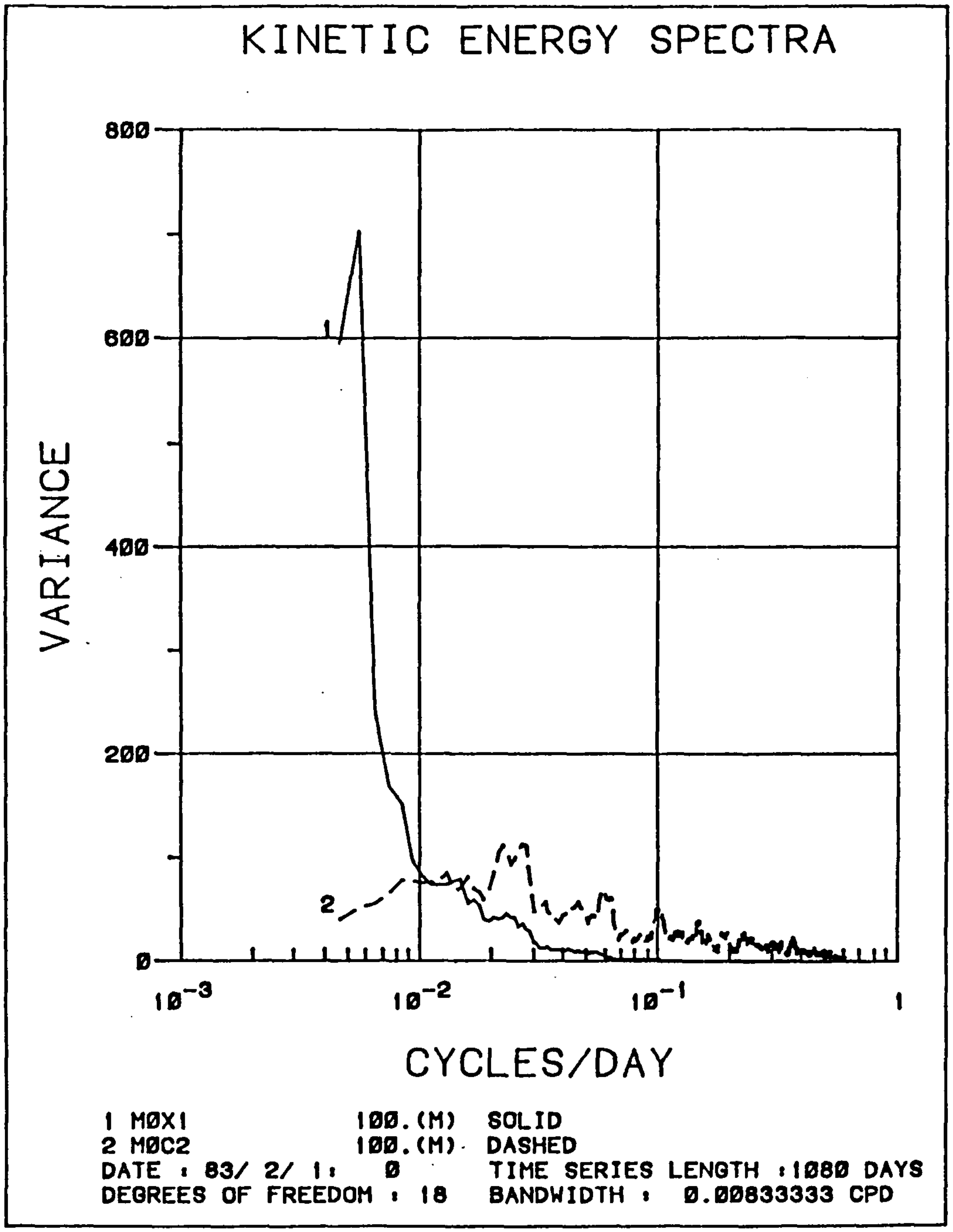
FIGURE 8: Upper 900m of the bottom topography used in initial layer intersection experiments.

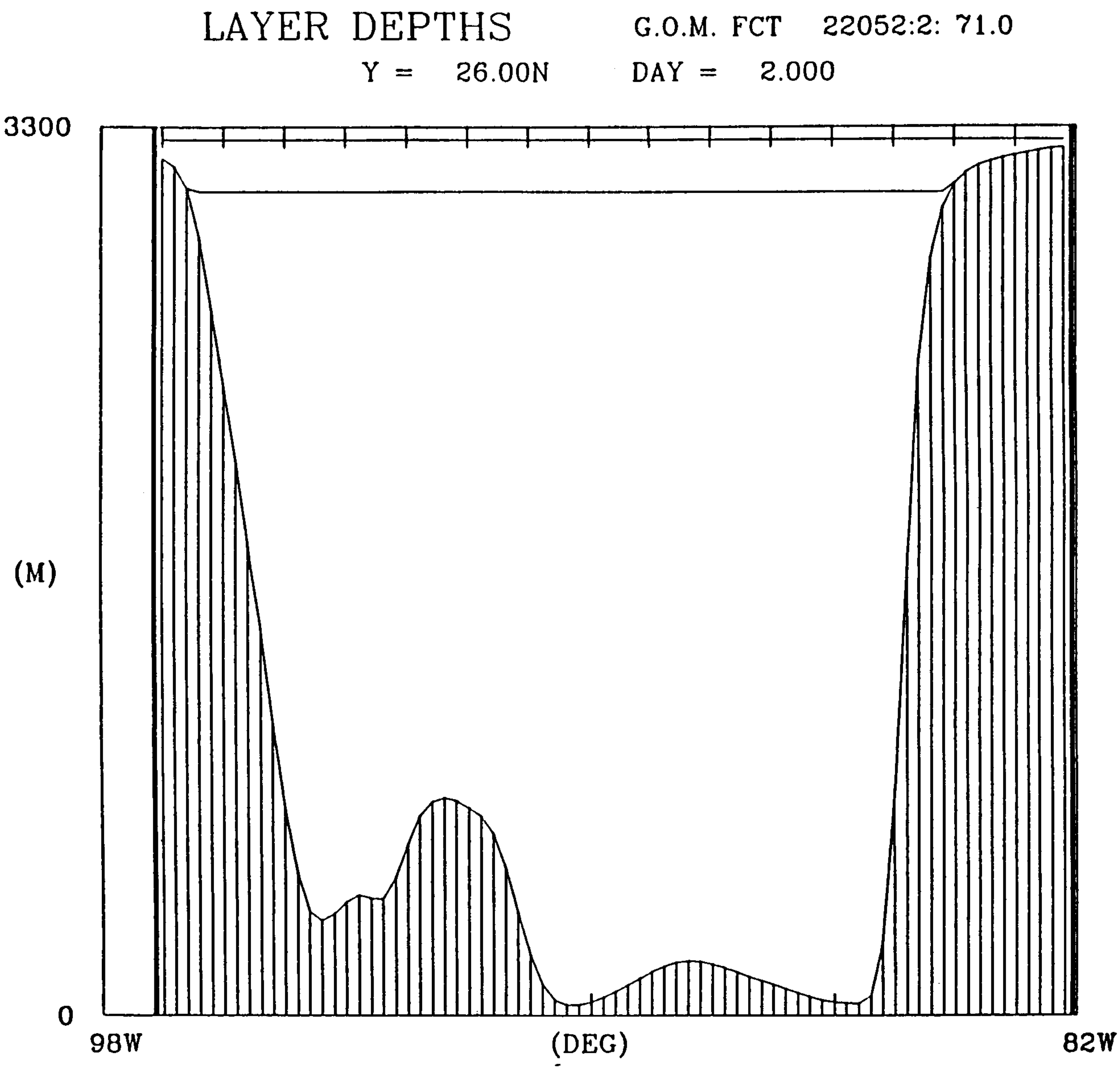
FIGURE 9: Upper layer currents after only 20 days from a wind forced experiment (no port forcing) with the bottom topography of figure 8.



DRIFTER TRAJECTØRY G. ØF MEXICØ 60
DRIFTER NØ. 3 FRØM 1680 TØ 1980 (DAYS)




KINETIC ENERGY SPECTRA
VARIANCE
800
600
400
200
0
10^-3
10^-2
10^-1
1
CYCLES/DAY
1
2
1 MØX1 100.(M) SOLID
2 MØC2 100.(M) DASHED
DATE : 83/ 2/ 1: Ø TIME SERIES LENGTH :1080 DAYS
DEGREES OF FREEDOM : 18 BANDWIDTH : Ø.ØØ833333 CPD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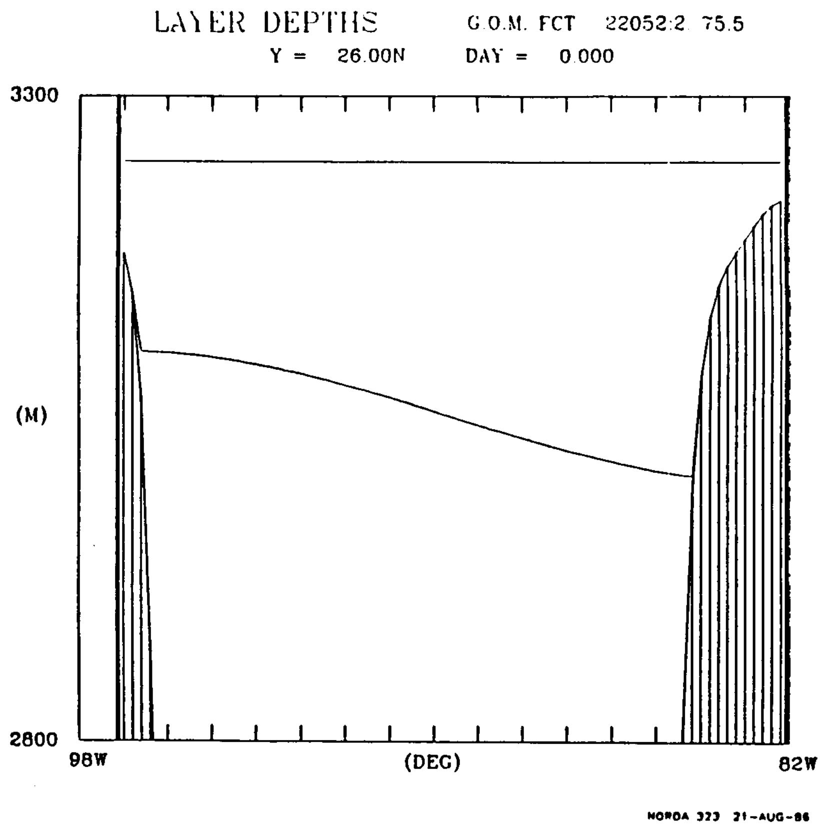
3300
(M)
0
98W
(DEG)
82W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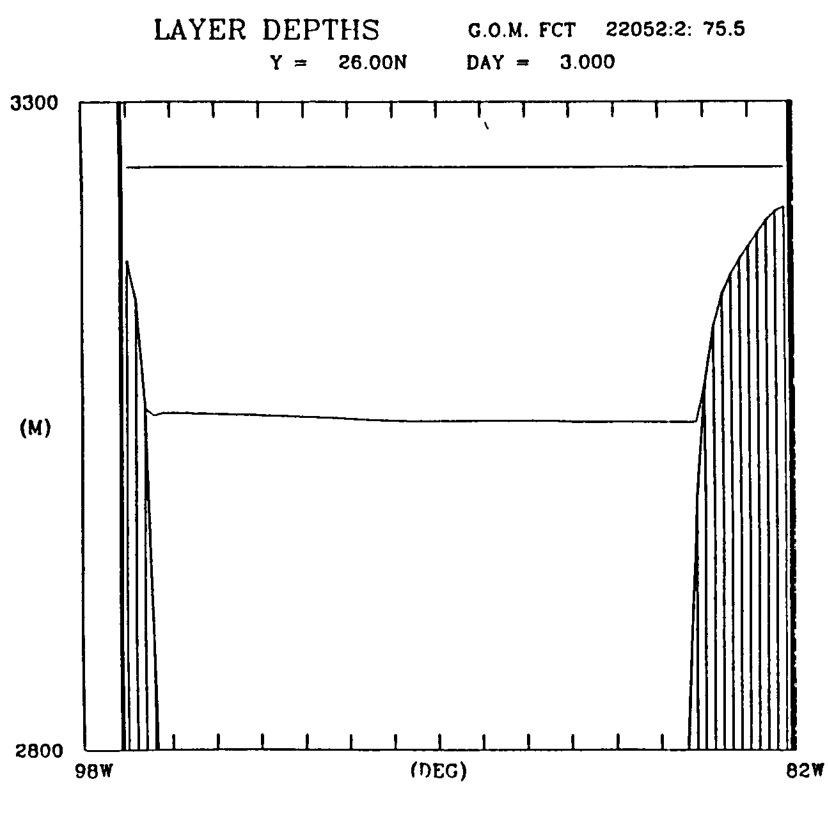
(M)
2800
98W
(DEG)
82W
NORDA 323 21-AUG-86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DAY = 3.000
3300
(M)
2800
98W
(DEG)
82W
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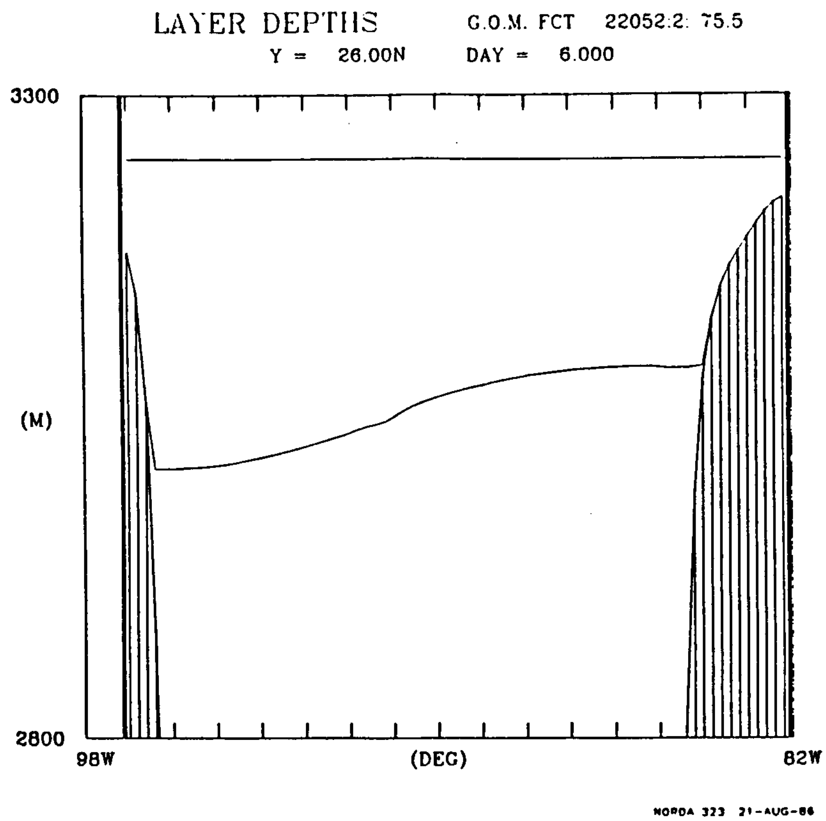
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82W
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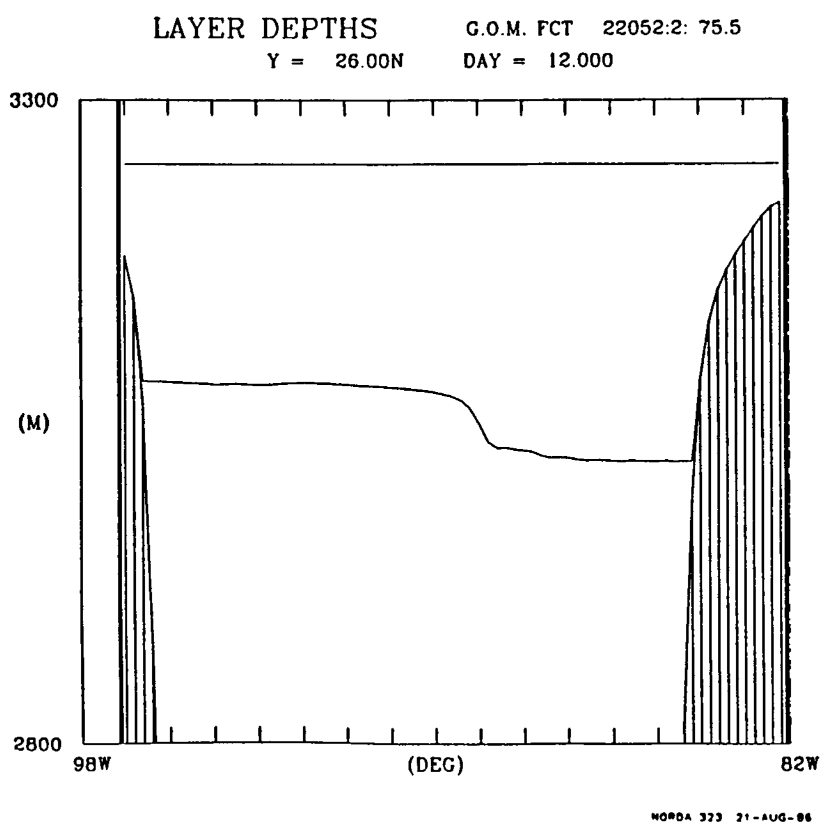
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98W
(DEG)
82W
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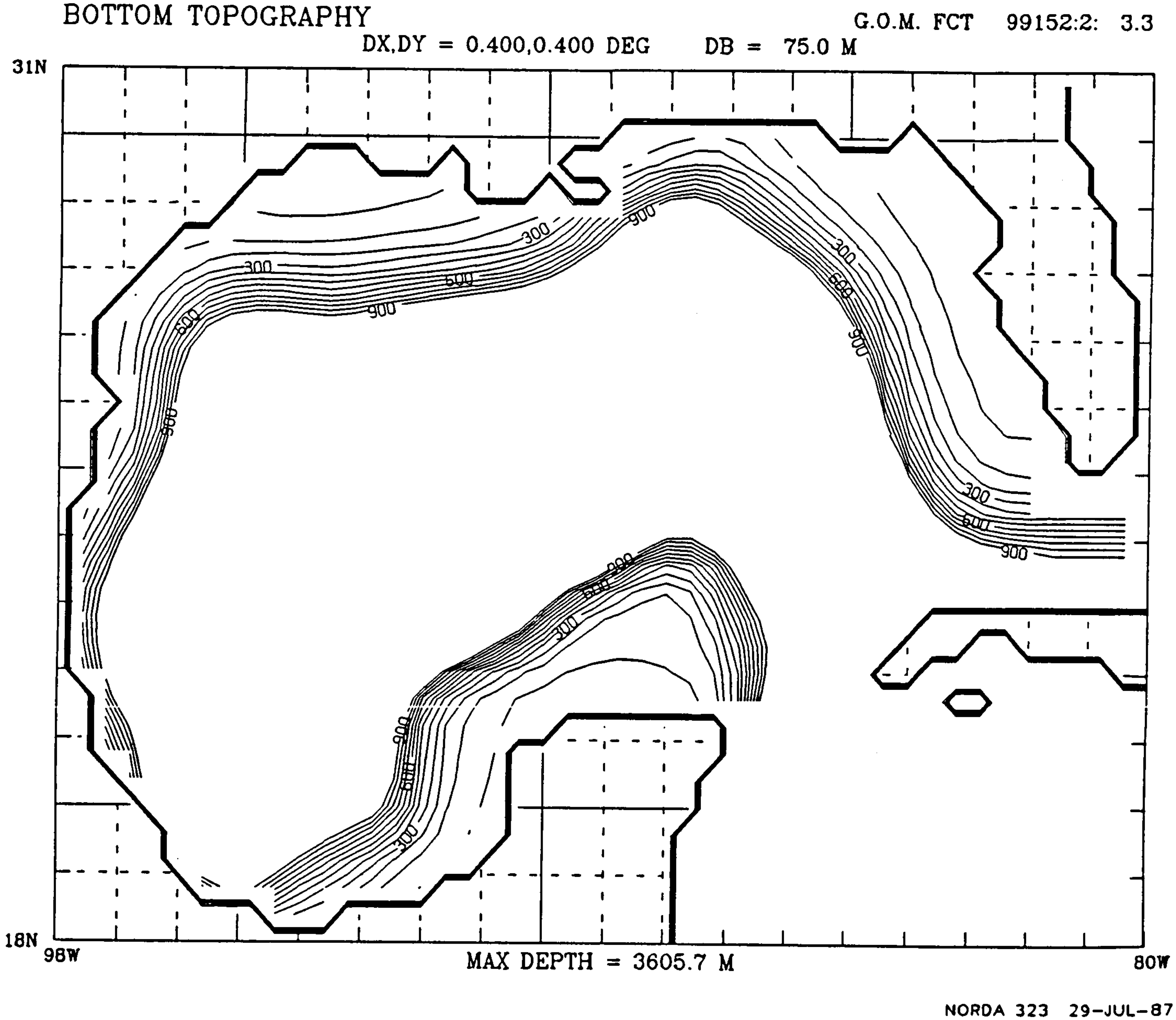
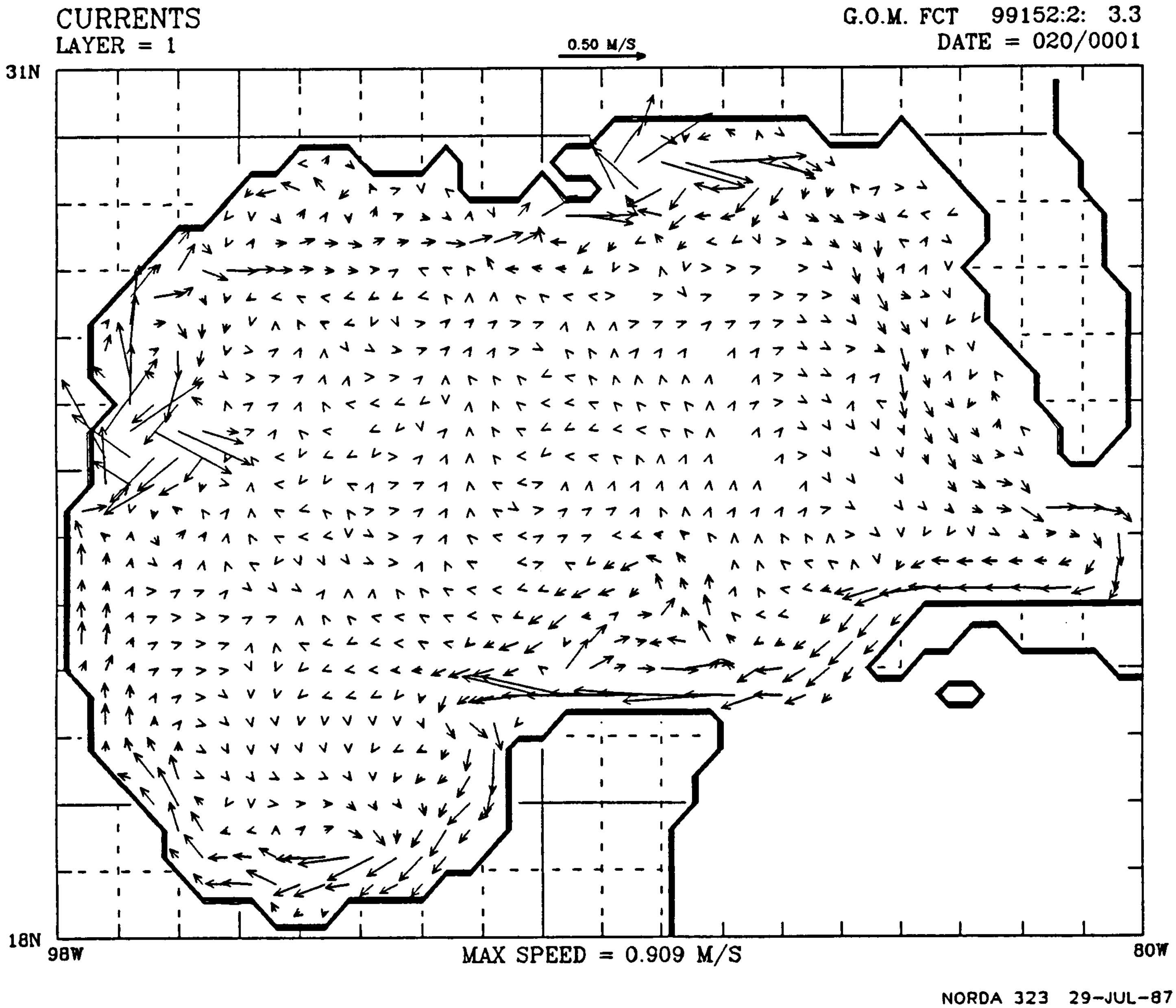

BOTTOM TOPOGRAPHY
G.O.M. FCT 99152:2: 3.3
DX,DY = 0.400,0.400 DEG DB = 75.0 M
31N
18N
98W
80W
300
600
900
MAX DEPTH = 3605.7 M
NORDA 323 29-JUL-87


CURRENTS
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0.50 M/S
G.O.M. FCT 99152:2: 3.3
DATE = 020/0001
31N
18N
98W
80W
MAX SPEED = 0.909 M/S
NORDA 323 29-JUL-87

ABSTRACT
FOR
STUDY OF IMPACTS OF OCS ACTIVITIES ON SENSITIVE COASTAL HABITATS
(BARRIER BEACHES AND NON-LOUISIANA WETLANDS)

Second 1987
MMS Ternary Studies Meeting
July 30, 1987
Mobile, Alabama

Submitted to: Environmental Studies Group
Gulf Regional Office
Minerals Management Service

Submitted by: Karen M. Wicker
Coastal Environments, Inc.
1260 Main Street
Baton Rouge, LA 70802

ABSTRACT

Study of Impacts of OCS Activities on Sensitive Coastal Habitats (Barrier Beaches and Non-Louisiana Wetlands). Karen M. Wicker, Coastal Environments, Inc., 1260 Main Street, Baton Rouge, La. 70802. Summer Ternary Meeting; MMS, Mobile, Ala. 30 July 1987.

Onshore Impacts of Federal OCS Activities

In order to achieve one of our research objectives, i.e., identification of impacts of OCS activities according to type of activity and type of environment, we are assembling a data base on Federal OCS pipelines and navigation channels and environmental conditions along the Gulf Coast. We are trying to make the study as comprehensive as circumstances will allow.

A first step has been to describe the Gulf Coast environment by region (Texas Barrier Island, Strand Plain - Chenier Plain, Mississippi Delta, North Central Gulf Coast) and to map, at a scale of 1:250,000, major environmental parameters such as wetlands, beach type, geomorphic forms, shoreline change, depth to Pleistocene, salinity regime, wave/tidal energy and circulation, and land use (i.e., development, parks, refuges).

A data base on all Federal OCS pipelines is being assembled to include: pipeline owner/operator, pipeline size and content, date of completion, landfall location on 1:24,000 and 1:250,000 USGS topographic maps and within county or parish, lease block origin, emplacement technique, and type of mitigation used, if any. Pipeline companies have been asked to verify this information and provide additional relevant data. These data are also being cross-checked with numerous pipeline maps and data on file at the Minerals Management Service. Searches are being made of the files in the U.S. Army Corps of Engineers, New Orleans and Mobile Districts, and the Coastal Program Divisions in Louisiana and Mississippi for additional information on these pipelines.

All OCS pipelines and navigation channels are being located on recent aerial photographs in order to obtain an initial assessment of the condition of the site at the beach and in wetlands within our study area. This exercise has helped us select pipelines from each of the four coastal regions for field investigations. Although we have tentatively identified between 162 and 194 pipelines in Texas, Louisiana,

Mississippi, and Alabama, the geographical delineation of our study area has restricted the number of pipelines we will actually be using for analysis of impacts. For example, all pipelines making landfall on and passing through marsh habitat from East Bay, Texas to Waveland, Mississippi are presently eliminated from detailed analysis.

Two field investigations have been conducted and the results are being reviewed prior to initiation of additional fieldwork. Within the Texas Barrier Island System, two pipelines crossing Matagorda Peninsula and East Matagorda Bay were sampled. In the Chenier Plain, three pipelines and one OCS navigation channel (the Mermentau River to Gulf of Mexico) were investigated. At each of these sites, vibracores, beach profiles, bathymetric surveys, and vegetation samples were taken along the pipeline and away from the pipeline in order to provide a basis for discerning impacts. General site descriptions, including conditions along the pipeline, and photographs were also made.

We have assembled a bibliography of pipeline references from the 1920s to the present and are presently researching this material for information on pipeline construction methods and collateral information on specific OCS pipelines. We are obtaining historic data from the U.S. Army Corps of Engineers on four (Matagorda Ship Channel, Mermentau to Gulf of Mexico Navigation Channel, Belle Pass, and Gulf Port Harbor) of the six navigation channels that were identified in the literature as supporting or intending to support OCS activities or for which their use by OCS activities was cited as justification for the project. We are not looking at the Houma Navigation Canal or Freshwater Bayou because they do not intersect barrier beaches.

Analysis of historic aerial photographs, field data, regional literature, and data on specific pipelines will enable us to reach some conclusions with regard to the type of impact that is made under a given set of conditions (i.e. environment and emplacement technique/emplacement maintenance operations). This information, along with a summary of regulatory conditions existing on the Federal, state, and local levels and conclusions available from an ongoing LSU study, will serve as a basis for predicting future impacts.

Nearshore Impact from Discharge of Offshore Produced Waters

The Louisiana State University Institute for Energy Studies (LSU-IES) and the Louisiana Universities Marine Consortium (LUMCON) are studying the effects of onshore discharges of offshore-produced waters. Research personnel have met with officials of the Louisiana Department of Environmental Quality (DEQ) to obtain information available from the DEQ files on the discharges of produced waters. Because produced waters are not regulated by either DEQ or EPA, DEQ data are confined to voluntary responses the industries have submitted to DEQ-generated questionnaires. LSU-IES researchers have entered these data (i.e., locations and discharge rates of on- or nearshore-produced water discharges) into the DEQ Vax computer system and proofed the data files. The data are searchable by a variety of fields including discharge rates, locations, and companies. Based on these searches, several major discharge sites have been identified. These discharge sites are being investigated to identify the origin of the produced waters to ascertain that it is OCS and not onshore water being discharged. Through this process, several discharge locations have been identified as possible sites for the field study. These sites will be visited in the near future in order to select a final site for fieldwork. It should be emphasized that the effects of produced water discharges is a "sensitive" topic and great care must be exercised when this topic is discussed. LSU-IES and LUMCON personnel are going to considerable lengths to ensure and explain that strict scientific objectivity is the driving force for this study.

ABSTRACT
FOR
OUTER CONTINENTAL SHELF DEVELOPMENT AND POTENTIAL COASTAL HABITAT ALTERATION

Second 1987
MMS Ternary Studies Meeting
July 30, 1987
Mobile, Alabama

Submitted to: Environmental Studies Group
Gulf Regional Office
Minerals Management Service

Submitted by: R. Eugene Turner and Donald R. Cahoon
Coastal Ecology Institute
Center for Wetland Resources
Louisiana State University
Baton Rouge, LA 70803

OUTER CONTINENTAL SHELF DEVELOPMENT AND POTENTIAL COASTAL HABITAT ALTERATION

R. Eugene Turner
Program Manager

Donald R. Cahoon
Science Manager

Coastal Ecology Institute
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Baton Rouge, Louisiana 70803

The Minerals Management Service project "Outer Continental Shelf Development and Potential Coastal Habitat Alteration" is in the 22nd month of a 27-month contract. During the past four months, nearly all of the field and laboratory work described in detail at the previous ternary meeting has been completed for all 16 subtasks. Current effort is focusing on data analysis, writing, and consensus review for the draft final report due on September 30, 1987.

PROJECT SYNTHESIS

Project integration is the main administrative goal for the final phase of this project. As a first step in project closure, all project participants met with the Science Review Board in April to discuss progress to date and project integration. It was agreed that the final report should be presented in the context of regional climate and geological history. To this end, we have contracted Dr. Robert Muller, State Climatologist and Professor of Geography at LSU, to prepare a chapter on the recent (100 yr) changes in climate which are relevant to the interpretation of sea level rise, water level fluctuations, and salinity balance. Dr. Harry Roberts, a coastal geomorphologist in the Coastal Studies Institute, School of Geoscience, LSU, has agreed to act as a geologic advisor for the preparation of the geology chapter (being prepared by R. E. Turner and R. Adams) and the interpretation of our sedimentation and subsidence analyses. Also, as a means of improving integration on the issue of coastal submergence, it was agreed that the sedimentation/subsidence working group would put together a regional sediment budget, which is currently being prepared for Barataria Basin.

The integration of 16 individual tasks into a comprehensive synthesis is proceeding in an orderly, directed, and planned manner. The 16 tasks are organized into four working groups (Direct Impacts, Salinity Intrusion, Sedimentation/Subsidence, and Aerial Imagery). Each task within a working group is preparing an individual report. During this summer, each working group has been meeting on a regular basis to discuss individual results and report preparation. Also, they have been meeting and corresponding with interested Science Review Board members. Each working group is preparing a report describing the group's consensus on the major questions they are attempting to answer. Prior to coming to a consensus, however, each group is presenting a seminar to all project personnel as a final means of in-house review and information exchange. The Direct Impacts and Salinity Intrusion Groups have already presented their seminars and are completing their group report. The Sedimentation/Subsidence and Aerial Imagery Groups are scheduled to present their seminars August 5 and 7, respectively. Once the group reports are completed, exchanged between groups, and reviewed, all project personnel will meet to discuss the project findings and arrive at a final project consensus. This meeting will take place on August 27 and 28 at the LUMCON facilities in Cocodrie, Louisiana. The consensus derived from this meeting will become the executive summary of the report.

STATUS OF INDIVIDUAL TASKS

Work on the 16 subtasks is proceeding on schedule and the writing of many chapters is already complete. To date, the following chapters of the project report have been completed in preliminary draft form: Introduction (Turner and Cahoon), Climatology (Muller), Direct Impacts of Pipelines (Baumann), Direct Impacts of Navigation Channels (Reed and Baumann), Non-OCS Direct Impacts (Turner), Saltwater Intrusion Model (Wang), Salinity Inventory (Wiseman and Swenson), Influence of Salinity and Submergence on Marsh Vegetation (Mendelssohn and McKee), Sediment Deposition (DeLaune), and Sediment Deposition (Cahoon). All other chapters will be completed within the next two weeks. The importance of individual results in answering the questions we addressed becomes clear during working group review and consensus. For this reason, the results will be discussed in the context of the working group consensus.

WORKING GROUP RESULTS

The first level of integration (synthesis at the working group level) has been completed for the Direct Impacts Working Group. All remaining working groups are coordinating closely among themselves but are awaiting final analysis of a few data sets before completing their group report. The Salinity Intrusion Working Group has coordinated closely with the Science Review Board and is awaiting completion of the model of saltwater movement through the marsh. The Sedimentation/Subsidence Working Group has completed a draft sediment budget, which is currently being reviewed by members of the Science Review Board, and will complete group consensus prior to presenting their seminar on August 5. The Aerial Imagery Working Group will present their seminar on August 7, and will complete their consensus by that time. Thus, all working group reports will be completed by mid-August. Because consensus has not been completed for all working groups, any attempt to develop a project consensus or to discuss all group consensuses at this time would be premature. Therefore, only the results of the Direct Impacts Working Group are presented below.

Analysis of Direct Impacts of OCS Development on Wetland Habitats Direct impacts accounted for 26 percent of the total wetland loss along the Louisiana coast from 1955-1978. Direct impacts of OCS allocated activities account for 3.9 to 4.7 percent of the total wetland loss. For the entire study area, OCS pipelines have resulted directly in 12,010 ha of habitat change and OCS allocated navigation channels have resulted in an additional 58 to 2,885 ha of habitat change.

Direct impacts on a per unit length basis are 20 times greater for navigation channels than for pipelines. Per unit length impacts for navigation channels are increasing due to project design whereas per unit length impacts per pipeline for OCS pipelines are decreasing primarily because of the increased use of backfilling. Direct impacts from backfilled canals are reduced by 75 percent in comparison to their non-backfilled counterparts. Direct impacts for a 70 percent sample population of all OCS identified pipelines averaged 2.49 ha/km, a value substantially less than the MMS guideline of 16.25 ha/km.

Factors other than backfilling that significantly affect direct impacts of OCS pipelines include geologic region, habitat type, diameter of pipeline and age of pipeline.

LIST OF REGISTERED ATTENDEES

Minerals Management Service
Ternary Meeting
30 July 1987

Mr. J. Kenneth Adams, Deputy Regional Supervisor, U.S. Department of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, Department Regulation, 1201 Elmwood Park Boulevard, New Orleans, Louisiana 70123-2394

Dr. Robert M. Avent, U.S. Department of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, Leasing and Environment, 1201 Elmwood Park Boulevard, New Orleans, Louisiana 70123-2394

Ms. Barbara B. Bailey, Chevron U.S.A., Inc., 935 Gravier Street, New Orleans, Louisiana 70112

Mr. James Barkuloo, U.S. Fish and Wildlife Service, 1612 June Avenue, Panama City, Florida 32405

Mr. David Barley, Alabama Department of Economics and Community Affairs, Planning and Economic Development Division, P.O. Box 2939, Montgomery, Alabama 36105-0939

Mr. Robert H. Baumann, Louisiana State University, Center for Energy Studies, Baton Rouge, Louisiana 70803

Ms. Darice Breeding, U.S. Department of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, Leasing and Environment, 1201 Elmwood Park Boulevard, New Orleans, Louisiana 70123-2394

Dr. Donald R. Cahoon, Louisiana State University, Center for Wetland Resources, Coastal Ecology Institute, Baton Rouge, Louisiana 70803

Mr. Les Dauterive, U.S. Department of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, 1201 Elmwood Park Boulevard, New Orleans, Louisiana 70123-2394

Dr. Richard Defenbaugh, U.S. Department of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, Leasing and Environment, 1201 Elmwood Park Boulevard, New Orleans, Louisiana 70123-2394

Mr. Douglas J. Elvers, U.S. Department of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, Leasing and Environment, 1201 Elmwood Park Boulevard, New Orleans, Louisiana 70123-2394

Mr. Jerry Ford, Florida A&M University, College of Engineering Sciences and Technology, Tallahassee, Florida 32307

Mr. Ruben G. Garza, Geo-Marine, Inc., 1316 14th Street, Plano, Texas 75074

Mr. Lawrence R. Handley, U.S. Fish and Wildlife Service, National Wetlands Research Center, 1010 Gause Boulevard, Slidell, Louisiana 70420

Dr. Stanley Hecker, Mississippi Alabama Sea Grant Consortium, Caylor Building, G.C.R.L., 703 East Beach Drive, P.O. Box 7000, Ocean Springs, Mississippi 39564-7000

Mr. Paul G. Johnson, Office of the Governor, Office of Planning and Budgeting, The Capitol, Tallahassee, Florida 32301

Dr. Anthony J. Lewis, Louisiana State University, Department of Geography and Anthropology, Baton Rouge, Louisiana 70803

Mr. Keith E. Miller, National Park Service, Park Operations, 728 Santa Fe, Santa Fe, New Mexico 87501

Mr. Allan J. Mueller, U.S. Fish and Wildlife Service, Ecological Services, 17629 El Camino Real, Suite 211, Houston, Texas 77058

Ms. Lorna Patrick, U.S. Fish and Wildlife Service, Ecological Services, 1612 June Avenue, Panama City, Florida 32405

Mr. J. Rogers Pearcy, Regional Director, U.S. Department of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, 1201 Elmwood Park Boulevard, New Orleans, Louisiana 70123-2394

Dr. Richard Rezak, Texas A&M University, Department of Oceanography, College Station, Texas 77843

Mr. R. Mark Rouse, U.S. Department of the Interior, Minerals Management Service, 1201 Elmwood Park Boulevard, New Orleans, Louisiana 70123-2394

Mr. Kenneth J. Schaudt, Marathon Oil Company, Operations and Construction Services, P.O. Box 3120, Houston, Texas 77253

Mr. J. Kevin Shaw, Science Applications International Corporation, P.O. Box 6647, Mobile, Alabama 36660

Capt. A.E. Tanos, Chief, Marine Safety Division, U.S. Coast Guard, CCGD7 (M), 515 West 1st Avenue, Miami, Florida 33130

Mr. Norm Thomas, Chief, Federal Activities Branch, U.S. Environmental Protection Agency, 1445 Ross Avenue, Dallas, Texas 75202

Dr. Evans Waddell, Science Applications International Corporation, Marine Science and Engineering, 4900 Waters Edge Drive, Raleigh, North Carolina 27606

Mr. Alan J. Wallcraft, JAYCOR, NORDA Code 323, NSTL Station, Mississippi 39529

Dr. E.G. Wermund, University of Texas, Bureau of Economic Geology, Box X University Station, Austin, Texas 78750

Dr. Karen Wicker, Coastal Environments, Inc., 1260 Main Street, Baton Rouge Louisiana 70802

Mr. Lloyd Wise, U.S. Environmental Protection Agency, Marine Protection Section, 345 Courtland Street N.E., Atlanta, Georgia 30365

The Department of the Interior Mission

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering sound use of our land and water resources; protecting our fish, wildlife, and biological diversity; preserving the environmental and cultural values of our national parks and historical places; and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to ensure that their development is in the best interests of all our people by encouraging stewardship and citizen participation in their care. The Department also has a major responsibility for American Indian reservation communities and for people who live in island territories under U.S. administration.

The Minerals Management Service Mission

As a bureau of the Department of the Interior, the Minerals Management Service's (MMS) primary responsibilities are to manage the mineral resources located on the Nation's Outer Continental Shelf (OCS), collect revenue from the Federal OCS and onshore Federal and Indian lands, and distribute those revenues.

Moreover, in working to meet its responsibilities, the **Offshore Minerals Management Program** administers the OCS competitive leasing program and oversees the safe and environmentally sound exploration and production of our Nation's offshore natural gas, oil and other mineral resources. The MMS **Minerals Revenue Management** meets its responsibilities by ensuring the efficient, timely and accurate collection and disbursement of revenue from mineral leasing and production due to Indian tribes and allottees, States and the U.S. Treasury.

The MMS strives to fulfill its responsibilities through the general guiding principles of: (1) being responsive to the public's concerns and interests by maintaining a dialogue with all potentially affected parties and (2) carrying out its programs with an emphasis on working to enhance the quality of life for all Americans by lending MMS assistance and expertise to economic development and environmental protection.