OCS Study
MMS 96-0030

Texas-Louisiana Shelf Circulation and Transport Processes Study: Year 3, Annual Report

MMS U.S. Department of the Interior
Minerals Management Service
Gulf of Mexico OCS Region

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Editors

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ABSTRACT

The Louisiana-Texas Shelf Physical Oceanography Program (LATEX) is supported by the Minerals Management Service of the U. S. Department of the Interior. The Texas A&M University System is conducting Study Unit A of LATEX, the Texas-Louisiana Shelf Circulation and Transport Processes Study (LATEX A). The third field year of LATEX A was April 1994 through December 1994. Data were collected from an array of current meter moorings, bottom wave recorders, meteorological buoys, drifting buoys, and hydrographic and acoustic Doppler current profiler (ADCP) surveys on the Texas-Louisiana continental shelf in the Gulf of Mexico. Historical and concurrent data from other programs in this region also were collected.

The current meter array consisted of 67 current meters measuring current speed and direction, temperature, and conductivity on 28 stations; five directional wave gauges measuring current speed and direction, temperature, and pressure; and one inverted echo sounder measuring acoustic travel time and bottom temperature and pressure. Eight meteorological buoys were installed on the shelf to measure wind speed and direction, air and sea surface temperature, and barometric pressure. Six drifting buoys were deployed and provided information on their locations and sea surface temperature via satellite. Three hydrographic/ADCP surveys were conducted with at least 170 hydrographic sampling stations per survey and continuous ADCP measurements along the cruise track. At each hydrographic sampling station continuous profiles were made of conductivity, temperature, dissolved oxygen, downwelling irradiance, particle scattering, fluorescence, and beam attenuation. Up to 12 water samples were taken at each station and analyzed for six nutrients: nitrate, nitrite, phosphate, silicate, urea, and ammonium. At 100 or more stations, water samples were analyzed for dissolved oxygen, salinity, phytoplankton pigments, and surface and bottom particulate matter concentrations. Secchi disk depths were taken at each daylight station. Meteorological measurements were transmitted via the Global Telecommunications System four times a day. The instrumentation as well as calibration and sampling procedures are described in Jochens and Nowlin (1994b and 1995).

The collected data were subjected to quality control/assurance procedures as described or referenced in Jochens and Nowlin (1994b and 1995). They then were archived with the LATEX A Data Management Office and are regularly transmitted to the National Oceanographic Data Center (NODC). It should be noted that all LATEX data are still considered preliminary. Only after the final synthesis is well along will final data sets be submitted to the NODC. This will allow the maximum number of errors to be corrected. LATEX A initiated or maintained data sharing agreements with more than 20 other programs or researchers during the third field year.

Information regarding LATEX has been disseminated in various ways. Plans and reports, meeting announcements, weekly drifter trajectories and meteorological summaries, and the LATEX calendar were posted to the GULF.MEX bulletin board on the electronic mail service ScienceNet of Omnet. The Defense Mapping Agency, U.S. Navy Submarine Command, and the United States Coast Guard were regularly advised regarding changes in LATEX A mooring positions and deployments. In February 1995, a meeting on the oceanography of the LATEX region was held in Baton Rouge, LA. It was well attended by representatives from LATEX A, B, and C, state and federal agencies, other concurrent research programs, and the LATEX Science Advisory Panel. The LATEX *Fortnightly News* was published bi-weekly until 31 December 1994. It contained news and announcements regarding the LATEX programwas and was mailed to approximately

2500 addressees. LATEX A scientists presented talks or papers at a variety of forums during the period covered by this report.

Assembly is underway of collateral and historical data that will be of assistance in the interpretation/synthesis of the LATEX data. These data sets contain information from pertinent historical reports of physical oceanographic work in the Gulf of Mexico and from other programs collecting physical oceanographic and meteorological data during the LATEX field years.

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ACRONYMS AND ABBREVIATIONS

ADCP	acoustic Doppler current profiler
CTD	conductivity-temperature-depth
EHI	Evans-Hamilton, Inc.
GMT	Generic Mapping Tool software
GPS	Global Positioning System
HPLC	high performance liquid chromatography
IES	inverted echo sounder
LATEX	Louisiana-Texas Shelf Physical Oceanography Program
LATEX A	Texas-Louisiana Shelf Circulation and Transport Processes Study (also called LATEX Shelf)
LATEX B	Mississippi River Plume Hydrography Study
LATEX C	Gulf of Mexico Eddy Circulation Study
LSU	Louisiana State University
MMA	Maine Maritime Academy
MMS	Minerals Management Service, U.S. Department of the Interior
M/V	motor vessel
NDBC	National Data Buoy Center
NOAA	National Oceanic and Atmospheric Administration
NODC	National Oceanographic Data Center
NWS	National Weather Service
QA/QC	quality assurance/quality control
R/V	research vessel
SAIC	Science Applications International Corporation
SAP	LATEX Science Advisory Panel
TAMU	Texas A&M University
TAMUG	Texas A&M University at Galveston
USCG	United States Coast Guard
USM	University of Southern Mississippi
UTC	universal coordinated time
XBT	expendable bathythermograph probe

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The editors were assisted greatly by the efforts and contributions of the LATEX A staff at TAMU. Special thanks to Yongxiang Li, Matt Howard, Steve DiMarco, Woody Lee, Debz DeFreitas, Frank Kelly, and Jodi Hughes for providing text, information, and graphics. The help of student workers Marinda Smith and Paul Griffin is much appreciated.

To all who participated on the seven LATEX A cruises during the third field year we extend our great appreciation. Special thanks go to Chief Scientists Bob Hamilton (mooring maintenance cruises) and Carrie Neuhard Lyons (hydrography cruises). The LATEX science crews included Ken Bottom, Mark Garner, Dennis Guffy, Rick O'Neill, Mark Spears, and Eddie Webb of the Technical Support Services Group, Department of Oceanography, TAMU; Bob Albers, Mike Fredericks, Jim Jobling, Chris Nugent, Erik Quiroz and John Shannon of the Geochemical and Environmental Research Group (GERG), TAMU; Paula Bontempi, graduate student in the Department of Oceanography, TAMU; Joel Chaky, Ken Fitzgerald, and Rod Fredericks of the Coastal Studies Institute at LSU; Brian W. Blanchard of LSU; and Chuck Abbott, Jeff Cox, Doug Evans, Troy Horton, Dan Howard, Keith Kurrus, and Eric Noah of EHI. LATEX field operations were also assisted by EHI's land crew Barbara Allen and Jackie Abert.

We thank Roger Fay for his work in coordinating logistic and onshore support for the current meter cruises. No data could have been collected without outstanding work by the crews of the vessels; thus, our thanks to Captain Mike Field of the R/V *Gyre*, Captains Dana Dyre and Pat Sherrard of the R/V *J.W. Powell*, and to their crews. Captain Dean Letzring and Sandra Green of Marine Operations, Department of Oceanography, TAMU, offered assistance with many aspects of the LATEX cruises. Their unfailing cooperation is greatly appreciated.

Thanks also to the project administration staff of the Texas A&M Research Foundation. At the RF, our greatest debt of gratitude is owed to Phyllis Bonifazi and Charlene Miller.

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Ann E. Jochens
Worth D. Nowlin, Jr.

1 EXECUTIVE SUMMARY

1.1 Introduction

The Minerals Management Service (MMS) of the U.S. Department of the Interior supports the Louisiana-Texas Shelf Physical Oceanography Program (LATEX). LATEX is divided into parts: Study Unit A, Texas-Louisiana Shelf Circulation and Transport Processes (LATEX A or LATEX Shelf); Study Unit B, Mississippi River Plume Hydrography (LATEX B or LATEX Plume); and Study Unit C, Gulf of Mexico Eddy Circulation (LATEX C or LATEX Eddy). LATEX A, the largest of the three studies, covers the middle and outer Texas-Louisiana continental shelf from the Mississippi River to the Rio Grande. This report concentrates on the work of LATEX A during the third field year, April through December 1994. Per the contract, this report does not contain detailed analyses or interpretation of the data collected.

The Texas A&M University System, a combination of Texas institutions of higher learning and Texas state agencies dedicated to training, research, and extension, conducts the LATEX A Program. The contract for LATEX A was awarded to the Texas A&M Research Foundation on 30 September 1991. In addition to support from the MMS, financial backing for LATEX A is provided by the Texas Institute of Oceanography, the Texas Engineering Experiment Station, and Texas A&M University (TAMU), all components of the System. The System is assisted in this program by subcontracts with Evans-Hamilton, Inc. (EHI), Louisiana State University (LSU), Maine Maritime Academy (MMA), and the University of Southern Mississippi (USM).

The major objective of LATEX A is to identify key dynamical processes governing circulation, transport, and cross-shelf mixing on the Texas-Louisiana shelf. This objective will be met through the completion of a three-year field program over the Texas-Louisiana continental shelf, after which observations will be synthesized, interpreted, and reported.

The LATEX A Program is overseen by the Program Management Office, under Dr. Worth D. Nowlin, Jr., Program Manager, and Dr. Ann E. Jochens, Deputy Program Manager. Data collection is accomplished through six tasks:

- Current and Meteorological Measurement Moorings (Task A-1)
  Mr. Robert C. Hamilton of EHI, Principal Investigator
- ARGOS-Tracked Drifting Buoys (Task A-2)
  Dr. Worth D. Nowlin, Jr., of TAMU, Principal Investigator
- Standard Grid Hydrography (Task A-3)
  Dr. Denis A. Wiesenburg of USM, Principal Investigator
- Acoustic Doppler Current Surveys (Task A-4)
  Dr. Douglas C. Biggs of TAMU, Principal Investigator
- Collateral Data Collection (Task A-5)
  Dr. Norman L. Guinasso, Jr., of TAMU, Principal Investigator
- Winter Northers/Cyclogenesis (Task A-6)
  Dr. S.A. Hsu of LSU, Principal Investigator

Data quality control and processing are provided under Task A-7 by the LATEX A Data Management Office at the direction of Dr. Norman L. Guinasso, Jr., Data Manager. Additionally, the Data Office oversees Task A-10, Information Transfer, under which the

GULF.MEX electronic bulletin board on Omnet was maintained, and Task A-11, Public Notification, Cooperation, and Data Dissemination, under which the *LATEX Fortnightly* newsletter was published and information provided to federal agencies and the public.

Once data have undergone quality control, the analysis phase of LATEX A begins. There are three tasks under this phase: First is the Analyses and Reports task (Task A-8, Dr. Worth D. Nowlin, Jr., and Dr. Ann E. Jochens of TAMU, Co-Principal Investigators) under which the scientific analyses and syntheses of the data are performed and annual reports to MMS are prepared and finalized. Second is the Field Measurements/Model Comparisons task (Task A-9, Professor Robert O. Reid of TAMU, Principal Investigator) to compare the LATEX observational data with model results; the LATEX Science Advisory Panel is supported under this task. Third is the analysis portion of Task A-6.

All equipment provided by MMS will be refurbished and returned to the Service under the Government Furnished Equipment/Capital Equipment task (Task A-12, Mr. Robert C. Hamilton, Principal Investigator).

1.2 Field Activities

1.2.1 Introduction

Four mooring cruises and three hydrographic/ADCP survey cruises were conducted during the third field year. From April 1994 through December 1994, data were collected from an array of current meter moorings, meteorological buoys, drifting buoys, and hydrographic/ADCP surveys on the Texas-Louisiana continental shelf in the Gulf of Mexico. The data sets then were processed for quality assurance and quality control.

1.2.2 Moored Measurements and Winter Cyclogenesis

Task A-1 provided a shelf-wide network of current, temperature, salinity, and meteorological time series with which to identify, characterize, and parameterize circulation processes. The moored array in year two consisted of a boundary array along the shelf edge, cross-shelf arrays for study of along-shelf transports, and a deep-water inverted echo sounder to monitor the westward passage of rings into the Texas-Louisiana shelf region. Task A-6 deployed and maintained four meteorological buoys during the winter season for the study of cyclogenesis resulting from cold air outbreaks over the Texas-Louisiana shelf.

The current meter array consisted of 67 current meters measuring current speed and direction, temperature, and conductivity on 28 moorings; five directional wave gauges measuring current speed and direction, temperature, and pressure near the sea floor; and one inverted echo sounder measuring acoustic travel time and bottom temperature and pressure. Eight meteorological buoys, including four Task A-6 buoys, were installed on the shelf to measure wind speed and direction, air and sea surface temperature, and barometric pressure. Table 1.2.1 lists the instrumentation typically deployed on each mooring and the maintenance schedule. Figure 1.2.1 shows the mooring locations.

Both the moored measurement and winter cyclogenesis tasks were curtailed in December 1994, by mutual agreement between MMS and LATEX A. This was done to conserve funding and provide more time for the analysis and synthesis efforts of the LATEX A Program.

Table 1.2.1. Typical mooring configurations for the third field year.

Mooring No.	Water Depth (m)	Latitude (°N)	Longitude (°W)	Comments	Top Meter Depth	Middle Meter Depth	Bottom Meter Depth	Maintenance Interval (Day)
1	13	27°19.40'	97°18.42'	Platform	10m		19m	120
2	37	27°17.03'	96°58.82'	Platform	10m		30m	120
3	66	27°17.35'	96°44.18'	Platform	10m	30m	61m	120
4	201	27°07.82'	96°21.65'	Marker Buoy	14m	100m	190m	120
5	199	27°27.82'	96°04.12'	Marker Buoy	14m	100m	190m	120
6	201	27°42.62'	95°38.83'	Marker Buoy	14m	100m	190m	120
7	199	27°50.12'	95°04.05'	Marker Buoy	14m	100m	190m	120
8	200	27°49.52'	94°10.52'	Marker Buoy	14m	100m	190m	120
9	200	27°48.82'	93°32.78'	Marker Buoy	14m	100m	190m	120
10	200	27°56.13'	92°44.63'	Marker Buoy	14m	100m	190m	120
11	200	27°50.55'	92°00.10'	Marker Buoy	14m	100m	190m	120
12				Removed				
13	200	28°03.33'	90°29.32'	Marker Buoy	14m	100m	190m	120
14	48	28°23.75'	90°29.63'	Platform	14m	26m	42m	60
15	27	28°36.48'	90°29.55'	Platform	10m		24m	60
16	16	28°56.33'	90°29.40'	Platform	10m		17m	60
17	8	29°11.87'	91°57.90'	Met Buoy; Platform	3m		5m	60
18	22	28°57.73'	91°59.03'	Platform	10m		21m	60
19	53	28°27.90'	92°02.27'	Met Buoy; Platform	3m	21m	44m	60
20	13	29°30.03'	94°01.42'	Met Buoy; Platform	3m		13m	60
21/51	25	28°50.27'	94°04.80'	Met Buoy; Platform	10m		21m	60
22	54	28°21.33'	93°57.33'	Met Buoy; Platform	3m	20m	48m	60
23	15	28°42.82'	95°32.20'	Platform	9m		13m	60
24	27	28°32.22'	95°23.58'	Platform	11m		27m	60
25				Removed				
42				Removed				
43				Lost				
44				Removed				
45				Removed				
46				Removed				
48	201	27°58.98'	91°17.13'	Marker Buoy	14m	100m	190m	120
49	498	27°22.95'	95°54.02'	Marker Buoy	14m	100m	495m	180
50	20	28°52.86'	95°02.20'	Met Buoy; Platform				60
51/21	25	28°50.28'	94°04.79'	Met Buoy; Platform	10m		21m	60
52	27	28°48.18'	93°01.11'	Met Buoy; Platform				60
53	13	28°48.04'	90°57.22'	Met Buoy; Platform				60

MetBuoy = DSI Surface Meteorological Buoy; Marker Buoy = Lighted Surface Marker Buoy;
IES = Inverted Echo Sounder; blank = No instrument; Platform = Mooring located near permanent structure

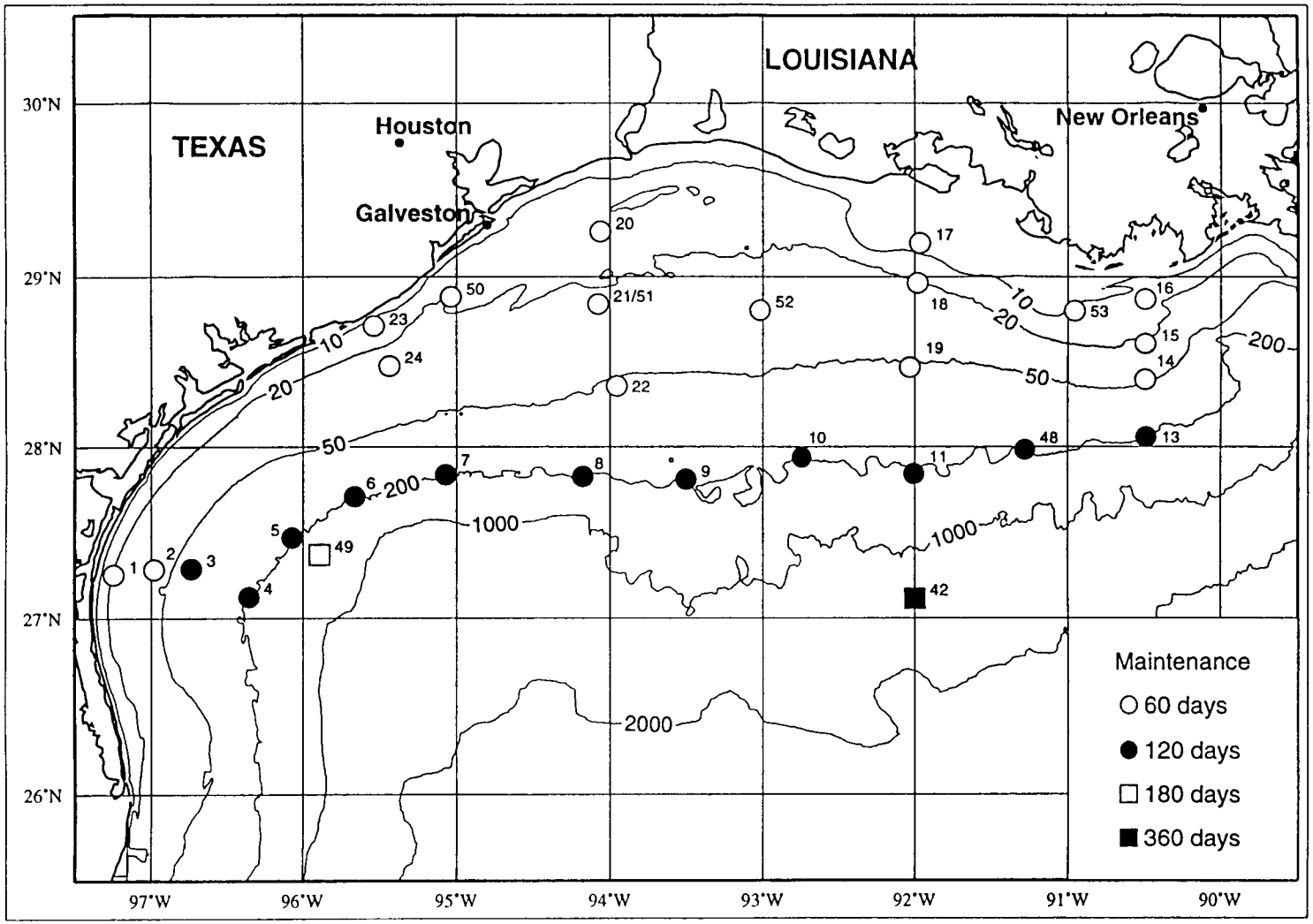

Figure 1.2.1. Moored array locations.

1.2.3 Drifting Buoy Measurements

Task A-2 deployed a total of sixteen drifters over the three field years to study the continunity of alongshore flow. During the third field year, three drifters were deployed on the middle and outer shelf near 94°W on 1 May 1994 (cruise H08). Three more drifters, given to LATEX A by SAIC, were deployed 3 November (cruise H10). All six provided information on their locations, and thus, horizontal currents, and sea surface temperature via satellite.

1.2.4 Hydrographic/ADCP Measurements

Tasks A-3 and A-4 conducted hydrographic/ADCP survey work to characterize the seasonal patterns of circulation and water mass characteristics and to allow initial assessment of interannual variability. The ADCP surveys performed on all hydrographic cruises provided vertical profiles of horizontal currents. Three full-shelf surveys were completed during the third field year. Figure 1.2.2 shows a typical cruise track and station locations. At each hydrographic sampling station, continuous profiles were made of conductivity, temperature, dissolved oxygen, downwelling irradiance, particle scattering, fluorescence, and percent transmission (which gives the paricle beam attenuation coefficient). Up to 12 water samples were taken at each station and analyzed for six nutrients: nitrate, nitrite, phosphate, silicate, urea, and ammonium. At half or more of the stations, water samples were analyzed for dissolved oxygen, salinity, phytoplankton pigments, and the surface and bottom particulate matter concentrations. Secchi disk depths were taken at each daylight station. Meteorological measurements were recorded for input to the National Weather Service. Complementary research programs were conducted on each of the cruises.

1.3 Collateral Data

Task A-5 consists of information from historical or concurrent physical oceanography programs on the Texas-Louisiana shelf or adjacent Gulf of Mexico. These data are collected to augment the LATEX A data set and to aid in interpretations. Most historical information was compiled during the first field year, although that compilation continues. Concurrent data were obtained from numerous other programs collecting oceanographic data in the LATEX region during the third field year, including data from LATEX B and C and weather buoy data from NOAA.

1.4 Observations/Model Comparison

The LATEX Science Advisory Panel (SAP) was formed to assist with observation/model comparisons. The current panelists are: Dr. John S. Allen, Chairman (Oregon State University), Prof. John D. Cochrane (Texas A&M University, retired), Dr. Gabriel T. Csanady (Old Dominion University), Dr. Richard W. Garvine (University of Delaware), Dr. Dong-Ping Wang (SUNY–Stony Brook), Dr. Clinton D. Winant (Scripps Institution of Oceanography), and Dr. William J. Wiseman, Jr. (Louisiana State University). One meeting of the SAP was held in Baton Rouge, 21-23 February 1995.

1.5 Government Furnished Equipment

Final inventory, refurbishment, and redistribution of the equipment furnished to the LATEX A Program by MMS was begun during the third field year. Equipment was transferred at MMS' direction to investigators at LSU, the Chevron Oil Co., and Florida

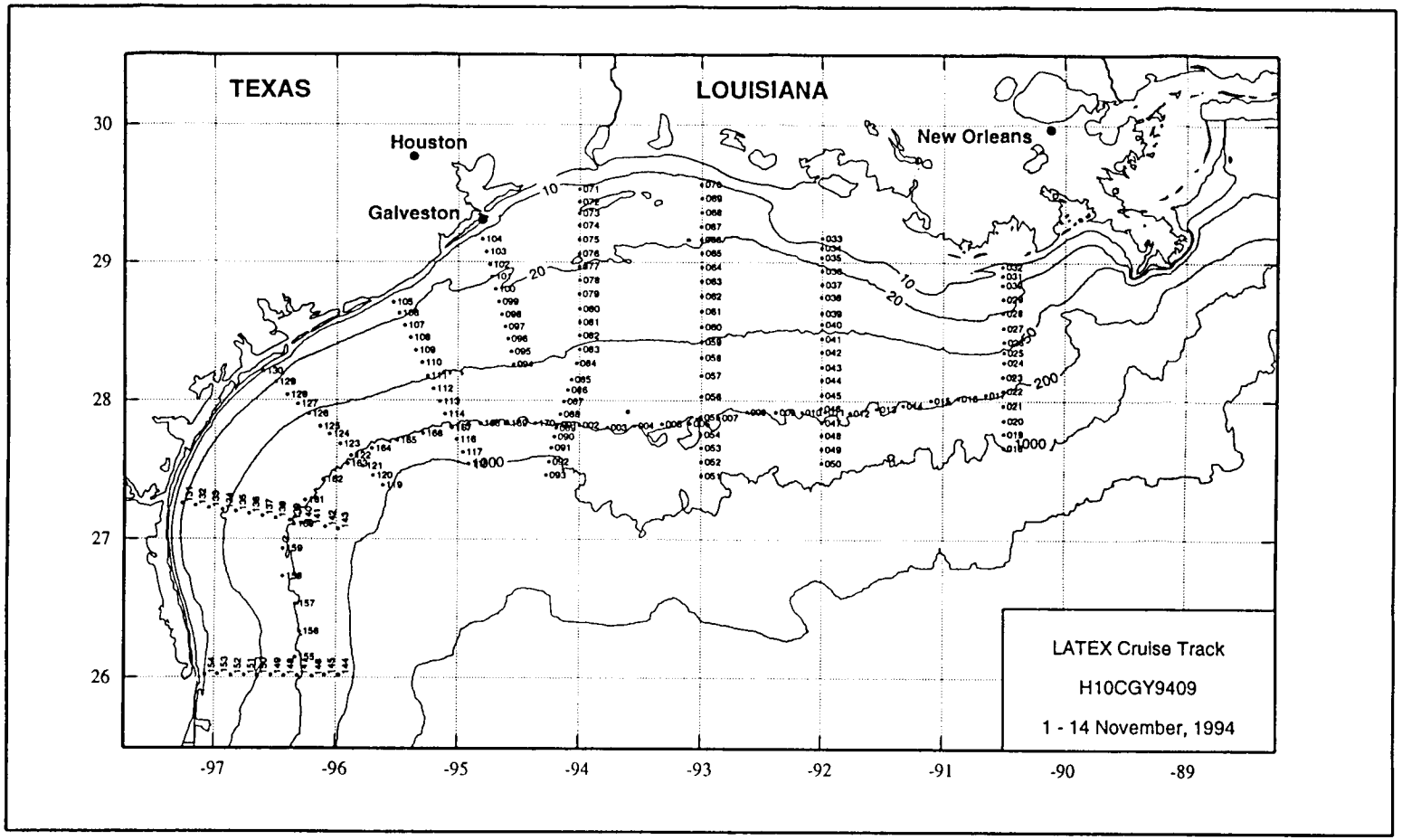

Figure 1.2.2. Typical hydrography/ADCP cruise track and station locations.

State University during 1995. MMS-owned equipment remaining under LATEX A custodianship is being refurbished preparatory to return to the Service.

1.6 Third Annual Report

This third annual report focuses on the data collection and processing activities of LATEX A. It contains no detailed analyses of the data. Examples of products can be found in the first annual report (Jochens and Nowlin 1994a and b) and in the second (Jochens and Nowlin 1995).

The LATEX Synthesis Report, in preparation, will contain discussions of all data analyses carried out and will incorporate discussions of interpretive work completed by LATEX B and C. A draft of this report will be submitted to MMS in November of 1996.

2 INTRODUCTION

2.1 Programmatic Changes

With MMS encouragement and approval, the current measurement mooring program was shortened in the third field year. This was done to conserve funds for the purpose of data analysis. The mooring program was originally planned to end in April 1995; however, all LATEX A deployments were removed from the Gulf by 7 December 1994. Measurements for the winter cyclogenesis study ended at the same time.

To ensure that the last three hydrographic/ADCP cruises could complete full-shelf surveys, two MMS approved modifications to the hydrographic program were implemented beginning in April 1994. First, we eliminated closely-spaced stations (5-km separation) on cross-shelf transects and, when time permitted, extended each transect seaward by two stations into water depth of 1000 m. Examination of cross-shelf scales of variability in temperature, salinity, and resulting geopotential anomaly, based on historical as well as LATEX data, justified this decision. Second, we eliminated sampling along the 50-m isobath. Seven previous LATEX A cruises had collected data along that contour. That data and the current meter measurements indicate that flows along and across the 50-m line are less complicated than those near the shelf break at 200 meters. Data collected along the 200-m isobath provide information on shelf/slope boundary conditions important in understanding the exchanges of mass, heat, and freshwater between the shelf and the open ocean. Thus, it was concluded that stations along the 200-m isobath were of higher priority than those along the 50-m.

Revision of the hydrographic/ADCP cruise plans resulted in cost savings that allowed for three full-shelf cruises, whereas, had the original plan been followed, only two full-shelf cruises and one half-shelf cruise could have been realized in the third field year.

2.2 Overview of Cruise Schedule and Nomenclature

Four mooring cruises and three hydrographic/ADCP survey cruises were carried out by the LATEX A program during the third field year. They were conducted from the R/V *Gyre*, the R/V *J.W. Powell*, the M/V *Seis Surveyor,* and the M/V *Universal Surveyor.* Table 2.2.1 provides a listing of the cruises, their various designators, and their start and end dates.

The MMS identifying code is the number assigned each LATEX cruise in the LATEX Calendar posted to the GULF.MEX bulletin board on Omnet (cf. section 5.4.1). This designator is deciphered as follows:

First character:	M=mooring cruise; H=hydrographic/ADCP survey
Second & third characters:	LATEX A mooring cruise number, LATEX A hydrographic/ADCP survey number
Fourth character:	C=cruise
Fifth & Sixth characters:	vessel identifier (GY = *Gyre*, PW = *J.W. Powell*; SS = *Seis Surveyor,* US = *Universal Surveyor*)
Seventh & eighth characters:	year of cruise
Ninth & tenth characters:	vessel cruise number

The LATEX ID is the shorthand identifier used in this report. The cruise ID number is the standard cruise identifier in wide use in the oceanographic community. The first two characters give the year of the cruise, the third character gives the ship identifier (P = *Powell;* G = *Gyre*, and the last two characters give the number of the ship's cruise for that year.

Table 2.2.1. Cruise identifiers and dates.

Current Mooring Maintenance Cruises

Cruise	Description	MMS ID	Start Date	End Date	LATEX ID	Cruise ID
15	60-day Maintenance	M15CPW9406	05/26/94	06/01/94	M15	94P06
16	120-day Maintenance	M16CSS9413	07/23/94	08/02/94	M16	*Seis Surveyor*
17	60-day Maintenance	M17CUS9413	09/27/94	10/04/94	M17	*Universal Surveyor*
18	Final Mooring Recovery	M18CGY9411	11/29/94	12/07/94	M18	94G11

Hydrographic Surveys

Survey	Description	MMS ID	Start Date	End Date	LATEX ID	Cruise ID
8	Full Shelf	H08CGY9401	04/24/94	05/07/94	H08	94G01
9	Full Shelf	H09CPW9410	07/26/94	08/07/94	H09	94P10
10	Full Shelf	H10CGY9409	11/02/94	11/13/94	H10	94G09

2.3 Report Organization

This third annual report of the LATEX A Study describes the results of the third year's field work in terms of data gathering efforts, the measurement and analytical methodologies employed, quantity of data collected, the results of quality control exercises and determinations, and the status of data archiving and data sharing with other contractors. All times are reported in Universal Coordinated Time (UTC) unless stated otherwise. There are no extensive analyses or syntheses of the information; these will be found in the Synthesis Report, to be released at the end of the program in 1997.

Section 3 of this report details the data acquisition for the moored measurements, drifting buoy measurements, hydrographic and ADCP measurements, and collateral data assembly. Section 4 discusses data quality and analysis for the observations collected, including data processing efforts and data quality control methods and results. Section 5 summarizes data archiving and information sharing.

Although LATEX A data have been processed for quality control and quality assurance, they are still preliminary. It is likely that further corrections will be made to all the data sets prior to their final submission to NODC.

3 DATA ACQUISITION

3.1 Introduction

This section provides an overview of LATEX A data acquisition activities. It includes discussion of data gathering efforts from the moored current meter array, meteorological buoys, drifting buoys, hydrographic/ADCP surveys, and collateral data assembly. Four mooring maintenance cruises and three hydrographic/ADCP cruises are summarized, giving data types, data collection methods, and locations and times of data collection.

3.2 Moored Measurements

3.2.1 Mooring Maintenance Cruises

During the third year of field operations, four mooring cruises were conducted. The dates for these cruises are summarized in Table 2.2.1. Maintenance work consisted of retrieval of instruments and moorings as necessary, examination and repair of equipment, downloading of data, and redeployment. CTD casts were taken at each visited mooring for calibration of temperature and conductivity sensors.

Moorings in different water depths were maintained on different schedules as indicated in Table 3.2.1, which also gives the mooring configurations at the beginning of the third field year. Modifications to these configurations are discussed under descriptions of each cruise. Figure 3.2.1 shows the locations of the moorings. During the third field year, 67 current meters, eight meteorological buoys, five directional wave gauges, 17 acoustic releases, 12 transponders, and one inverted echo sounder (IES) were used.

Following are summaries of the major events of the four current meter cruises conducted in the third field year. Cruises M15 and M18 were carried out from TAMU-operated vessels and departed from and returned to Galveston, Texas. For cruises M16 and M17, commercial vessels were hired; they departed from and returned to Patterson, Louisiana. Table 3.2.2 lists the stations visited on each cruise.

3.2.1.1 Cruise M15CPW9406

Cruise M15 was a 60-day mooring maintenance cruise, conducted from the R/V *J.W. Powell* 26 May - 1 June 1994. Fourteen mooring locations were visited; 11 moorings were maintained and redeployed. The meteorological buoys at moorings 50, 51, 52, and 53, deployed for the study of winter cyclogenesis, were removed for the hurricane season. The buoy at mooring 52 was found to have a broken anemometer. The buoy at mooring 53 had been vandalized; its tower was missing and the electronics were flooded. No data were recovered from that buoy. The MiniSpec directional wave gauge at mooring 17 was removed to permit a MiniSpec deployment at mooring 23, there not being enough instruments to allow deployment at both stations. At mooring 23, a gradiometer was used to search for equipment lost at that location on a previous cruise; no equipment was recovered this time.

3.2.1.2 Cruise M16CSS9416

Cruise M16 was a 120-day mooring maintenance cruise, conducted from the M/V *Seis Surveyor* 23 July - 2 August 1994. Twenty-six moorings were visited; 24 were

Table 3.2.1. Mooring configurations as of April 1994.

Mrg No.	Water Depth (m)	Latitude (°N)	Longitude (°W)	Comments	Top	Middle	Bottom	Release	Maintenance Interval (Days)
1	13	27°19.40'	97°18.42'	Platform	174-10m , T,C	None	Mini-19m, T	None	120
2	37	27°17.03'	96°58.82'	Platform	174-10m, T,C	None	174-30m, T,C	None	120
3	66	27°17.35'	96°44.18'	Platform	174-10m, T,C	174-30m, T,C	174-61m, T,C	397	120
4	201	27°07.82'	96°21.65'	Marker Buoy "L"	174-14m, T,C	Aand-100m, T,C	Aand-190m, T,C	397	120
5	199	27°27.82'	96°04.12'	Marker Buoy "M"	174-14m, T,C	Aand-100m, T,C	Aand-190m, T,C	397	120
6	201	27°42.62'	95°38.83'	Marker Buoy "N"	174-14m, T,C	Aand-100m, T,C	Aand-190m, T,C	397	120
7	199	27°50.13'	95°04.05'	Marker Buoy "O"	174-14m, T,C	Aand-100m, T,C	Aand-190m, T,C	397	120
8	200	27°49.52'	94°10.52'	Marker Buoy "P"	174-14m, T,C	Aand-100m, T,C	Aand-190m, T,C	397	120
9	200	27°48.82'	93°32.78'	Marker Buoy "Q"	174-14m, T,C	Aand-100m, T,C	Aand-190m, T,C	397	120
10	200	27°56.13'	92°44.63'	Marker Buoy "R"	174-14m, T,C	Aand-100m, T,C	Aand-190m, T,C	397	120
11	200	27°50.55'	92°00.10'	Marker Buoy "S"	174-14m, T,C	Aand-100m, T,C	Aand-190m, T,C	Benthos	120
12				Permanently Removed					
13	200	28°03.33'	90°29.32'	Marker Buoy "U"	174-14m, T,C	Aand-100m, T,C	Aand-190m, T,C	Benthos	120
14	48	28°23.75'	90°29.63'	Platform	174-14m, T,C	174-26m, T,C	174-42m, T,C	None	60
15	27	28°36.48'	90°29.55'	Platform	174-10m, T,C	None	174-24m, T,C	None	60
16	16	28°56.33'	90°29.40'	Platform	174-10m, T,C	None	Mini-17m, T	None	60
17	8	29°11.87'	91°57.90'	Platform & Met Buoy "C"=937	S4-3m, T,C	None	Mini-5m, T	None	60
18	22	28°57.73'	91°59.03'	Platform	174-10m, T,C	None	174-21m, T,C	None	60
19	53	28°27.90'	92°02.27'	Platform & Met Buoy "D"=930	S4-3m, T,C	174-21m, T,C	174-44m, T,C	397	60
20	13	29°30.03'	94°01.42'	Platform & Met Buoy "E"=931	S4-3m, T,C	None	Mini-13m, T	None	60
21/51	25	28°50.27'	94°04.80'	Platform & Met Buoy "F"=934	174-10m, T,C	None	174-21m, T,C	None	60
22	54	28°21.33'	93°57.33'	Platform & Met Buoy "G"=932	S4-3m, T,C	174-20m, T,C	174-48m, T,C	397	60
23	15	28°42.82'	95°32.20'	Platform	174-9m, T,C	None	Mini-13m, T	None	60
24	27	28°32.22'	95°23.58'	Platform	174-11m, T,C	None	174-27m, T,C	None	60
25				Permanently Removed					
42				Permanently Removed					
43				Unrecoverable					
44				Permanently Removed					
45				Permanently Removed					
46				Permanently Removed					
47				Permanently Removed					
48	201	27°58.98'	91°17.13'	Marker Buoy "T"	174-14m, T,C	Aand-100m, T	Aand-190m, T	Benthos	120
49	498	27°22.95'	95°54.02'	Marker Buoy "W"	174-14m, T,C	Aand-100m, T,C	Aand-495m, T,C	Benthos	180
50	20	28°52.86'	95°02.20'	Platform & Met Buoy "H"=936	None	None	None	None	60
51/21	25	28°50.28'	94°04.79'	Platform & Met Buoy "F"=934	174-10m, T,C	None	174-21m, T,C	None	60
52	27	28°48.18'	93°01.11'	Platform & Met Buoy "I"=933	None	None	None	None	60
53	13	28°48.04'	90°57.22'	Platform & Met Buoy "J"=935	None	None	None	None	60

Met Buoy = DSI Surface Meteorological Buoy
S4 = InterOcean S4 Electromagnetic Current Meter
174 = Endeco Model SSM174 Current Meter
Aand = Aanderaa Models RCM 7 or 8
RCM = Aanderaa Models 4 or 5
397 = Datasonics Model 397 Acoustic Release
Mini = CLI MiniSpec Directional Wave Gauge
T = Temperature Sensor
C = Conductivity Sensor

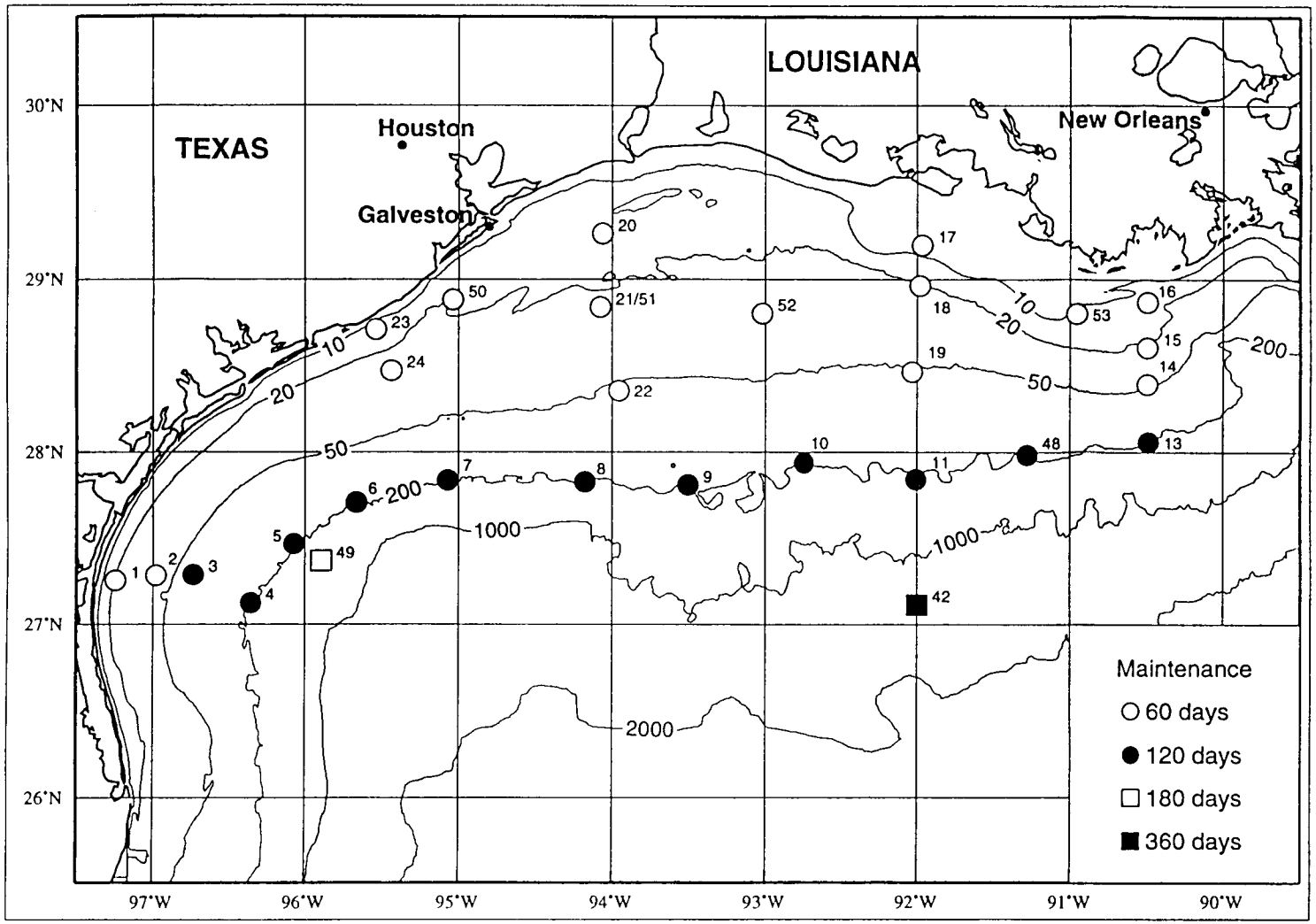

Figure 3.2.1. Mooring locations and maintenance intervals for the third field year.

Table 3.2.2. Mooring maintenance by cruise for the third field year.

Mooring No.	M15	M16	M17	M18
1		√		√
2		√		√
3		√		√
4		√		√
5		√	√	√
6		√		√
7		√		√
8		√		√
9		√		√
10		√		√
11		√	√	√
12 (Removed)				
13		√		√
14	√	√	√	√
15	√	√	√	√
16	√	√	√	√
17	√	√	√	√
18	√	√	√	√
19	√	√	√	√
20	√	√	√	√
21	√	√	√	√
22	√	√	√	√
23	√	√	√	√
24	√	√	√	√
25 (Removed)				
42		√ Removed		
43 (Lost)				
44 (Removed)				
45 (Removed)				
46 (Removed)				
47 (Removed)				
48		√		√
49		√		√
50	R			
51	R			
52	R			
53	R			

√ = Mooring maintenance conducted
R = Meteorological buoy removed for hurricane season
(Removed) = Entire mooring was removed in second field year
(Lost) = IES at this location is irretrievable

redeployed. MiniSpec directional wave gauges were removed from moorings 16 and 23 for factory repair. The IES was recovered from mooring 42; this mooring was not redeployed. Five XBTs were launched between moorings 42 and 11. Mooring 5 was not deployed due to lack of spare current meters. On 30 July, the ship put in at Port Aransas, Texas, to retrieve mooring 4, complete except for anchor and release, from a shrimper who had snagged it in shallow water. Equipment reported as lost after this cruise: 1 Aanderaa RCM7, 2 RCM4s, 1 Endeco SSM174, 1 Benthos release, 1 Datasonics release.

3.2.1.3 Cruise M17CUS9417

Cruise M17 was a 60-day mooring maintenance cruise conducted from the M/V *Universal Surveyor* 27 September - 4 October 1994. Fifteen moorings were planned for maintenance; however, moorings 2 and 49 were omitted during the cruise. Thirteen moorings were maintained and redeployed. Meteorological buoys were installed at moorings 19 and 22 without S4 current meters. Mooring 5, not deployed on cruise M15 due to lack of equipment, was reinstalled. A search for equipment previously lost at this mooring was unsuccessful. A MiniSpec directional wave gauge was deployed at mooring 23. Sediment traps were set at mooring 18 for LATEX B.

3.2.1.4 Cruise M18CGY9411

Cruise M18, the final cruise of the LATEX Program, was conducted from the R/V *Gyre* 29 November - 7 December 1994. Twenty-five moorings were recovered; none were redeployed. All LATEX moorings were removed from the Gulf by the end of the cruise. Thirty-two XBTs were launched along the 200-m isobath. Damage to meteorological buoys was noted for moorings 17 (tower and anemometer missing) and 22 (tower missing but buoy still transmitting). The current meter on mooring 16 was missing. Searches for missing equipment were conducted at moorings 4, 5, and 48. No equipment was recovered at moorings 4 and 5. Efforts were rewarded at mooring 48, however; dragging brought up two Benthos glass floats and an Aanderaa RCM7 current meter lost in November of 1993.

3.2.2 Instrumentation, Calibration, and Sampling Procedures

The calibration of all instruments and sampling procedures were performed, in general, as noted in sections 9.3 and 9.4 of Nowlin et al. (1991), in section 2.2.2 of Jochens and Nowlin (1994b), and in section 3 of Jochens and Nowlin (1995). Some variations from the procedures set out in these references occurred due to time constraints and the actual instruments used. Because of instrument loss, the current meters could not be returned to shore for major refurbishment and recalibration as frequently as originally planned. Therefore, the data from the CTD casts taken before and/or after instrument recovery and redeployment were used to assist with instrument calibrations.

3.2.3 Summary of Data Collection

The third year of deployment was from April through December 1994. Data were recovered from the moored instrumentation during mooring maintenance cruises M15 through M18. Moored instrumentation consisted of current meters collecting current speed and direction, temperature, and conductivity; meteorological buoys collecting wind speed and direction, air and sea surface temperature, and barometric pressure; MiniSpec directional wave gauges collecting current speed and direction, temperature, and pressure; and an inverted echo sounder collecting acoustic travel time, temperature, and pressure.

3.2.3.1 Current Meter Data and Maximum Currents

Table 3.2.2 shows moorings visited for maintenance on each cruise. Figure 3.2.2 summarizes the recovery results for the second year. In Figure 3.2.2, T stands for the top instrument, M for the middle, and B for the bottom instrument on the numbered mooring; see Table 3.2.1 for instrument types. For each current meter on each mooring, Table 3.2.3 shows the data recovery and problems during the third field year.

MMS wishes to predict the maximum likely distance that spilled oil could move in a 48-hour period over the Texas-Louisiana shelf. Toward that end, the maximum speeds and directions have been determined for the upper current meters on the LATEX A moorings (Table 3.2.4). For the third field year, maximum low-passed currents range from 28 to 72 $cm \cdot s^{-1}$, directions vary around the compass, and maxima occur around the calendar. However, there is a tendency toward upcoast directions in summer (June-August) and downcoast directions otherwise, as expected for the inner shelf region. Note that instruments did not record at all locations year round.

3.2.3.2 Wave Gauge Data

This section details problems encountered with MiniSpec directional wave gauges during each deployment period; these are indicated in the exceptions column of Table 3.2.5. Figure 3.2.3 shows a timeline for the MiniSpec data return. Because the MiniSpec directional wave gauges were not equipped with internal compasses that would have determined each instrument's directional orientation, there was uncertainty about the diver-reported orientation measurement during the first year of deployment. This measurement became more reliable during the second half of the field study. By comparing the mean wave directions of wave data calculated at each mooring over the entire study, we determined accurate directional orientations of the velocity sensors.

Cruise M15 recovered data from MiniSpec S/N 10093, 10096, and 10092 at LATEX moorings 16, 17, and 20, respectively. The data of S/N 10093 showed no problems. The pressure sensor of S/N 10096 malfunctioned after seventeen days, evidenced by excessive noise in the wave spectrum. The pressure burst data were replaced with the character string "-999.00" ("nine-filled") to indicate bad data after 16 April. Although its wave data after this time are useless, the instrument continued to record average hydrostatic pressure, corresponding to sea surface height. These data are included in the current meter file and are flagged as questionable. In S/N 10092, the current sensor malfunctioned during the first fifteen days of deployment, evidenced by excessive noise in the current sensor wave spectrum. After 15 April, the noise was no longer evident in the wave spectrum. Current burst and average data were nine-filled from 1-15 April, and have been flagged as questionable from 15 April to the end of the deployment.

Four MiniSpecs, S/N 10094, 10096, 10093, and 10092, were recovered during cruise M16, at moorings 1, 16, 20, and 23, respectively. S/N 10094 and 10093 recorded full complements of wave data with no apparent problems. The pressure sensor in S/N 10096 continued to exhibit problems. Usable pressure data from this instrument extends only four days into the deployment. Plots of the wave energy density, estimated from the current velocity sensor in S/N 10092, show noise over the entire wind-wave frequency range beginning at 00:00Z on 17 July 1994. The energy introduced into the spectrum by this noise was small compared to the total wave energy and was retained in the data file. These data are flagged, however, as questionable. Both S/N 10096 and 10092 were removed from the field for repair.

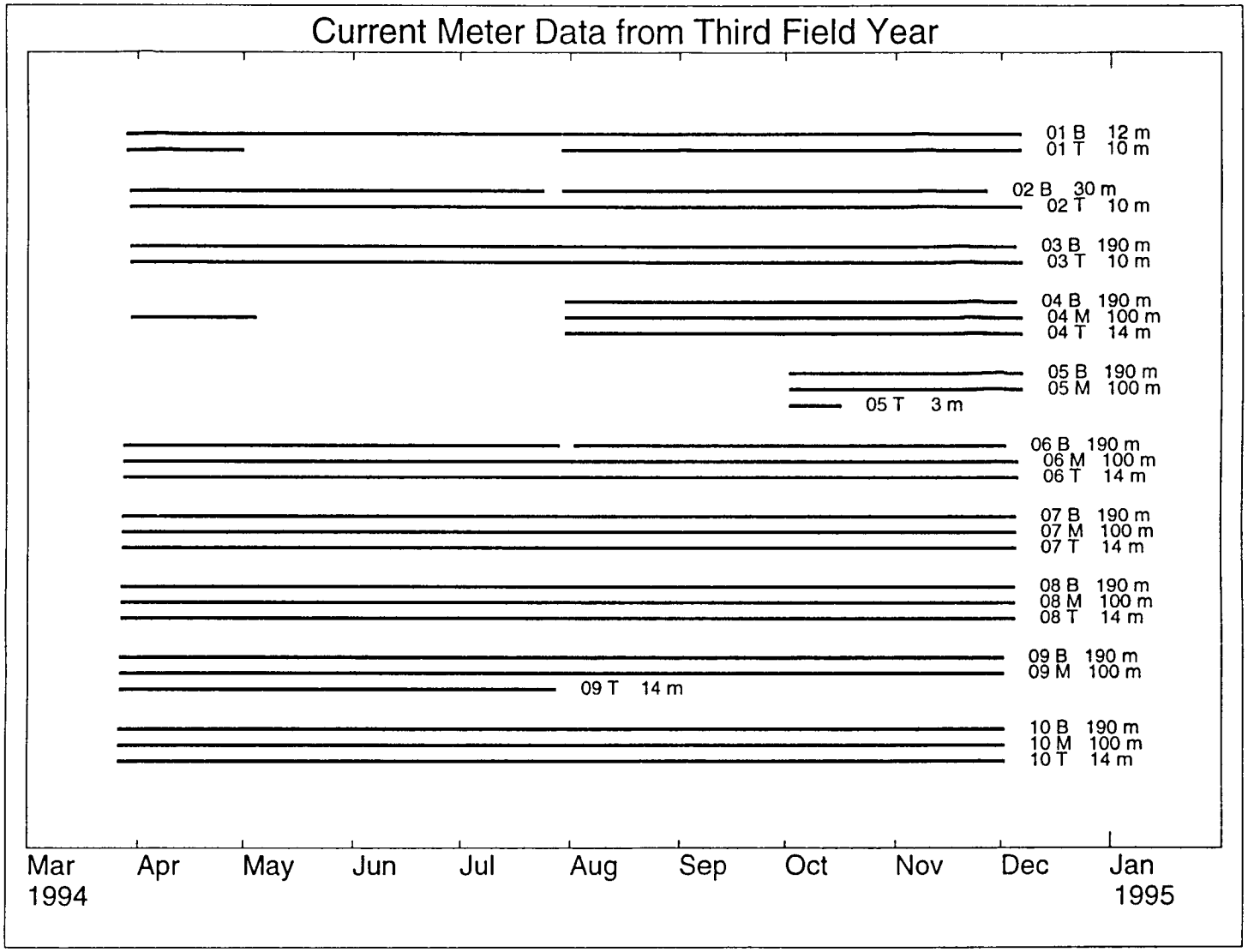

Figure 3.2.2. Current meter data recovered during the third field year.

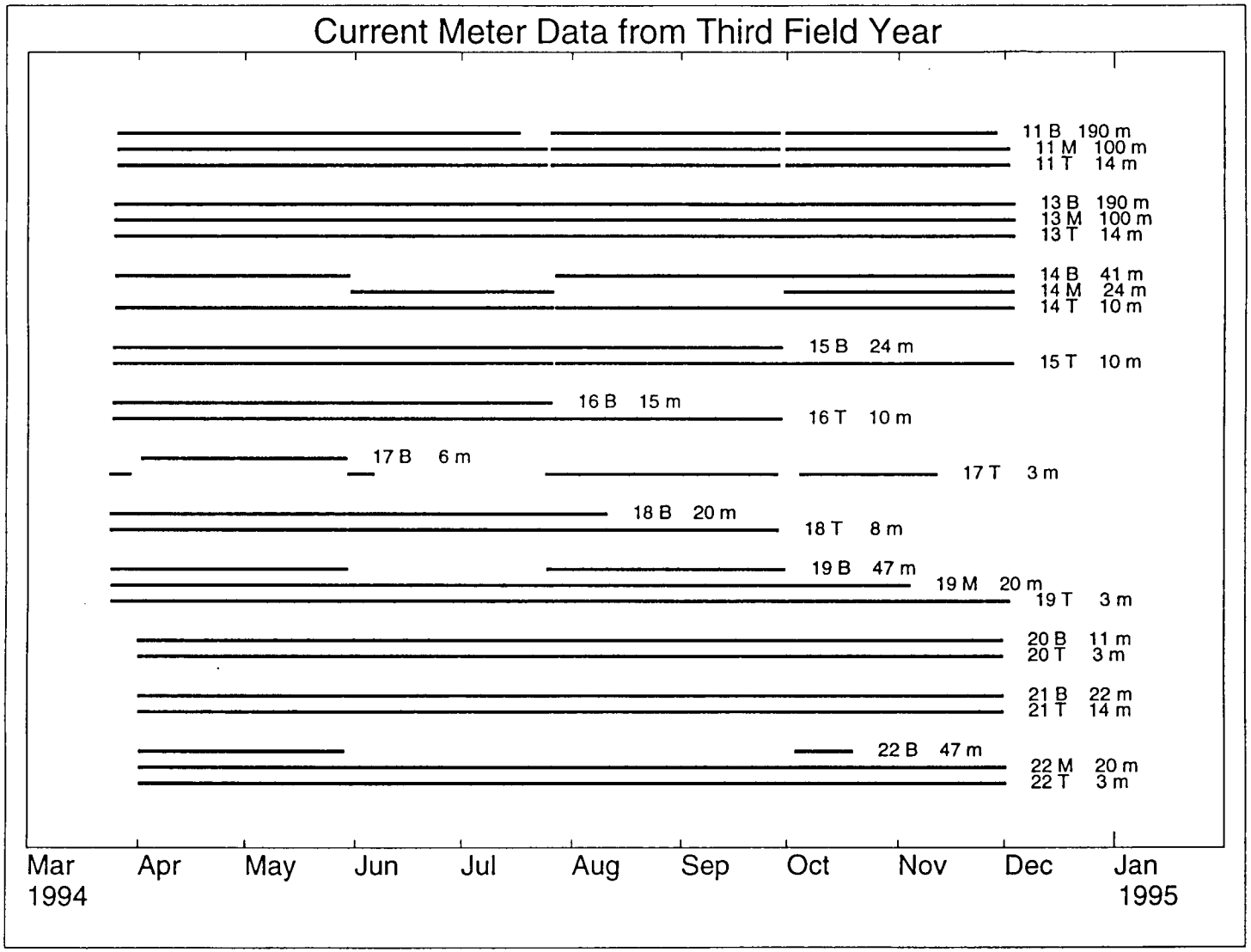

Figure 3.2.2. Current meter data recovered during the third field year (continued).

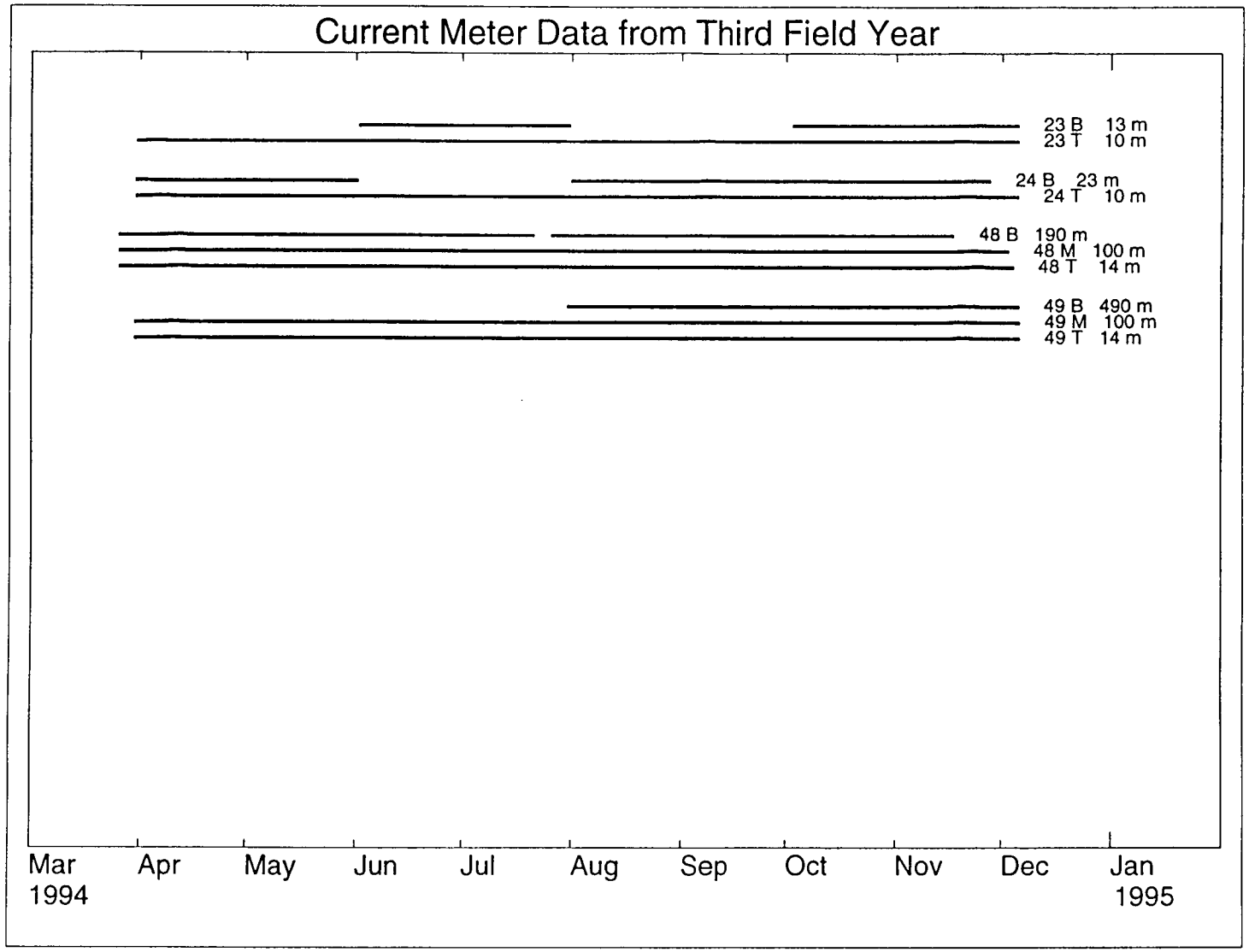

Figure 3.2.2. Current meter data recovered during the third field year (continued).

Table 3.2.3. LATEX Current Meter Data April 1994 - December 1994.

Mooring	Depth	S/N	Deploy Cruise	Recover Cruise	Start Data	End Data	Exceptions
01 B	12 m	10094	94S14 (M14)	94S16 (M16)	03/28/1994 14:00	07/29/1994 11:30	
01 B	12 m	10094	94S16 (M16)	94G11 (M18)	07/29/1994 19:00	12/06/1994 13:00	
01 T	10 m	SSM256	94S14 (M14)	94S16 (M16)	03/28/1994 15:00	04/30/1994 23:00	
01 T	10 m	SSM042	94S16 (M16)	94G11 (M18)	07/29/1994 12:30	12/06/1994 13:30	N
02 B	30 m	LSU005	94S14 (M14)	94S16 (M16)	03/29/1994 12:30	07/24/1994 10:30	A,D,E
02 B	30 m	DMT238	94S16 (M16)	94G11 (M18)	07/29/1994 15:30	11/27/1994 01:10	
02 T	10 m	SSM240	94S14 (M14)	94S16 (M16)	03/29/1994 13:30	07/29/1994 15:00	K
02 T	10 m	SSM256	94S16 (M16)	94G11 (M18)	07/29/1994 15:30	12/06/1994 17:00	
03 B	58 m	AA7175	94S14 (CM14)	94S16 (CM16)	03/29/1994 17:00	07/29/1994 20:00	N
03 B	58 m	AA7170	94S16 (CM16)	94G11 (CM18)	07/29/1994 22:30	12/05/1994 03:00	
03 T	10 m	SSM235	94S14 (M14)	94S16 (M16)	03/29/1994 18:00	07/29/1994 20:00	
03 T	10 m	SSM240	94S16 (M16)	94G11 (M18)	07/29/1994 23:00	12/06/1994 20:00	
04 B	190 m	AA7175	94S16 (CM16)	94G11 (CM18)	07/30/1994 10:30	12/05/1994 08:00	
04 M	100 m	AA9121	94S14 (M14)	94S16 (M16)	03/29/1994 22:00	05/04/1994 13:00	H
04 M	100 m	AA10677	94S16 (M16)	94G11 (M18)	07/30/1994 10:30	12/06/1994 23:30	
04 T	14 m	SSM235	94S16 (M16)	94G11 (M18)	07/30/1994 10:30	12/06/1994 23:30	
05 B	190 m	AA10682	94U17 (M17)	94G11 (M18)	10/01/1994 23:30	12/07/1994 04:30	
05 M	100 m	AO004	94U17 (M17)	94G11 (M18)	10/02/1994 00:00	12/07/1994 04:00	D,E
05 T	3 m	08111780	94U13 (M17)	94G11 (M18)	10/01/1994 23:40	10/16/1994 14:40	
06 B	190 m	AA10677	94S14 (M14)	94S16 (M16)	03/27/1994 16:00	07/29/1994 00:30	
06 B	190 m	AA10678	94S16 (M16)	94G11 (M18)	08/02/1994 00:30	12/02/1994 10:00	D,E,N
06 M	100 m	AA10681	94S14 (M14)	94S16 (M16)	03/27/1994 16:00	07/29/1994 01:00	B,K,N
06 M	100 m	AA10690	94S16 (M16)	94G11 (M18)	07/29/1994 03:30	12/05/1994 22:30	
06 T	14 m	SSM042	94S14 (M14)	94S16 (M16)	03/27/1994 16:00	07/29/1994 00:00	
06 T	14 m	SSM244	94S16 (M16)	94G11 (M18)	07/29/1994 03:30	12/05/1994 22:30	
07 B	190 m	AA10678	94S14 (M14)	94S16 (M16)	03/27/1994 07:00	07/28/1994 19:00	K
07 B	190 m	AA10689	94S16 (M16)	94G11 (M18)	07/28/1994 21:30	12/05/1994 06:30	H,K,N
07 M	100 m	AA10690	94S14 (M14)	94S16 (M16)	03/27/1994 07:00	07/28/1994 19:00	
07 M	100 m	AA10684	94S16 (M16)	94G11 (M18)	07/28/1994 21:30	12/05/1994 06:30	
07 T	14 m	SSM244	94S14 (M14)	94S16 (M16)	03/27/1994 07:00	07/28/1994 18:30	
07 T	14 m	SSM241	94S16 (M16)	94G11 (M18)	07/28/1994 21:30	12/05/1994 06:30	L,N
08 B	190 m	AA10684	94S14 (M14)	94S16 (M16)	03/26/1994 23:00	07/28/1994 11:30	N
08 B	190 m	AA10672	94S16 (M16)	94G11 (M18)	07/28/1994 14:30	12/04/1994 23:30	
08 M	100 m	AA10689	94S14 (M14)	94S16 (M16)	03/26/1994 23:00	07/28/1994 11:30	H
08 M	100 m	AA10679	94S16 (M16)	94G11 (M18)	07/28/1994 14:30	12/04/1994 23:30	
08 T	14 m	SSM241	94S14 (M14)	94S16 (M16)	03/26/1994 23:00	07/28/1994 11:00	
08 T	14 m	SSM253	94S16 (M16)	94G11 (M18)	07/28/1994 14:30	12/05/1994 01:00	
09 B	190 m	AA10672	94S14 (M14)	94S16 (M16)	03/26/1994 16:00	07/28/1994 01:30	K
09 B	190 m	AA10680	94S16 (M16)	94G11 (M18)	07/28/1994 04:30	12/01/1994 19:30	
09 M	100 m	AA10679	94S14 (M14)	94S16 (M16)	03/26/1994 16:00	07/28/1994 01:30	N
09 M	100 m	AA10685	94S16 (M16)	94G11 (M18)	07/28/1994 04:30	12/01/1994 19:30	
09 T	14 m	SSM253	94S14 (M14)	94S16 (M16)	03/26/1994 16:00	07/28/1994 02:00	H
10 B	190 m	AA10685	94S14 (M14)	94S16 (M16)	03/26/1994 07:00	07/27/1994 19:00	
10 B	190 m	AA10673	94S16 (M16)	94G11 (M18)	07/27/1994 22:00	12/02/1994 02:00	
10 M	100 m	AA10680	94S14 (M14)	94S16 (M16)	03/26/1994 06:00	07/27/1994 19:00	K
10 M	100 m	AA10687	94S16 (M16)	94G11 (M18)	07/27/1994 21:30	12/02/1994 02:00	
10 T	14 m	SSM247	94S14 (M14)	94S16 (M16)	03/26/1994 06:30	07/27/1994 18:30	
10 T	14 m	SSM233	94S16 (M16)	94G11 (M18)	07/27/1994 22:00	12/02/1994 03:00	
11 B	190 m	AA9410	94S14 (M14)	94S16 (M16)	03/25/1994 23:30	07/17/1994 10:00	
11 B	190 m	AA9411	94S16 (M16)	94U17 (M17)	07/25/1994 20:30	09/29/1994 00:30	
11 B	190 m	AA9121	94U17 (M17)	94G11 (M18)	09/30/1994 10:00	11/28/1994 16:30	

Table 3.2.3. LATEX Current Meter Data April 1994 - December 1994. (continued)

Mooring	Depth	S/N	Deploy Cruise	Recover Cruise	Start Data	End Data	Exceptions
11 M	100 m	AA10669	94S14 (M14)	94S16 (M16)	03/25/1994 23:30	07/25/1994 00:30	
11 M	100 m	AA10682	94S16 (M16)	94U17 (M17)	07/25/1994 20:30	09/29/1994 00:00	
11 M	100 m	AA9411	94U17 (M17)	94G11 (M18)	09/30/1994 10:00	12/02/1994 09:00	H
11 T	14 m	SSM258	94S14 (M14)	94S16 (M16)	03/25/1994 23:30	07/25/1994 00:00	
11 T	14 m	SSM250	94S16 (M16)	94U17 (M17)	07/25/1994 20:30	09/29/1994 00:30	
11 T	14 m	AO003	94U17 (M17)	94G11 (M18)	09/30/1994 10:00	12/02/1994 09:00	D,E
13 B	190 m	AA10673	94S14 (M14)	94S16 (M16)	03/25/1994 04:00	07/27/1994 00:30	
13 B	190 m	AA10670	94S16 (M16)	94G11 (M18)	07/27/1994 03:00	12/03/1994 22:00	A
13 M	100 m	AA10687	94S14 (M14)	94S16 (M16)	03/25/1994 04:00	07/27/1994 00:30	
13 M	100 m	AA10688	94S16 (M16)	94G11 (M18)	07/27/1994 03:30	12/03/1994 22:00	
13 T	14 m	SSM233	94S14 (M14)	94S16 (M16)	03/25/1994 04:00	07/27/1994 00:00	J,K
13 T	14 m	SSM255	94S16 (M16)	94G11 (M18)	07/27/1994 03:30	12/03/1994 22:00	
14 B	41 m	LSU020	94S14 (M14)	94P06 (M15)	03/25/1994 07:00	05/30/1994 12:25	D,E
14 B	41 m	LSU040	94S16 (M16)	94U17 (M17)	07/27/1994 06:00	09/29/1994 20:50	D,E
14 B	41 m	LSU045	94U17 (M17)	94G11 (M18)	09/30/1994 00:00	12/03/1994 19:10	B,D,E
14 M	24 m	DMT238	94P06 (M15)	94S16 (M16)	05/30/1994 14:30	07/26/1994 21:35	
14 M	24 m	DMT015	94U17 (M17)	94G11 (M18)	09/30/1994 00:30	12/03/1994 18:50	C,E,N
14 T	10 m	SSM243	94S14 (M14)	94P06 (M15)	03/25/1994 07:30	05/30/1994 10:00	
14 T	10 m	SSM255	94P06 (M15)	94S16 (M16)	05/30/1994 14:30	07/26/1994 21:00	
14 T	10 m	SSM243	94S16 (M16)	94U17 (M17)	07/27/1994 06:30	09/29/1994 20:30	
14 T	10 m	AO006	94U17 (M17)	94G11 (M18)	09/30/1994 00:00	12/03/1994 19:00	A,B,D,E
15 B	24 m	LSU040	94S14 (M14)	94P06 (M15)	03/24/1994 17:00	05/30/1994 15:45	D,E
15 B	24 m	LSU040	94P06 (M15)	94S16 (M16)	05/30/1994 17:00	07/26/1994 16:15	D,E
15 B	24 m	LSU070	94S16 (M16)	94U17 (M17)	07/26/1994 18:00	09/29/1994 19:00	D,E
15 T	10 m	SSM039	94S14 (M14)	94P06 (M15)	03/24/1994 17:00	05/30/1994 15:30	
15 T	10 m	SSM243	94S14 (M14)	94S16 (M16)	05/30/1994 17:00	07/26/1994 15:30	
15 T	10 m	DMT015	94S16 (M16)	94U17 (M17)	07/27/1994 04:00	09/30/1994 05:00	C,E
15 T	10 m	SSM250	94S16 (M16)	94G11 (M18)	09/29/1994 20:00	12/03/1994 16:00	
16 B	15 m	10093	94S14 (M14)	94P06 (M15)	03/24/1994 13:30	05/30/1994 19:30	
16 B	15 m	10096	94P06 (M15)	94S16 (M16)	05/30/1994 20	07/26/1994 11:30	
16 T	10 m	SSM254	94S14 (M14)	94P06 (M15)	03/24/1994 14:00	05/30/1994 19:00	
16 T	10 m	SSM039	94P06 (M15)	94S16 (M16)	05/30/1994 22:00	07/26/1994 11:30	H
16 T	10 m	SSM257	94S16 (M16)	94U17 (M17)	07/26/1994 14:30	09/29/1994 16:00	
17 B	6 m	10096	94S14 (M14)	94P06 (M15)	04/01/1994 13:00	05/29/1994 17:30	
17 T	3 m	08111777	94S14 (M14)	94P06 (M15)	03/23/1994 17:18	03/29/1994 19:00	
17 T	3 m	08111748	94P06 (M15)	94s13 (M16)	05/29/1994 19:35	06/06/1994 08:35	
17 T	3 m	08111777	94S13 (M16)	94U13 (M17)	07/24/1994 13:04	09/28/1994 13:04	
17 T	3 m	08111780	94U13 (M17)	94G11 (M18)	10/04/1994 10:05	11/11/1994 22:35	
18 B	20 m	LSU160	94S14 (M14)	94P06 (M15)	03/23/1994 19:00	05/29/1994 16:15	A,D,E
18 B	20 m	DMT208	94P06 (M15)	94S16 (M16)	05/29/1994 21:30	07/24/1994 14:30	B
18 B	20 m	LSU010	94S16 (M16)	94U17 (M17)	07/24/1994 16:00	08/11/1994 00:00	O
18 T	8 m	DMT015	93S14 (M14)	94P06 (M15)	03/23/1994 20:00	05/29/1994 16:55	
18 T	8 m	SSM250	94S14 (M14)	94S16 (M16)	05/29/1994 22:00	07/24/1994 14:30	
18 T	8 m	SSM239	94S16 (M16)	94U17 (M17)	07/24/1994 16:30	09/28/1994 16:30	
19 B	47 m	LSU050	94S14 (M14)	94P06 (M15)	03/24/1994 01:30	05/30/1994 01:00	D,E,N
19 B	47 m	LSU055	94S16 (M16)	94U17 (M17)	07/24/1994 20:30	09/30/1994 14:50	D,E
19 M	20 m	DMT238	93S14 (M14)	94P06 (M15)	03/24/1994 02:00	05/29/1994 19:40	K
19 M	20 m	DMT015	94P06 (M15)	94S16 (M16)	05/30/1994 03:00	07/24/1994 18:55	C,E
19 M	20 m	DMT208	94S16 (M16)	94U17 (M17)	07/24/1994 21:00	09/30/1994 14:30	B
19 M	20 m	LSU070	94U17 (M17)	94G11 (M18)	09/30/1994 17:30	11/04/1994 10:50	D,E
19 T	3 m	08111781	94S14 (M14)	94P06 (M15)	03/24/1994 01:30	05/30/1994 00:30	A

Table 3.2.3. LATEX Current Meter Data April 1994 - December 1994. (continued)

Mooring	Depth	S/N	Deploy Cruise	Recover Cruise	Start Data	End Data	Exceptions
19 T	3 m	08111744	94P06 (M15)	94S13 (M16)	05/30/1994 03:05	07/24/1994 18:35	
19 T	3 m	08111478	94S13 (M16)	94U13 (M17)	07/24/1994 20:13	09/30/1994 14:13	
19 T	3 m	08111778	94S13 (M17)	94G11 (M18)	09/30/1994 17:00	12/02/1994 14:30	
20 B	11 m	10092	94S14 (M14)	94P06 (M15)	03/31/1994 13:30	05/31/1994 14:30	N
20 B	11 m	10093	94P06 (M15)	94S16 (M16)	05/31/1994 15:30	08/01/1994 18:30	
20 B	11 m	10093	94S16 (M16)	94U16 (M17)	08/01/1994 23:00	10/03/1994 17:00	
20 B	11 m	10093	94U17 (M17)	94G11 (M18)	10/03/1994 22:30	11/30/1994 14:30	
20 T	3 m	08111778	94S14 (M14)	94P06 (M15)	03/31/1994 16:05	05/31/1994 15:05	A
20 T	3 m	08111745	94P06 (M15)	94S13 (M16)	05/31/1994 17:05	08/01/1994 18:35	
20 T	3 m	08111779	94S13 (M16)	94U13 (M17)	08/01/1994 22:00	10/03/1994 19:30	
20 T	3 m	08111744	94U13 (M17)	94G11 (M18)	10/03/1994 20:35	11/30/1994 13:35	
21 B	22 m	DMT215	93S14 (M14)	94P06 (M15)	03/31/1994 20:30	05/28/1994 16:30	
21 B	22 m	DMT145	94P06 (M15)	94S16 (M16)	05/28/1994 21:30	08/01/1994 11:55	C,D,E
21 B	22 m	DMT145	94S16 (M16)	94U17 (M17)	08/01/1994 15:00	10/03/1994 14:10	
21 B	22 m	DMT215	94U17 (M17)	94G11 (M18)	10/03/1994 15:00	11/30/1994 20:25	
21 T	14 m	SSM255	94S14 (M14)	94P06 (M15)	03/31/1994 21:00	05/28/1994 21:00	N
21 T	14 m	SSM285	94S14 (M14)	94S16 (M16)	05/28/1994 22:00	08/01/1994 12:00	
21 T	14 m	SSM285	94S16 (M16)	94U17 (M17)	08/01/1994 15:00	10/03/1994 14:00	
21 T	14 m	SSM279	94S16 (M16)	94G11 (M18)	10/03/1994 15:30	11/30/1994 20:00	
22 B	47 m	LSU030	94S14 (M14)	94P06 (M15)	04/01/1994 02:00	05/29/1994 01:30	
22 B	47 m	LSU055	94U17 (M17)	94G11 (M18)	10/03/1994 03:30	10/19/1994 11:10	H
22 M	20 m	DMT208	93S14 (M14)	94P06 (M15)	04/01/1994 02:00	05/28/1994 20:50	B,D,E
22 M	20 m	DMT215	94P06 (M15)	94S16 (M16)	05/29/1994 03:30	07/31/1994 23:00	
22 M	20 m	DMT215	94S16 (M16)	94U17 (M17)	08/01/1994 03:00	10/03/1994 00:00	K
22 M	20 m	AO005	94U17 (M17)	94G11 (M18)	10/03/1994 04:00	12/01/1994 13:30	
22 T	3 m	08111780	94S14 (M14)	94P06 (M15)	04/01/1994 02:05	05/29/1994 00:35	
22 T	3 m	08111779	94P06 (M15)	94S13 (M16)	05/29/1994 04:05	07/31/1994 22:05	
22 T	3 m	08111744	94S13 (M16)	94U13 (M17)	08/01/1994 02:49	10/03/1994 00:49	
22 T	3 m	08111748	94U13 (M17)	94G11 (M18)	10/03/1994 05:05	12/01/1994 13:05	
23 B	13 m	10092	94P06 (M15)	94S16 (M16)	06/01/1994 16:00	07/31/1994 13:30	
23 B	13 m	10096	94U17 (M17)	94G11 (M18)	10/02/1994 15:00	12/05/1994 15:30	A
23 T	10 m	SSM239	94S14 (M14)	94P06 (M15)	03/30/1994 20:00	06/01/1994 14:00	D,E
23 T	10 m	SSM279	94P06 (M15)	94S16 (M16)	06/01/1994 16:30	07/31/1994 14:00	D,E
23 T	10 m	SSM254	94S16 (M16)	94U17 (M17)	07/31/1994 14:30	10/02/1994 14:00	
23 T	10 m	SSM243	94S16 (M16)	94G11 (M18)	10/02/1994 15:30	12/05/1994 15:30	
24 B	23 m	LSU070	94S14 (M14)	94P06 (M15)	03/30/1994 13:00	06/01/1994 12:00	D,E
24 B	23 m	LSU050	94S16 (M16)	94U17 (M17)	07/31/1994 16:00	10/01/1994 15:00	B,D,E
24 B	23 m	LSU040	94U17 (M17)	94G11 (M18)	10/01/1994 15:30	11/27/1994 14:10	D,E
24 T	7 m	SSM279	94S14 (M14)	94P06 (M15)	03/30/1994 13:00	06/01/1994 12:00	
24 T	10 m	SSM254	94P06 (M15)	94S16 (M16)	06/01/1994 14:30	07/31/1994 12:00	N
24 T	10 m	SSM279	94S16 (M16)	94U17 (M17)	07/31/1994 16:30	10/01/1994 14:00	
24 T	10 m	SSM257	94U17 (M17)	94G11 (M18)	10/01/1994 16:00	12/05/1994 13:00	
48 B	190 m	AA10688	94S14 (M14)	94S16 (M16)	03/25/1994 17:30	07/21/1994 08:00	K
48 B	190 m	AA9410	94S16 (M16)	94G11 (M18)	07/26/1994 02:30	11/17/1994 06:30	A,B,D,E
48 M	100 m	AA10670	94S14 (M14)	94S16 (M16)	03/25/1994 17:30	07/26/1994 00:00	K
48 M	100 m	AA10669	94S16 (M16)	94G11 (M18)	07/26/1994 02:30	12/02/1994 18:00	
48 T	14 m	SSM257	94S14 (M14)	94S16 (M16)	03/25/1994 17:30	07/25/1994 23:30	
48 T	14 m	SSM258	94S16 (M16)	94G11 (M18)	07/26/1994 02:30	12/04/1994 04:30	
49 B	490 m	7171	94S16 (CM16)	94G11 (CM18)	07/30/1994 16:30	12/05/1994 20:00	
49 M	100 m	AA10676	94S14 (M14)	94S16 (M16)	03/30/1994 04:00	07/30/1994 13:30	
49 M	100 m	AA10676	94S16 (M16)	94G11 (M18)	07/30/1994 17:00	12/06/1994 01:00	

Table 3.2.3. LATEX Current Meter Data April 1994 - December 1994. (continued)

Mooring	Depth	S/N	Deploy Cruise	Recover Cruise	Start Data	End Data	Exceptions
49 T	14 m	SSM232	94S14 (M14)	94S16 (M16)	03/30/1994 04:00	07/30/1994 13:00	
49 T	14 m	SSM232	94S16 (M16)	94G11 (M18)	07/30/1994 16:30	12/06/1994 01:00	

Exception Descriptions

A - No Speed Data.	H - Partial data.
B - No Direction data.	I - Temp and Cond scrambled; No data.
C - No Temperature data.	J - Leaked during deployment.
D - No Conductivity data.	K - Conductivity goes bad during deployment.
E - No Salinity Data.	L - Meter tangled in line/wire.
F - Dropped Samples.	M - Missing many 24 hour marks.
G - Self checks in temp. channel.	N - Speed goes bad during deployment.

Table 3.2.4. Maximum speed and corresponding direction observed in 40-hr low-passed current record from each LATEX A mooring during the third field year.

Mooring	Latitude N	Longitude W	Depth (m)	S_{max} (cm/s)	Dir_{max} (°T)	Date
1	27° 19.40'	97° 18.42'	19	28	195	12 Apr 1994
2	27° 17.03'	96° 58.82'	10	56	210	2 Oct 1994
3	27° 17.35'	96° 44.18'	13	45	19	1 Jul 1994
4	27° 07.82'	96° 21.65'	12	48	34	30 Aug 1994
5	27° 27.82'	96° 04.12'	14	43	242	6 Oct 1994
6	27° 42.62'	95° 38.83'	13	38	124	28 Sep 1994
7	27° 50.13'	95° 04.05'	14	57	60	30 Jun 1994
8	27° 49.52'	94° 10.52'	15	57	113	4 Jul 1994
9	27° 48.82'	93° 32.78'	14	46	108	13 Jul 1994
10	27° 56.13'	92° 44.63'	14	31	79	26 Jun 1994
11	27° 50.55'	92° 00.10'	14	30	137	23 Sep 1994
12	Removed					
13	28° 03.33'	90° 29.32'	15	72	57	20 Sep 1994
14	28° 23.75'	90° 29.63'	19	42	273	15 Sep 1994
15	28° 36.48'	90° 29.55'	10	51	275	15 Sep 1994
16	28° 56.33'	90° 29.40'	11	46	258	15 Sep 1994
17	29° 11.87'	91° 57.90'	3	47	305	15 Oct 1994
18	28° 57.73'	91° 59.03'	10	37	301	17 Apr 1994
19	28° 27.90'	92° 02.27'	3	63	279	25 Sep 1994
20	29° 30.03'	94° 01.42'	3	71	92	24 Jun 1994
21	28° 50.27'	94° 04.80'	14	38	94	30 Jun 1994
22	28° 21.33'	93° 57.33'	3	54	214	15 Aug 1994
23	28° 42.82'	95° 32.20'	10	58	243	17 Apr 1994
24	28° 32.22'	95° 23.58'	10	68	81	28 Jun 1994
25	Removed					
44	Removed					
45	Removed					
46	Removed					
47	Removed					
48	27° 58.98'	91° 17.13'	14	40	85	8 Aug 1994
49	27° 22.95'	95° 54.02'	14	45	63	27 Aug 1994

Table 3.2.5. MiniSpec directional wave gauge deployment data.

MiniSpec - Data Ranges -Third Field Year						
Mooring	Deploy.-Recov. Cruise S/N	In Water / Out Water	Pressure Start Data / Stop Data	Current Start Data / Stop Data	Temperature Start Data / Stop Data	Exceptions
	M14 - M15					
1	10094	03/28/94 13:40				
		recovered CM16				
16	10093	03/24/94 12:59	03/24/94 13:30	03/24/94 13:30	03/24/94 13:30	
		05/30/94 19:38	05/30/94 19:30	05/30/94 19:30	05/30/94 19:30	
17	10096	04/01/94 12:49	04/01/94 13:00	04/01/94 13:00	04/01/94 13:00	A
		05/29/94 18:04	04/17/94 00:00	05/29/94 17:30	05/29/94 17:30	
20	10092	03/31/94 13:24	03/31/94 13:30	04/15/94 00:00	03/31/94 13:30	B
		05/31/94 14:59	05/31/94 14:30	05/31/94 14:30	05/31/94 14:30	
23		not				
		deployed				
	M15 - M16					
1	10094	03/28/94 13:40	03/28/94 14:00	03/28/94 14:00	03/28/94 14:00	
		07/29/94 12:01	07/29/94 11:30	07/29/94 11:30	07/29/94 11:30	
16	10096	05/30/94 19:38	05/30/94 20:00	05/30/94 20:00	05/30/94 20:00	A
		07/26/94 11:54	06/02/94 01:00	07/26/94 11:00	07/26/94 11:00	
17		not				
		deployed				
20	10093	05/31/94 15:00	05/31/94 15:30	05/31/94 15:30	05/31/94 15:30	
		07/31/94 19:02	08/01/94 18:30	08/01/94 18:30	08/01/94 18:30	
23	10092	06/01/94 15:31	06/01/94 16:00	06/01/94 16:00	06/01/94 16:00	B
		07/31/94 14:04	07/31/94 13:30	07/31/94 13:30	07/31/94 13:30	
	M16 - M17					
1	10094	07/29/94 16:59				
		recovered CM18				
16		not				
		deployed				
17		not				
		deployed				
20	10093	08/01/94 15:00	08/01/94 23:00	08/01/94 23:00	no data	C
		10/03/94 17:00	10/03/94 17:00	10/03/94 17:00	no data	
23		not				
		deployed				

Table 3.2.5. MiniSpec directional wave gauge deployment data (continued).

MiniSpec - Data Ranges -Third Field Year (Continued)						
Mooring	Deploy.-Recov. Cruise S/N	In Water / Out Water	Pressure Start Data / Stop Data	Current Start Data / Stop Data	Temperature Start Data / Stop Data	Exceptions
		M17 - M18				
1	10094	07/29/94 16:59	07/29/94 19:00	07/29/94 19:00	07/29/94 19:00	A C
		12/06/94 14:25	12/03/94 04:00	12/06/94 13:00	12/06/94 13:00	
16		not				
		deployed				
17		not				
		deployed				
20	10093	10/03/94 21:31	10/03/94 22:30	10/03/94 22:30	10/03/94 22:30	
		11/30/94 14:43	11/30/94 14:30	11/30/94 14:30	11/30/94 14:30	
23	10096	10/02/94 14:45	10/02/94 15:30	no data	10/02/94 15:30	B D
		12/05/94 15:57	12/05/94 15:30	no data	12/05/94 15:30	

Exception Descriptions
A - Pressure sensor failure
B - Current sensor failure
C - No average mode data
D - No burst pressure data

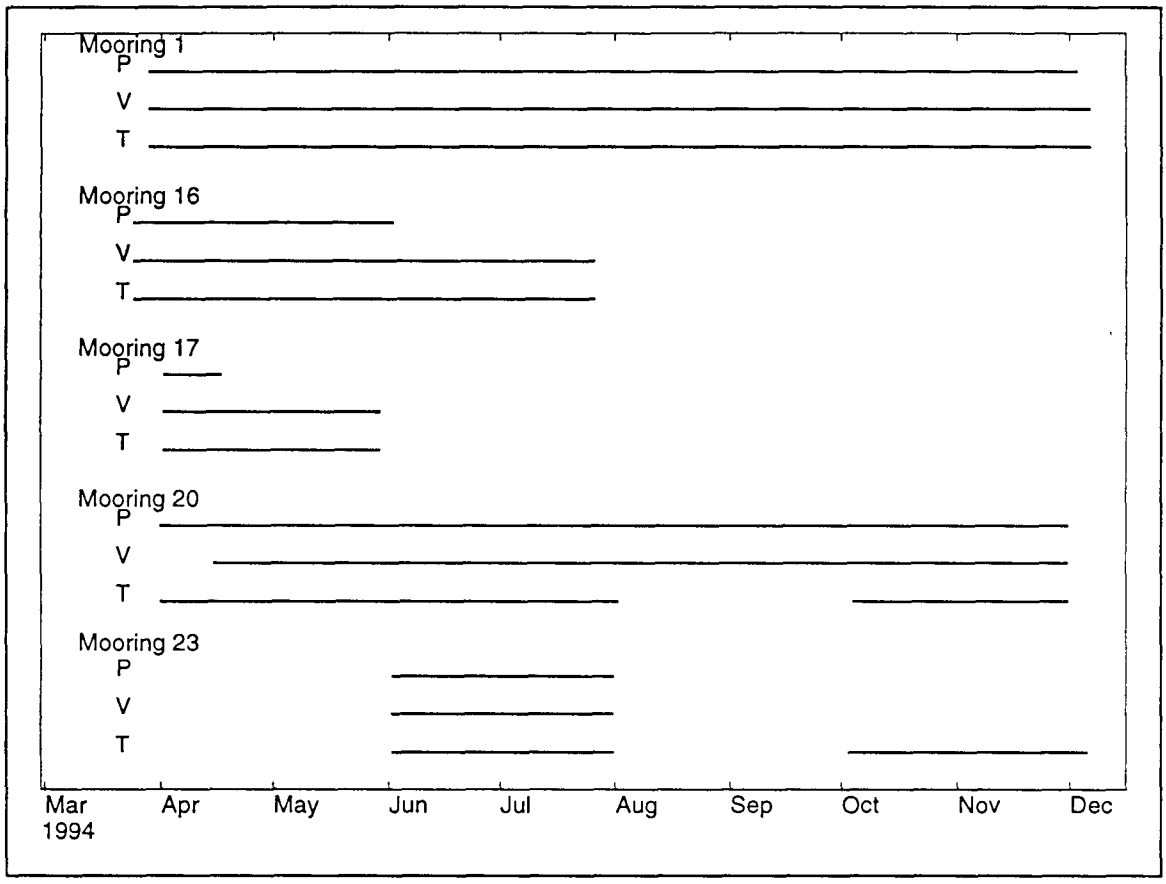

Figure 3.2.3. Timelines of MiniSpec data returns during the third field year. P = pressure, V = current velocity, and T = temperature.

The absence of average data presents a unique problem with the QA/QC of this data set. Since their calibration at NOAA's Northwest Regional Calibration Center in the summer of 1993 (Kelly et al. 1993), on 13 of 22 MiniSpec deployments the instruments were configured to record burst temperature. For those deployments where burst temperature was not recorded, temperature recorded in the average mode was used to calibrate the pressure sensors. S/N 10093 recovered on M17 was not configured to record burst temperature and, therefore, recorded no temperature data during this deployment period. The pressure data were calibrated using sea-surface temperature measured by the InterOcean S4 current meter moored several meters above the MiniSpec.

Three MiniSpecs were recovered on cruise M18: S/N 10093, 10094, and 10096, at moorings 20, 1, and 23, respectively. S/N 10093 and 10096 had been deployed in October 1994 on M17, while S/N 10094 was deployed in July 1994 on M16. The pressure, temperature, and current velocity data of S/N 10093 appear reasonable with no obvious malfunction of the instrument's sensors. The instrument was not set to record temperature while in burst mode, so average mode temperature data was used when applying the LATEX pressure calibration parameters. The orientation angles measured by the divers, however, are highly suspect. Upon deployment of this instrument the measured orientation of the +v velocity component was 225°. Upon recovery this orientation was 20°. Directional parameters calculated for this instrument are flagged as questionable.

S/N 10094 failed to record any data in average mode. Burst temperature was recorded. Wave statistics from pressure and velocity data recorded by this instrument indicated that the pressure sensor malfunctioned around 04:00Z on 3 December 1994. The malfunction also was evident in the tidal mode pressure data. These pressure data are flagged as questionable. Directional parameters measured by this meter are suspect and also marked as questionable.

Because of a current sensor malfunction, S/N 10096 failed to record any current velocities. It also failed to record any burst pressure data because it was set to record x-y current and temperature only. Therefore, this instrument recorded only temperature and average pressure. Gaps in the average pressure record were filled by linear interpolation of the tidal mode pressure record.

3.2.3.3 Meteorological Data

Internally-recorded, meteorological data collected during the third year of deployment were recovered during mooring maintenance cruises M15 through M18. Table 3.2.6 summarizes the recovery results for the third field year. Calibrations and processing of the data from the meterological buoys were completed as described in section 2.2.3.3 of Jochens and Nowlin (1994b).

Table 3.2.6. Meteorological data recovered April - December 1994.

Mooring	Deploy Cruise	Recovery Cruise	Start Data		End Data		Exceptions
17	M16	M17	07/24/1994	12:00	09/27.1994	13:00	a,d,e,f
17	M17	M18	10/04/1994	09:00	12/02/1994	22:00	b
19	M14	M15	03/24/1994	00:35	05/29/1994	21:35	a,c,d
19	M15	M16	05/30/1994	01:00	07/24/1994	14:00	
19	M16	M17	07/24/1994	20:00	09/30/1994	11:00	
19	M17	M18	09/30/1994	15:45	12/02/1994	10:45	
20	M14	M15	03/31/1994	14:30	05/31/1994	11:30	f,h
20	M16	M17	08/01/1994	20:30	10/03/1994	15:30	b
20	M17	M18	10/03/1994	20:25	11/30/1994	11:25	f
22	M14	M15	04/01/1994	01:00	05/28/1994	22:00	
22	M15	M16	05/29/1994	02:30	07/28/1994	22:30	
22	M16	M17	08/01/1994	01:45	10/02/1994	22:45	c
22	M17	M18	10/03/1994	03:09	12/01/1994	12:09	b,d
50	M14	M15	03/30/1994	23:54	05/31/1994	19:54	
51	M14	M15	03/31/1994	19:30	05/28/1994	17:30	
52	M14	M15	04/01/1994	06:00	05/29/1994	07:00	b,c,d

Exceptions

a. Significant part of the wind direction record flagged as bad.
b. Significant part of the wind speed record flagged as bad.
c. Significant part of the pressure record flagged as bad.
d. Significant part of the air temperature record flagged as bad.
e. Significant part of the sea temperature record flagged as bad.
f. Entire wind direction record flagged as bad.
g. Entire wind speed record flagged as bad.
h. Entire pressure record flagged as bad.
i. Entire air temperature record flagged as bad.
j. Entire sea temperature record flagged as bad.
k. Suspect wind direction.
l. Suspect air temperature.

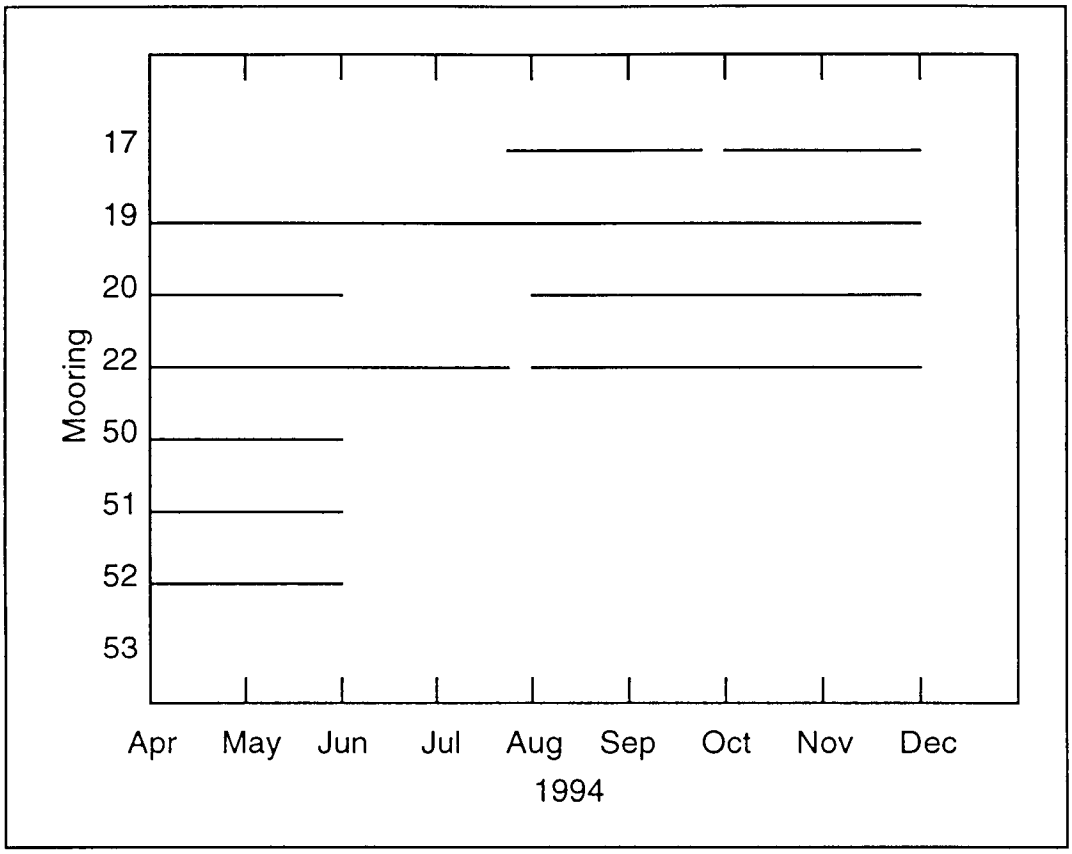

Figure 3.2.4. Meteorological buoy data recovered during the third field year.

3.2.3.4 Cyclogenesis Study

Cyclogenesis is defined as any development or strengthening of cyclonic circulation in the atmosphere. The term is applied here to the development of low-pressure systems over the northwestern Gulf of Mexico. Between 1972 and 1983, an average of 10.4 winter cyclones developed each year over the LATEX region. Of these, 5 to 6 cyclones per year developed central pressures at or below 1010 mb. The period April - December 1994 saw a total of 17 cyclogenesis events, of which 11 attained central pressures of or below 1010 mb or at least class 2 in Hsu's (1993) classification scheme (Table 3.2.7).

Table 3.2.7. Winter cyclogenesis over the northwestern Gulf of Mexico, April through December 1994

Month	Beginning Day*	Intensity**
April	19	1
April	22	2
May	2	1
May	14	2
June	2	2
June	21	1
September	9	0
September	14	0
September	15	2
September	22	2
October	1	3
October	8	2
October	29	2
November	29	1
December	3	2
December	28	2
December	31	2

* The beginning date listed marked the first appearance over the northwestern Gulf of either the letter "L" or the word "Low" or a closed isobar on the 0700 EST NOAA Daily Weather Map.

** The intensity classification is based on Hsu (1993). The data source is "Daily Weather Maps", published weekly by NOAA.

3.2.3.5 IES Data

One inverted echo sounder (Sea Data Model 1665) was placed with an acoustic release within one meter of the sea bed in 1500 m of water at mooring 42 in July 1993. It was recovered in July 1994. The IES data has been converted to engineering units by Earl Childress of Woods Hole Instruments System, Ltd. The instrument was not redeployed.

3.3 Drifting Buoy Measurements

3.3.1 Deployment Times and Locations

Six satellite-tracked drifting buoys (drifters) were released in the LATEX study area in the third year of the field program. The last three of the original sixteen LATEX A drifters were released 1 May 1994 during cruise H08. Three additional drifters donated to the LATEX A program by Dr. Thomas Berger of SAIC were deployed 3 November 1994 during cruise H10. The donated drifters were of the same holey-sock design as the original sixteen except that two, 07834 and 07833, were drogued at 50 m and one, 07839, was drogued at 100 m. The original sixteen drifters were drogued at 9 m.

According to the contract, drifters were to be implaced on both sides of the coastal frontal boundary zone, mid-shelf, and near the shelf break on each deployment cruise. In May 1994, as in the previous May, drifters released by another MMS-sponsored program, the Surface Current Lagrangian Program (SCULP) were active in the inner to mid-shelf region. Consequently, the LATEX A drifters were released near the shelf break at approximately the same locations as in the May 1993 deployment. In the November 1994 deployment, the donated drifters were released at the eastern end of the LATEX study area near the shelf break. The locations were chosen to be compatible with the longer tethers and to support the study of the cross-shelf flow near the shelf break during the passage of a Loop Current eddy.

Table 3.3.1 lists the drifting buoys by their Platform Transmitter Terminal identification numbers (ARGOS ID) along with dates and times of their operation, release locations, and the number of days that transmissions were received.

Table 3.3.1. LATEX A drifter deployment dates and disposition.

ARGOS ID	Dates	Time(UTC)	Latitude	Longitude	Gulf Data
06940	01-May-94	07:15	27°59.6'N	94°02.1'W	26 days
	26-May-94	15:04	28°14.0'N	93°21.9'W	
03584	01-May-94	10:08	27°47.6'N	94°11.9'W	60 days
	29-June-94	02:07	29°15.7'N	93°11.4'W	
06936	01-May-94	08:29	27°54.5'N	94°10.1'W	11 days
	11-June-94	23:27	28°45.7'N	91°46.1'W	
07839	03-Nov-94	11:53	27°56.7'N	91°32.3'W	165 days
	17-April-95	15:28	43°50.0'N	42°52.9'W	
07834	03-Nov-94	19:29	28°02.6'N	90°38.5'W	13 days
	15-Nov-94	23:06	27°51.5'N	90°29.9'W	
07833	03-Nov-94	15:41	28°00.7'N	91°05.5'W	54 days
	26-Dec-94	00:26	26°54.8'N	79·56.9'W	

3.3.2 Instrumentation and Sampling Procedures

A physical description of the drifting buoys, their instrumentation, data recovery methods, predeployment tasks, and bench testing were described in section 9.5 of Nowlin

et al. (1991) and section 2.3.2 of Jochens and Nowlin (1994b). A description of the deployment method was described in Jochens and Nowlin (1995).

3.3.3 Summary of Data Collection

Details of the steps used to process the drifting buoy data can be found in section 2.3.3 of Jochens and Nowlin (1994b). A change in the processing was made in the third year. In the past, only those temperatures accompanying locations were retained. However, in the method used by Service ARGOS to determine locations, more temperature observations are collected than locations. Service ARGOS determines a drifter's location based on repeated measurements of the Doppler shift as the satellite passes across the horizon. This method results in multiple messages being received by the satellite over a wide angle. At times, either the number of messages are too few or the angle between them is too small and no location is generated during that pass; however, a temperature observation accompanies each message. Thus, whether a location is determined or not, there are always more temperature measurements than locations. The change in procedure is that all temperatures were retained during the spline-fitting process described in the earlier reports, and all drifter data sets have been reprocessed in this way.

Following their release, drifters 06936, 03584, and 06940 moved in near-parallel trajectories for three weeks, at first towards the northwest across the shelf then northeast alongshelf. Drifter 06940 stopped transmitting after 25 days. The two remaining buoys continued to drift northeast until early June, when the inshore drifter, 06940, turned northward and 06936 took a more easterly route. In the second week of June, drifter 06936 was captured by unknown persons and taken to Brownsville, Texas, where it continued transmitting for approximately ten months. Drifter 03584 moved downcoast the third week of June and upcoast the fourth week. This behavior was similar in timing and trajectory to that of drifters released in May of 1993.

In November 1994, a Loop Current eddy was located south of the Mississippi delta and was slowly translating westward. Three drifters were deployed northeast of the eddy near the 200-m isobath. Initially, all three drifters moved offshore and clockwise around the north wall of the eddy. Drifter 07833 was captured three days later by personnel aboard a supply boat. They returned with the drifter to Morgan City, Louisiana, and telephoned to report the find. They were asked to redeploy the drifter where they found it and they did so within three days of its recovery. Drifters 07833 and 07839 drifted southward along the eastern limb of the ring. In December they left the ring and joined the northward flowing limb of the Loop Current. Both drifters exited the Gulf of Mexico around 20 December. Drifter 07833 ceased transmitting shortly thereafter. Drifter 07839 continued to travel with the Gulf Stream to the northern mid-Atlantic Ocean. The last message was transmitted on 17 April 1995 from 43°48'N, 42°54'W. Initially, the third drifter, 07834, paralleled the trajectory of drifters 07833 and 07839; however, 07834 was captured 12 days after release by unknown persons. It moved in and out of Morgan City in a pattern that suggests that the boat was a fishing vessel.

3.4 Hydrographic Measurements

3.4.1 Synopsis of Hydrographic Surveys

For the third field year, the second field year hydrographic survey plan was modified to sample the shelf more effectively. LATEX A, with concurrence of MMS and the LATEX Science Advisory Panel, extended cross-shelf transect lines seaward to about the

1000-m isobath by reducing the number of stations across the shelf and adding two deep-water stations. This change was instituted after it was determined during the year two cruises that shelf-edge processes could be better defined by extending the cross-shelf transects into deeper water. To provide the ship time needed for this extension, the 50-m isobath alongshelf transect line was eliminated for all cruiss in year three. Each cruise covered the entire Texas-Louisiana shelf from south of Terrebonne Bay, Louisiana, to Brownsville, Texas. Carrie A. Neuhard of Texas A&M University served as Chief Scientist on all three LATEX A hydrography cruises in the third field year.

3.4.1.1 Cruise H08CGY9401

The eighth LATEX Shelf hydrographic survey (H08) was conducted in one leg from the R/V *Gyre*, departing Galveston, Texas, on 23 April 1994 and returning 07 May 1994. Figure 3.4.1 shows the station locations and the cruise track followed during the survey. Table 3.4.1 gives the station number, date and time, location, water depth and number of bottles tripped at each station. Hydrographic stations were occupied at 170 locations. Three AGROS-tracked drifting buoys were launched during cruise H08 (Table 3.3.1).

Seven complementary programs were accommodated on this cruise. Primary production measurements were taken by Gaston Gonzales, a graduate student of Dr. Sayed El-Sayed at TAMU. Measurements of photosynthesis vs. irradiance were made at 22 stations by Xiaogang Chen, a graduate student of Dr. Steve Lohrenz at the Center for Marine Sciences, USM. Gravity cores were collected at 126 sites for sediment analysis by Dan Bean, a graduate student of Dr. Niall Slowey (TAMU). Six additional gravity cores were collected for Youcheng Zhang, a graduate student of Dr. Wilford Gardner at TAMU who deploys sediment traps as part of LATEX B. Box cores were taken at 12 stations and excess water from 52 stations was collected for Dr. Enriqueta Barrera of the University of Michigan's Department of Geology, for analysis of oxygen, nitrogen, and carbon isotopes. Zooplankton samples were preserved by Cammie Coulter, a research technician who conducted sampling for Dr. Ed Buskey of UTMSI.

This was the only LATEX hydrography cruise during which bottom samples were collected. The surface sediment samples from the cores will be analyzed by other investigators for organic carbon, carbonate content, and grain size distribution. These data will help interpret the LATEX suspended particulate material measurements. Additional funding for the ship time needed to collect the cores was provided by Dr. Kathleen Fisher of the Naval Research Laboratory, Stennis Space Center, Mississippi.

3.4.1.2 Cruise H09CPW9410

The ninth LATEX A hydrography cruise (H09) was conducted in one leg from the R/V *J.W. Powell*, departing Galveston, Texas, on 26 July 1994 and returning 07 August 1994. Figure 3.4.2 shows the station locations and the cruise track. Table 3.4.2 gives the station number, date and time, location, water depth, and number of bottles tripped for each station. Hydrographic stations were occupied at 170 locations.

Sampling for four complementary research programs was undertaken during the cruise. Primary production measurements were made at nine stations by Gaston Gonzales, a graduate student of Dr. Sayed El-Sayed at TAMU. Measurements of phytosynthesis vs. irradiance profiles in the ocean were made at 17 stations by Xiaogang Chen, a graduate student of Dr. Steven Lohrenz at USM. Water samples from 59 locations were collected

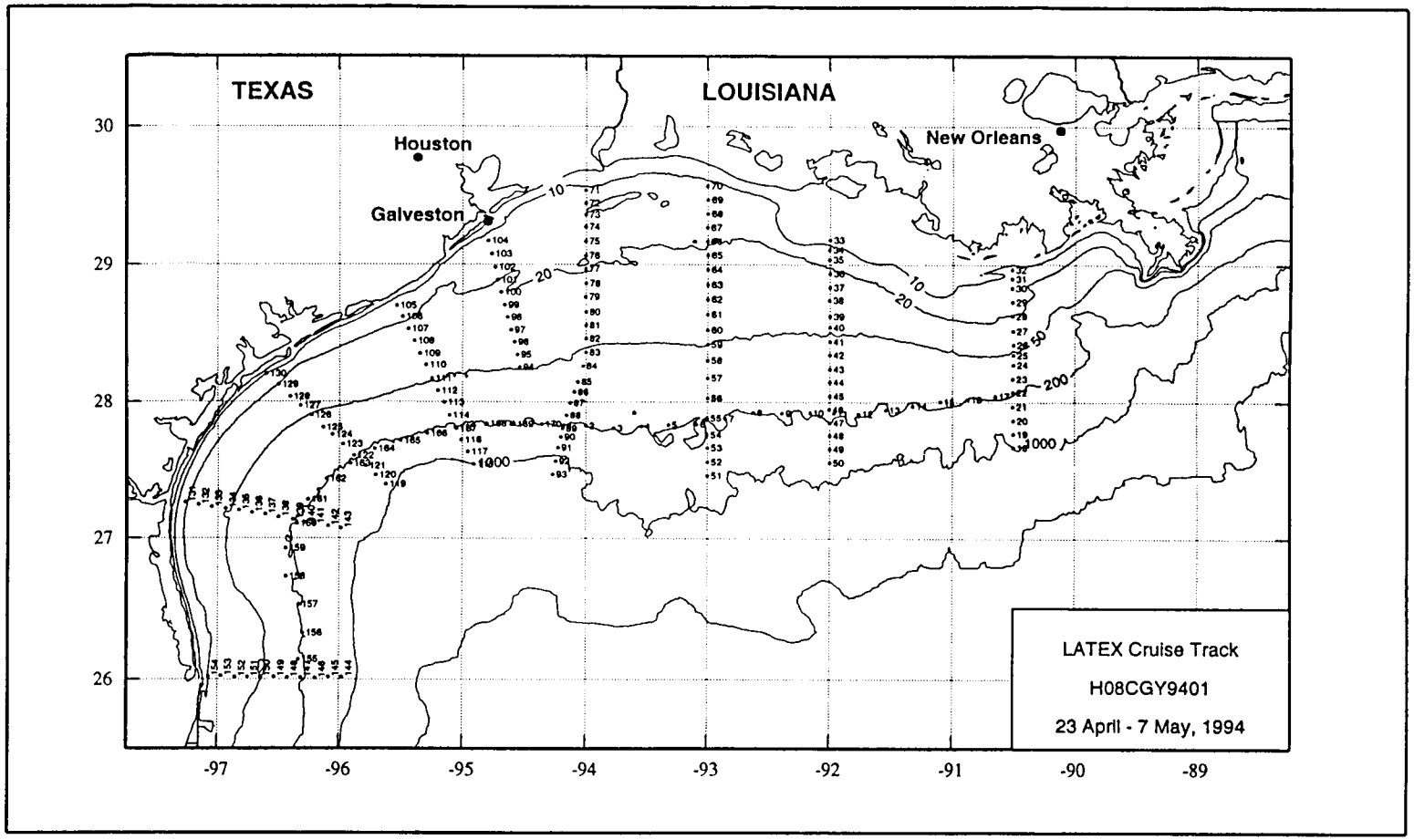

Figure 3.4.1. CTD stations and cruise track, LATEX H08.

Table 3.4.1. Station times and positions for LATEX A cruise H08.

Station	Date	Time (UTC)	Latitude N	Longitude W	Depth	Niskins
1	24APR94	1823	27°49.65'	94°10.84'	170	12
2	24APR94	2032	27°49.23'	94°00.02'	206	12
3	24APR94	2301	27°48.29'	93°46.27'	193	12
4	25APR94	0200	27°49.03'	93°32.57'	199	12
5	25APR94	0408	27°49.87'	93°19.14'	148	12
6	25APR94	0638	27°50.08'	93°05.29'	182	12
7	25APR94	0933	27°52.51'	92°51.39'	213	12
8	25APR94	1148	27°55.16'	92°37.47'	192	12
9	25APR94	1402	27°55.13'	92°23.39'	87	9
10	25APR94	1603	27°55.14'	92°09.97'	143	12
11	25APR94	1800	27°54.95'	91°57.93'	140	12
12	25APR94	2103	27°54.78'	91°45.89'	172	11
13	25APR94	2317	27°56.62'	91°32.67'	230	8
14	26APR94	0152	27°58.14'	91°19.54'	267	12
15	26APR94	0428	28°00.39'	91°05.85'	136	11
16	26APR94	0636	28°01.37'	90°52.41'	189	12
17	26APR94	0851	28°02.72'	90°38.58'	163	12
18	26APR94	1254	27°39.71'	90°29.99'	925	12
19	26APR94	1542	27°45.72'	90°29.99'	820	12
20	26APR94	1808	27°51.71'	90°30.00'	650	12
21	26APR94	2028	27°57.97'	90°30.13'	441	12
22	26APR94	2244	28°04.64'	90°30.19'	151	12
23	27APR94	0011	28°10.47'	90°30.29'	95	11
24	27APR94	0134	28°16.81'	90°30.00'	62	9
25	27APR94	0235	28°21.00'	90°29.97'	50	7
26	27APR94	0359	28°25.42'	90°29.97'	45	7
27	27APR94	0525	28°31.63'	90°30.19'	36	6
28	27APR94	0635	28°37.96'	90°30.35'	22	5
29	27APR94	0755	28°43.95'	90°30.37'	19	5
30	27APR94	0854	28°49.98'	90°30.61'	20	5
31	27APR94	0950	28°54.00'	90°30.61'	15	4
32	27APR94	1101	28°58.11'	90°30.63'	13	4
33	27APR94	2118	29°10.86'	92°00.00'	5	5
34	27APR94	2245	29°06.59'	92°00.06'	11	4
35	27APR94	2350	29°02.29'	92°00.10'	15	5
36	28APR94	0115	28°56.23'	91°59.98'	20	5
37	28APR94	0230	28°50.27'	92°00.00'	24	6
38	28APR94	0349	28°44.71'	92°00.09'	30	6
39	28APR94	0519	28°37.74'	91°59.89'	39	6
40	28APR94	0630	28°33.03'	91°59.86'	44	6
41	28APR94	0742	28°26.77'	91°59.87'	55	7
42	28APR94	0912	28°21.13'	91°59.80'	61	7
43	28APR94	1032	28°14.70'	91°59.90'	69	7
44	28APR94	1210	28°08.93'	91°59.93'	83	11
45	28APR94	1337	28°02.71'	91°59.96'	106	12
46	28APR94	1517	27°56.81'	92°00.07'	100	10
47	28APR94	1644	27°50.69'	91°59.98'	198	12
48	28APR94	1822	27°44.93'	91°59.91'	495	12
49	28APR94	2015	27°38.95'	91°59.95'	842	12
50	28APR94	2232	27°32.94'	91°59.97'	736	12
51	29APR94	0632	27°27.41'	92°59.96'	953	12
52	29APR94	0911	27°33.41'	92°59.95'	661	12

Table 3.4.1. Station times and positions for LATEX A cruise H08 (continued).

Station	Date	Time (UTC)	Latitude N	Longitude W	Depth	Niskins
53	29APR94	1108	27°39.42'	92°59.93'	316	12
54	29APR94	1240	27°45.27'	93°00.16'	205	12
55	29APR94	1428	27°52.86'	93°00.12'	190	12
56	29APR94	1608	28°01.82'	92°59.87'	102	10
57	29APR94	1733	28°10.84'	92°59.92'	71	10
58	29APR94	1858	28°18.50'	92°59.89'	52	8
59	29APR94	2016	28°25.38'	92°59.92'	48	8
60	29APR94	2132	28°31.86'	92°59.97'	43	7
61	29APR94	2253	28°38.40'	92°59.92'	33	7
62	29APR94	2356	28°44.92'	92°59.93'	30	6
63	30APR94	0108	28°51.41'	93°00.00'	25	5
64	30APR94	0206	28°57.82'	92°59.99'	22	5
65	30APR94	0311	29°03.99'	92°59.97'	22	5
66	30APR94	0419	29°10.04'	93°00.06'	18	5
67	30APR94	0515	29°15.94'	93°00.19'	18	5
68	30APR94	0618	29°22.01'	92°59.98'	14	4
69	30APR94	0729	29°27.93'	92°59.97'	13	4
70	30APR94	0831	29°34.06'	93°00.08'	10	4
71	30APR94	1431	29°32.04'	94°00.17'	11	4
72	30APR94	1540	29°26.63'	94°00.10'	12	4
73	30APR94	1629	29°21.61'	94°00.13'	10	4
74	30APR94	1728	29°16.19'	94°00.10'	13	5
75	30APR94	1825	29°10.01'	94°00.08'	16	5
76	30APR94	1926	29°03.77'	94°00.14'	19	5
77	30APR94	2017	28°57.91'	94°00.12'	17	5
78	30APR94	2116	28°51.88'	93°59.96'	25	6
79	30APR94	2209	28°46.00'	94°00.07'	25	6
80	30APR94	2309	28°39.62'	93°59.94'	29	6
81	01MAY94	0016	28°33.81'	93°59.93'	37	7
82	01MAY94	0117	28°27.94'	93°59.97'	43	6
83	01MAY94	0219	28°21.94'	94°00.00'	51	7
84	01MAY94	0334	28°16.00'	94°01.28'	58	8
85	01MAY94	0438	28°08.96'	94°03.76'	66	8
86	01MAY94	0537	28°04.64'	94°05.52'	70	8
87	01MAY94	0634	27°59.52'	94°07.50'	82	9
88	01MAY94	0747	27°54.13'	94°09.32'	96	10
89	01MAY94	0921	27°47.97'	94°11.42'	269	12
90	01MAY94	1038	27°44.25'	94°12.22'	442	12
91	01MAY94	1215	27°39.61'	94°13.47'	427	11
92	01MAY94	1421	27°33.60'	94°14.64'	662	12
93	01MAY94	1612	27°27.73'	94°16.20'	1012	12
94	01MAY94	2348	28°15.60'	94°32.41'	49	6
95	02MAY94	0052	28°21.00'	94°33.57'	43	7
96	02MAY94	0159	28°26.40'	94°35.15'	39	7
97	02MAY94	0304	28°31.77'	94°36.60'	34	7
98	02MAY94	0404	28°37.18'	94°38.42'	29	7
99	02MAY94	0509	28°42.56'	94°39.89'	26	6
100	02MAY94	0623	28°48.00'	94°41.46'	18	5
101	02MAY94	0724	28°53.38'	94°43.23'	20	5
102	02MAY94	0824	28°58.76'	94°44.45'	17	4
103	02MAY94	0932	29°04.44'	94°46.24'	18	4
104	02MAY94	1043	29°10.16'	94°47.98'	14	4

Table 3.4.1. Station times and positions for LATEX A cruise H08 (continued).

Station	Date	Time (UTC)	Latitude N	Longitude W	Depth	Niskins
105	02MAY94	1604	28°42.20'	95°32.20'	16	4
106	02MAY94	1659	28°37.45'	95°29.30'	18	4
107	02MAY94	1759	28°32.36'	95°26.34'	26	5
108	02MAY94	1905	28°27.00'	95°23.47'	30	6
109	02MAY94	2014	28°21.62'	95°20.85'	33	7
110	02MAY94	2139	28°16.42'	95°17.84'	38	7
111	02MAY94	2248	28°10.43'	95°15.06'	47	7
112	02MAY94	2358	28°05.02'	95°12.11'	56	7
113	03MAY94	0109	27°59.64'	95°09.10'	76	9
114	03MAY94	0208	27°54.07'	95°06.41'	108	11
115	03MAY94	0321	27°48.55'	95°03.57'	265	12
116	03MAY94	0455	27°43.01'	95°00.68'	508	12
117	03MAY94	0645	27°37.69'	94°57.58'	704	12
118	03MAY94	0938	27°32.38'	94°54.81'	853	12
119	03MAY94	1455	27°23.40'	95°37.32'	920	12
120	03MAY94	1701	27°27.61'	95°42.13'	704	12
121	03MAY94	1845	27°31.49'	95°47.11'	519	12
122	03MAY94	2026	27°36.11'	95°52.68'	187	12
123	03MAY94	2142	27°41.12'	95°58.25'	101	10
124	03MAY94	2251	27°45.31'	96°03.31'	77	7
125	03MAY94	2348	27°48.62'	96°07.86'	66	7
126	04MAY94	0102	27°53.97'	96°13.51'	49	6
127	04MAY94	0158	27°58.20'	96°18.94'	36	6
128	04MAY94	0254	28°02.39'	96°24.05'	26	5
129	04MAY94	0359	28°07.81'	96°30.02'	18	5
130	04MAY94	0503	28°12.60'	96°36.04'	9	4
131	04MAY94	1155	27°15.42'	97°16.05'	17	4
132	04MAY94	1255	27°14.42'	97°09.61'	24	5
133	04MAY94	1357	27°13.54'	97°03.12'	32	6
134	04MAY94	1456	27°12.69'	96°56.22'	42	8
135	04MAY94	1600	27°11.91'	96°49.60'	56	8
136	04MAY94	1717	27°11.05'	96°42.91'	71	9
137	04MAY94	1817	27°10.17'	96°36.37'	88	10
138	04MAY94	1918	27°09.09'	96°29.80'	113	12
139	04MAY94	2042	27°08.11'	96°22.81'	184	12
140	04MAY94	2205	27°06.88'	96°16.97'	314	12
141	04MAY94	2326	27°05.98'	96°12.59'	443	12
142	05MAY94	0108	27°05.27'	96°05.25'	613	12
143	05MAY94	0252	27°04.31'	95°58.92'	721	12
144	05MAY94	1105	26°00.97'	95°58.34'	1030	12
145	05MAY94	1317	26°00.99'	96°05.13'	821	12
146	05MAY94	1510	26°00.62'	96°11.56'	652	12
147	05MAY94	1653	26°00.80'	96°18.66'	210	12
148	05MAY94	1808	26°00.71'	96°25.25'	84	8
149	05MAY94	1918	26°00.96'	96°31.83'	59	7
150	05MAY94	2022	26°00.98'	96°38.62'	48	7
151	05MAY94	2119	26°00.96'	96°44.99'	44	6
152	05MAY94	2218	26°00.96'	96°51.45'	36	6
153	05MAY94	2322	26°01.48'	96°58.11'	29	6
154	06MAY94	0018	26°01.37'	97°04.54'	19	5
155	06MAY94	0519	26°08.61'	96°19.93'	235	12
156	06MAY94	0710	26°19.80'	96°17.85'	262	12

Table 3.4.1. Station times and positions for LATEX A cruise H08 (continued).

Station	Date	Time (UTC)	Latitude N	Longitude W	Depth	Niskins
157	06MAY94	0912	26°31.82'	96°19.93'	302	12
158	06MAY94	1124	26°43.76'	96°26.25'	206	12
159	06MAY94	1322	26°55.82'	96°26.25'	207	12
160	06MAY94	1507	27°06.31'	96°20.73'	230	12
161	06MAY94	1731	27°16.79'	96°15.21'	204	12
162	06MAY94	1921	27°25.79'	96°06.24'	205	12
163	06MAY94	2114	27°32.41'	95°54.48'	273	12
164	06MAY94	2310	27°39.04'	95°42.68'	250	12
165	07MAY94	0106	27°42.49'	95°30.13'	312	12
166	07MAY94	0302	27°45.69'	95°17.21'	267	12
167	07MAY94	0458	27°47.90'	95°02.91'	307	12
168	07MAY94	0653	27°50.16'	94°48.58'	238	12
169	07MAY94	0841	27°50.13'	94°35.31'	272	12
170	07MAY94	1033	27°50.05'	94°21.66'	172	12

for Dr. Enriqueta Barrera of the Department of Geology at the University of Michigan, for analysis of oxygen, nitrogen, and carbon isotopes as part of her study of planktonic foraminifera. Phytoplankton water samples were preserved from 31 stations and 12 plankton net tows were collected for Paula Bontempi, a TAMU graduate student working on a project funded by the Office of Naval Research. The Naval Oceanographic Office, Stennis Space Center, Mississippi, provided a K-meter to measure the diffuse attenuation coefficient of light at three stations.

3.4.1.3 Cruise H10CGY9409

The tenth and final LATEX A hydrography cruise (H10) was conducted in one leg from the R/V *Gyre*, departing Galveston, Texas, on 02 November 1994 and returning 14 November 1994. Figure 3.4.3 shows the station locations and the cruise track. Table 3.4.3 gives the station number, date and time, location, water depth, and number of bottles tripped for each station. Hydrographic stations were occupied at 171 locations. Sixty-one XBTs were launched at intervals between stations along the 200-m isobath. Three AGROS-tracked drifting buoys were launched during cruise H10 (Table 3.3.1).

Five complementary research efforts were accommodated. Primary production measurements were made at ten stations by Gaston Gonzales, graduate student of Dr. Sayed El-Sayed at TAMU. Measurements of photosynthesis vs. irradiance were made at 21 stations by Xiaogang Chen, a graduate student of Dr. Steve Lohrenz at the Center for Marine Sciences, USM. Water samples from 59 stations were collected for Dr. Enriqueta Barrera of the University of Michigan Department of Geology for analysis of oxygen, nitrogen and carbon isotopes. Phytoplankton water samples were preserved from 31 stations and 12 plankton net tows were collected for Paula Bontempi, a TAMU graduate student working on a project funded by the Office of Naval Research. Water samples were preserved for zooplankton identification by Noe Barrera, who collected the samples for Dr. Ed Buskey of UTMSI.

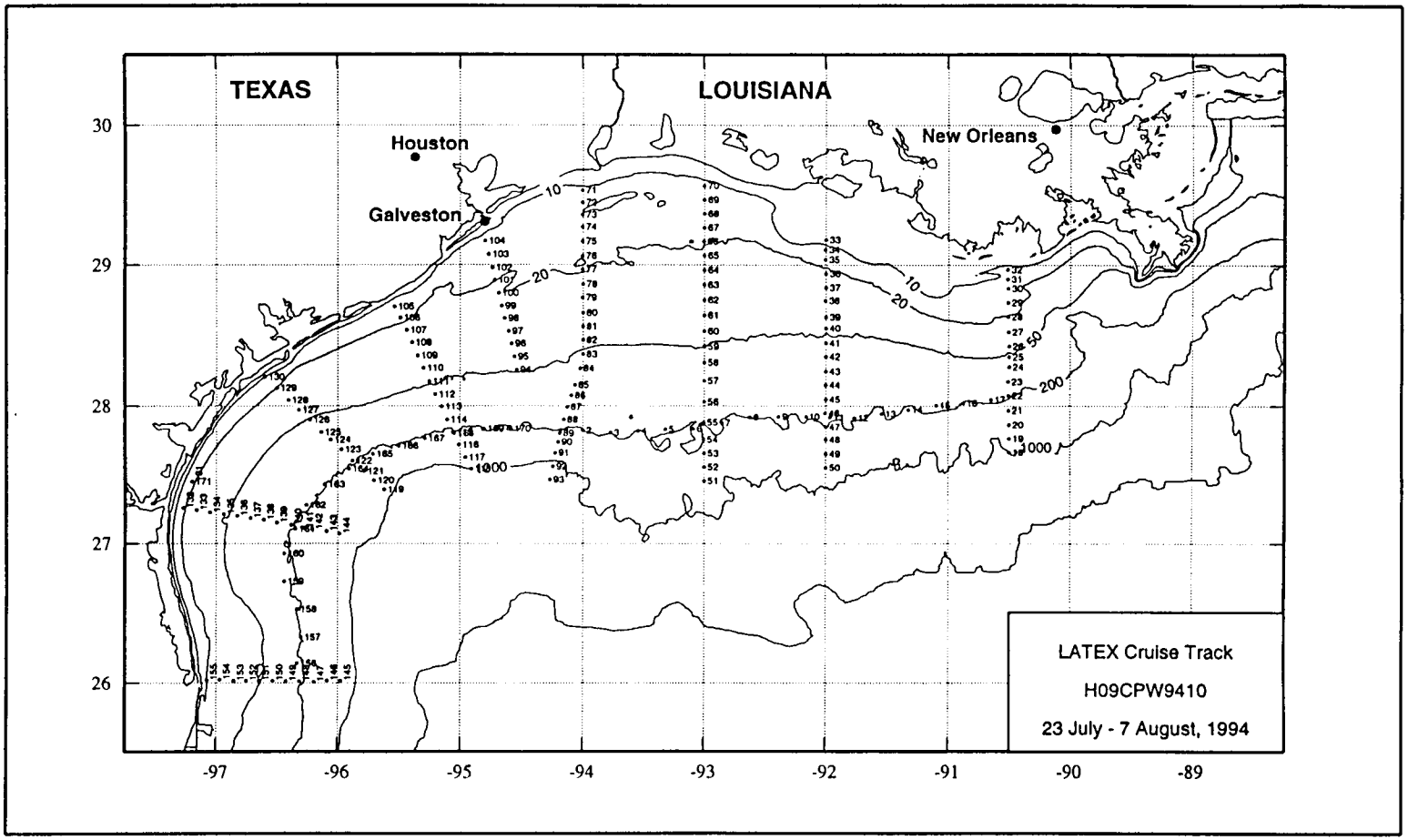

Figure 3.4.2. CTD stations and cruise track, LATEX H09.

Table 3.4.2. Station times and positions for LATEX A cruise H09.

Station	Date	Time (UTC)	Latitude N	Longitude W	Depth	Niskins
1	27JUL94	1342	27°49.65'	94°10.84'	168	12
2	27JUL94	1527	27°49.24'	94°00.02'	194	12
3	27JUL94	1802	27°48.28'	93°46.27'	192	12
4	27JUL94	1953	27°48.98'	93°32.54'	201	12
5	27JUL94	2137	27°49.83'	93°19.13'	151	12
6	27JUL94	2311	27°50.07'	93°05.27'	173	12
7	28JUL94	0106	27°52.49'	92°51.38'	222	12
8	28JUL94	0418	27°55.13'	92°37.46'	199	12
9	28JUL94	0609	27°55.14'	92°23.42'	82	9
10	28JUL94	0752	27°55.14'	92°09.95'	148	12
11	28JUL94	1024	27°54.94'	91°57.91'	151	12
12	28JUL94	1159	27°54.77'	91°45.88'	172	12
13	28JUL94	1338	27°56.61'	91°32.70'	227	12
14	28JUL94	1507	27°58.14'	91°19.48'	269	12
15	28JUL94	1640	28°00.39'	91°05.83'	137	12
16	28JUL94	1812	28°01.37'	90°52.40'	200	12
17	28JUL94	2005	28°02.71'	90°38.59'	169	12
18	28JUL94	2247	27°39.71'	90°30.00'	1042	12
19	29JUL94	0045	27°45.71'	90°30.01'	825	12
20	29JUL94	0208	27°51.71'	90°30.00'	660	12
21	29JUL94	0507	27°57.97'	90°30.16'	441	12
22	29JUL94	0623	28°04.66'	90°30.22'	158	12
23	29JUL94	0728	28°10.46'	90°30.31'	92	11
24	29JUL94	0826	28°16.81'	90°30.00'	62	9
25	29JUL94	0911	28°21.00'	90°29.96'	50	7
26	29JUL94	0956	28°25.41'	90°29.98'	45	7
27	29JUL94	1050	28°31.62'	90°30.18'	36	6
28	29JUL94	1142	28°37.94'	90°30.31'	22	5
29	29JUL94	1232	28°43.94'	90°30.35'	19	5
30	29JUL94	1321	28°49.99'	90°30.56'	20	5
31	29JUL94	1357	28°54.00'	90°30.61'	15	4
32	29JUL94	1521	28°58.11'	90°30.60'	12	4
33	30JUL94	0040	29°10.87'	91°59.99'	7	4
34	30JUL94	0137	29°06.60'	92°00.06'	11	5
35	30JUL94	0226	29°02.29'	92°00.09'	16	5
36	30JUL94	0338	28°56.22'	91°59.99'	22	5
37	30JUL94	0436	28°50.26'	92°00.00'	27	6
38	30JUL94	0532	28°44.70'	92°00.08'	32	6
39	30JUL94	0644	28°37.72'	91°59.88'	40	6
40	30JUL94	0731	28°33.00'	91°59.85'	45	6
41	30JUL94	0827	28°26.77'	91°59.86'	56	7
42	30JUL94	0924	28°21.13'	91°59.83'	60	7
43	30JUL94	1027	28°14.68'	91°59.90'	69	7
44	30JUL94	1152	28°08.94'	91°59.92'	83	11
45	30JUL94	1325	28°02.71'	91°59.97'	106	12
46	30JUL94	1427	27°56.79'	92°00.08'	101	11
47	30JUL94	1529	27°50.68'	91°59.97'	200	12
48	30JUL94	1702	27°45.30'	92°00.01'	486	12
49	30JUL94	1902	27°38.93'	91°59.96'	843	12
50	30JUL94	2030	27°32.94'	91°59.96'	727	12
51	31JUL94	0305	27°27.41'	92°59.94'	942	12
52	31JUL94	0456	27°33.41'	92°59.94'	650	12

Table 3.4.2. Station times and positions for LATEX A cruise H09 (continued).

Station	Date	Time (UTC)	Latitude N	Longitude W	Depth	Niskins
53	31JUL94	0627	27°39.41'	92°59.91'	309	12
54	31JUL94	0932	27°45.28'	93°00.14'	204	11
55	31JUL94	1050	27°52.86'	93°00.12'	191	11
56	31JUL94	1230	28°01.82'	92°59.84'	93	10
57	31JUL94	1337	28°10.85'	92°59.92'	72	10
58	31JUL94	1447	28°18.53'	92°59.98'	53	8
59	31JUL94	1606	28°25.37'	92°59.93'	49	8
60	31JUL94	1733	28°31.87'	92°59.98'	43	7
61	31JUL94	1859	28°38.41'	92°59.91'	33	7
62	31JUL94	1958	28°44.93'	92°59.93'	29	6
63	31JUL94	2059	28°51.42'	92°59.98'	25	5
64	31JUL94	2158	28°57.80'	92°59.99'	22	5
65	31JUL94	2247	29°03.98'	92°59.97'	22	5
66	31JUL94	2334	29°10.03'	93°00.06'	18	5
67	01AUG94	0020	29°15.91'	93°00.02'	17	5
68	01AUG94	0122	29°22.00'	92°59.97'	15	4
69	01AUG94	0236	29°27.93'	92°59.95'	13	4
70	01AUG94	0328	29°34.05'	93°00.01'	11	4
71	01AUG94	0957	29°32.03'	94°00.14'	10	4
72	01AUG94	1054	29°26.65'	94°00.12'	11	4
73	01AUG94	1138	29°21.60'	94°00.13'	10	4
74	01AUG94	1220	29°16.21'	94°00.09'	13	5
75	01AUG94	1307	29°09.98'	94°00.06'	17	5
76	01AUG94	1402	29°03.77'	94°00.13'	19	5
77	01AUG94	1452	28°57.92'	94°00.14'	18	5
78	01AUG94	1624	28°51.89'	93°59.96'	23	6
79	01AUG94	1720	28°46.01'	94°00.09'	24	6
80	01AUG94	1823	28°39.65'	93°59.94'	29	6
81	01AUG94	1929	28°33.83'	93°59.96'	34	7
82	01AUG94	2031	28°27.95'	93°59.99'	43	6
83	01AUG94	2143	28°21.94'	93°59.99'	52	7
84	01AUG94	2309	28°16.02'	94°01.29'	58	8
85	02AUG94	0021	28°08.98'	94°03.76'	68	8
86	02AUG94	0117	28°04.65'	94°05.53'	69	8
87	02AUG94	0223	27°59.55'	94°07.50'	81	9
88	02AUG94	0332	27°54.15'	94°09.31'	96	10
89	02AUG94	0505	27°47.98'	94°11.43'	268	12
90	02AUG94	0625	27°44.24'	94°12.20'	450	12
91	02AUG94	0758	27°39.61'	94°13.46'	439	12
92	02AUG94	1014	27°33.61'	94°14.64'	650	12
93	02AUG94	1222	27°27.72'	94°16.21'	964	12
94	02AUG94	1919	28°15.58'	94°32.41'	47	6
95	02AUG94	2019	28°20.99'	94°33.58'	42	7
96	02AUG94	2156	28°26.40'	94°35.15'	38	7
97	02AUG94	2248	28°31.77'	94°36.59'	34	7
98	02AUG94	2341	28°37.19'	94°38.42'	30	7
99	03AUG94	0033	28°42.58'	94°39.90'	26	6
100	03AUG94	0125	28°48.01'	94°41.43'	20	5
101	03AUG94	0217	28°53.40'	94°43.21'	20	5
102	03AUG94	0329	28°58.78'	94°44.42'	16	4
103	03AUG94	0424	29°04.50'	94°46.23'	18	4
104	03AUG94	0526	29°10.17'	94°47.98'	14	4

Table 3.4.2. Station times and positions for LATEX A cruise H09 (continued).

Station	Date	Time (UTC)	Latitude N	Longitude W	Depth	Niskins
105	03AUG94	1020	28°42.22'	95°32.22'	13	4
106	03AUG94	1112	28°37.46'	95°29.30'	18	4
107	03AUG94	1158	28°32.38'	95°26.33'	25	5
108	03AUG94	1249	28°27.00'	95°23.47'	30	6
109	03AUG94	1339	28°21.63'	95°20.86'	33	8
110	03AUG94	1443	28°16.34'	95°17.84'	39	7
111	03AUG94	1536	28°10.49'	95°15.01'	47	6
112	03AUG94	1633	28°05.03'	95°12.11'	54	7
113	03AUG94	1729	27°59.64'	95°09.10'	78	9
114	03AUG94	1835	27°54.09'	95°06.42'	108	11
115	03AUG94	1948	27°48.55'	95°03.60'	258	12
116	03AUG94	2113	27°43.02'	95°00.69'	494	12
117	03AUG94	2241	27°37.67'	94°57.59'	693	12
118	04AUG94	0010	27°32.41'	94°54.85'	846	12
119	04AUG94	0516	27°23.40'	95°37.33'	923	12
120	04AUG94	0654	27°27.61'	95°42.12'	708	12
121	04AUG94	0821	27°31.50'	95°47.11'	517	12
122	04AUG94	0942	27°36.13'	95°52.69'	190	12
123	04AUG94	1047	27°41.09'	95°58.18'	102	10
124	04AUG94	1146	27°45.29'	96°03.30'	79	7
125	04AUG94	1235	27°48.60'	96°07.84'	67	7
126	04AUG94	1339	27°53.98'	96°13.51'	50	6
127	04AUG94	1437	27°58.21'	96°18.94'	36	6
128	04AUG94	1528	28°02.40'	96°24.05'	27	5
129	04AUG94	1627	28°07.83'	96°30.03'	20	5
130	04AUG94	1742	28°12.61'	96°36.02'	10	4
131	05AUG94	0116	27°15.44'	97°16.05'	17	4
132	05AUG94	0216	27°14.42'	97°09.61'	25	5
133	05AUG94	0324	27°13.55'	97°03.13'	33	6
134	05AUG94	0426	27°12.69'	96°56.23'	43	7
135	05AUG94	0529	27°11.93'	96°49.59'	56	8
136	05AUG94	0633	27°11.04'	96°42.92'	72	8
137	05AUG94	0736	27°10.17'	96°36.38'	89	10
138	05AUG94	0848	27°09.09'	96°29.79'	114	11
139	05AUG94	0955	27°08.10'	96°22.81'	183	12
140	05AUG94	1102	27°06.88'	96°16.97'	309	12
141	05AUG94	1204	27°05.99'	96°12.59'	440	12
142	05AUG94	1332	27°05.28'	96°05.25'	605	12
143	05AUG94	1454	27°04.31'	95°58.92'	694	12
144	06AUG94	2245	26°00.96'	95°58.32'	1034	12
145	06AUG94	0029	26°00.97'	96°05.14'	836	12
146	06AUG94	0200	26°00.61'	96°11.55'	653	12
147	06AUG94	0322	26°00.80'	96°18.66'	208	12
148	06AUG94	0428	26°00.70'	96°25.26'	85	8
149	06AUG94	0527	26°00.96'	96°31.85'	60	8
150	06AUG94	0626	26°00.97'	96°38.62'	49	7
151	06AUG94	0718	26°00.96'	96°44.97'	44	6
152	06AUG94	0815	26°00.99'	96°51.43'	37	6
153	06AUG94	0908	26°01.49'	96°58.10'	29	6
154	06AUG94	1001	26°01.36'	97°04.54'	20	4
155	06AUG94	1420	26°08.61'	96°19.93'	233	12
156	06AUG94	1600	26°19.81'	96°17.84'	229	12

Table 3.4.2. Station times and positions for LATEX A cruise H09 (continued).

Station	Date	Time (UTC)	Latitude N	Longitude W	Depth	Niskins
157	06AUG94	1819	26°31.80'	96°19.94'	272	12
158	06AUG94	2015	26°43.78'	96°26.24'	203	12
159	06AUG94	2157	26°55.81'	96°26.25'	208	12
160	06AUG94	2343	27°06.29'	96°20.72'	227	12
161	07AUG94	0119	27°16.78'	96°15.21'	203	12
162	07AUG94	0304	27°25.80'	96°06.24'	202	12
163	07AUG94	0457	27°32.40'	95°54.46'	274	12
164	07AUG94	0643	27°39.01'	95°42.68'	238	12
165	07AUG94	0824	27°42.48'	95°30.12'	298	12
166	07AUG94	1009	27°45.68'	95°17.20'	254	12
167	07AUG94	1157	27°47.91'	95°02.88'	310	12
168	07AUG94	1347	27°50.14'	94°48.57'	233	12
169	07AUG94	1518	27°50.12'	94°35.30'	274	12
170	07AUG94	1652	27°50.06'	94°21.66'	170	12
171	05AUG94	2343	27°26.99'	97°12.00'	16	5

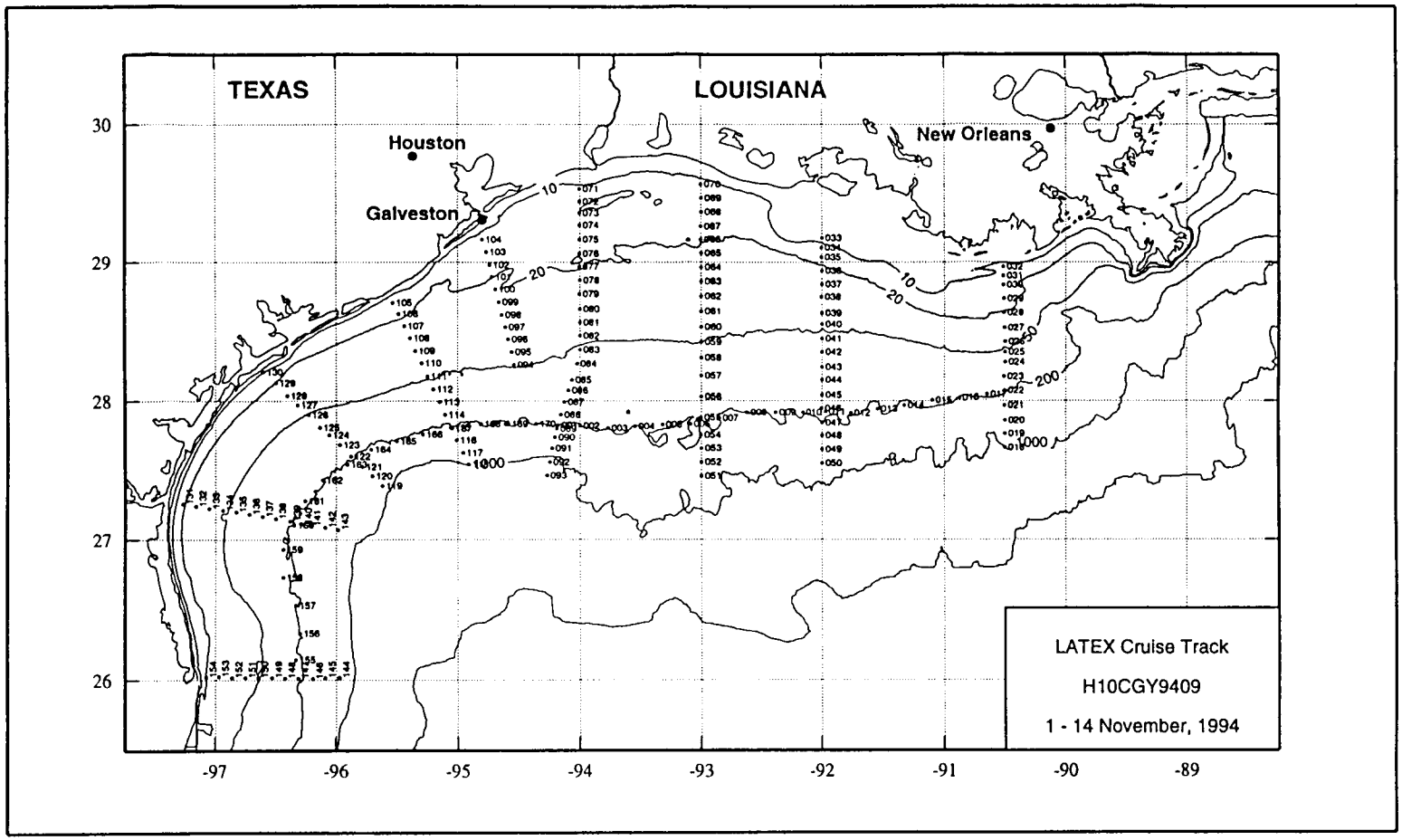

Figure 3.4.3. CTD stations and cruise track, LATEX H10.

Table 3.4.3. Station times and positions for LATEX A cruise H10.

Station	Date	Time (UTC)	Latitude N	Longitude W	Depth	Niskins
1	02NOV94	1402	27°49.66'	94°10.82'	183	12
2	02NOV94	1541	27°49.27'	94°00.02'	200	12
3	02NOV94	1733	27°48.30'	93°46.25'	190	12
4	02NOV94	1919	27°49.01'	93°32.56'	200	12
5	02NOV94	2059	27°49.86'	93°19.14'	151	12
6	02NOV94	2239	27°50.07'	93°05.28'	173	12
7	03NOV94	0034	27°52.49'	92°51.38'	221	12
8	03NOV94	0222	27°55.13'	92°37.48'	188	12
9	03NOV94	0408	27°55.14'	92°23.41'	89	9
10	03NOV94	0545	27°55.12'	92°09.95'	144	12
11	03NOV94	0744	27°55.32'	91°58.13'	141	12
12	03NOV94	0927	27°54.77'	91°45.87'	171	12
13	03NOV94	1119	27°56.61'	91°32.71'	225	12
14	03NOV94	1312	27°58.15'	91°19.50'	267	12
15	03NOV94	1510	28°00.38'	91°05.85'	136	12
16	03NOV94	1715	28°01.38'	90°52.40'	185	12
17	03NOV94	1905	28°02.72'	90°38.59'	167	12
18	03NOV94	2204	27°39.74'	90°30.01'	922	12
19	03NOV94	2338	27°45.71'	90°30.00'	820	12
20	04NOV94	0208	27°51.69'	90°29.99'	643	12
21	04NOV94	0410	27°57.95'	90°30.13'	436	12
22	04NOV94	0528	28°04.64'	90°30.22'	149	12
23	04NOV94	0629	28°10.48'	90°30.30'	94	11
24	04NOV94	0732	28°16.81'	90°29.99'	62	9
25	04NOV94	0857	28°20.99'	90°29.97'	50	7
26	04NOV94	0958	28°25.44'	90°29.97'	42	7
27	04NOV94	1055	28°31.64'	90°30.20'	35	6
28	04NOV94	1157	28°37.97'	90°30.33'	20	5
29	04NOV94	1250	28°43.95'	90°30.37'	17	5
30	04NOV94	1344	28°49.99'	90°30.60'	18	5
31	04NOV94	1425	28°53.99'	90°30.61'	15	4
32	04NOV94	1512	28°58.10'	90°30.60'	11	4
33	04NOV94	2350	29°10.87'	91°59.98'	6	3
34	05NOV94	0043	29°06.62'	92°00.06'	12	5
35	05NOV94	0204	29°02.28'	92°00.08'	18	5
36	05NOV94	0305	28°56.22'	91°59.97'	22	5
37	05NOV94	0502	28°50.24'	92°00.01'	26	6
38	05NOV94	0559	28°44.71'	92°00.08'	31	6
39	05NOV94	0708	28°37.74'	91°59.90'	39	6
40	05NOV94	0759	28°33.02'	91°59.85'	45	6
41	05NOV94	0859	28°26.79'	91°59.84'	56	7
42	05NOV94	1011	28°21.14'	91°59.82'	60	7
43	05NOV94	1135	28°14.69'	91°59.87'	69	7
44	05NOV94	1307	28°08.95'	91°59.93'	82	11
45	05NOV94	1440	28°02.69'	91°59.93'	104	12
46	05NOV94	1608	27°56.80'	92°00.08'	107	11
47	05NOV94	1736	27°50.68'	91°59.99'	201	12
48	05NOV94	1910	27°44.92'	91°59.86'	491	12
49	05NOV94	2116	27°38.97'	91°59.97'	865	12
50	05NOV94	2309	27°32.94'	91°59.96'	736	12
51	06NOV94	0548	27°27.40'	92°59.95'	944	12
52	06NOV94	0738	27°33.40'	92°59.95'	653	12

Table 3.4.3. Station times and positions for LATEX A cruise H10 (continued).

Station	Date	Time (UTC)	Latitude N	Longitude W	Depth	Niskins
53	06NOV94	0908	27°39.41'	92°59.92'	314	12
54	06NOV94	1034	27°45.26'	93°00.17'	206	12
55	06NOV94	1154	27°52.84'	93°00.12'	193	11
56	06NOV94	1327	28°01.81'	92°59.86'	100	10
57	06NOV94	1457	28°10.85'	92°59.92'	71	10
58	06NOV94	1609	28°18.48'	92°59.88'	51	8
59	06NOV94	1712	28°25.38'	92°59.95'	48	8
60	06NOV94	1827	28°31.87'	92°59.99'	43	7
61	06NOV94	1924	28°38.41'	92°59.95'	33	7
62	06NOV94	2016	28°44.91'	92°59.94'	29	6
63	06NOV94	2110	28°51.43'	92°59.97'	25	5
64	06NOV94	2200	28°57.81'	93°00.00'	23	5
65	06NOV94	2249	29°04.00'	92°59.97'	22	5
66	06NOV94	2338	29°10.04'	93°00.06'	19	5
67	06NOV94	0029	29°15.87'	93°00.15'	18	5
68	07NOV94	0122	29°22.00'	92°59.96'	14	4
69	07NOV94	0212	29°27.93'	92°59.96'	13	5
70	07NOV94	0305	29°34.03'	93°00.07'	11	3
71	07NOV94	0848	29°32.04'	94°00.17'	11	4
72	07NOV94	0950	29°26.63'	94°00.14'	11	4
73	07NOV94	1035	29°21.61'	94°00.12'	11	4
74	07NOV94	1125	29°16.21'	94°00.09'	13	4
75	07NOV94	1218	29°09.99'	94°00.08'	16	5
76	07NOV94	1312	29°03.78'	94°00.13'	19	5
77	07NOV94	1401	28°57.93'	94°00.15'	17	5
78	07NOV94	1506	28°51.90'	93°59.97'	24	6
79	07NOV94	1557	28°46.02'	94°00.10'	24	6
80	07NOV94	1652	28°39.65'	93°59.94'	29	6
81	07NOV94	1751	28°33.81'	93°59.94'	37	7
82	07NOV94	1854	28°27.94'	94°00.00'	42	7
83	07NOV94	1947	28°21.94'	94°00.00'	51	7
84	07NOV94	2051	28°16.01'	94°01.30'	57	8
85	07NOV94	2201	28°08.95'	94°03.77'	64	8
86	07NOV94	2246	28°04.66'	94°05.52'	69	8
87	07NOV94	2339	27°59.54'	94°07.49'	81	9
88	08NOV94	0036	27°54.12'	94°09.27'	97	10
89	08NOV94	0139	27°48.00'	94°11.40'	271	11
90	08NOV94	0235	27°44.27'	94°12.21'	551	12
91	08NOV94	0347	27°39.62'	94°13.48'	443	12
92	08NOV94	0517	27°33.61'	94°14.65'	667	12
93	08NOV94	1147	27°27.73'	94°16.21'	996	12
94	08NOV94	1253	28°15.59'	94°32.42'	48	7
95	08NOV94	1346	28°21.00'	94°33.59'	41	7
96	08NOV94	1439	28°26.40'	94°35.15'	39	7
97	08NOV94	1532	28°31.76'	94°36.61'	34	7
98	08NOV94	1623	28°37.18'	94°38.42'	30	6
99	08NOV94	1713	28°42.58'	94°39.90'	26	6
100	08NOV94	1804	28°48.02'	94°41.45'	20	5
101	08NOV94	1903	28°53.40'	94°43.22'	18	5
102	08NOV94	1955	28°58.79'	94°44.42'	16	4
103	08NOV94	2046	29°04.51'	94°46.24'	17	4
104	08NOV94	2141	29°10.19'	94°47.99'	13	4

Table 3.4.3. Station times and positions for LATEX A cruise H10 (continued).

Station	Date	Time (UTC)	Latitude N	Longitude W	Depth	Niskins
105	09NOV94	0300	28°42.21'	95°32.21'	14	4
106	09NOV94	0347	28°37.45'	95°29.32'	18	4
107	09NOV94	0434	28°32.38'	95°26.34'	25	5
108	09NOV94	0527	28°27.01'	95°23.49'	30	6
109	09NOV94	0632	28°21.63'	95°20.87'	33	6
110	09NOV94	0736	28°16.36'	95°17.86'	38	7
111	09NOV94	0837	28°10.51'	95°15.01'	47	7
112	09NOV94	0955	28°05.02'	95°12.13'	55	7
113	09NOV94	1058	27°59.65'	95°09.11'	78	9
114	09NOV94	1203	27°54.10'	95°06.41'	108	11
115	09NOV94	1311	27°48.55'	95°03.59'	268	12
116	09NOV94	1423	27°43.02'	95°00.67'	497	12
117	09NOV94	1543	27°37.69'	94°57.60'	698	12
118	09NOV94	1710	27°32.40'	94°54.82'	849	12
119	09NOV94	2220	27°23.38'	95°37.34'	915	12
120	09NOV94	0007	27°27.57'	95°42.12'	715	12
121	09NOV94	0143	27°31.50'	95°47.13'	523	12
122	10NOV94	0311	27°36.11'	95°52.68'	193	12
123	10NOV94	0421	27°41.09'	95°58.20'	104	10
124	10NOV94	0525	27°45.28'	96°03.33'	79	7
125	10NOV94	0701	27°48.58'	96°07.85'	68	7
126	10NOV94	0834	27°53.96'	96°13.53'	50	6
127	10NOV94	1026	27°58.21'	96°18.93'	36	6
128	10NOV94	1139	28°02.39'	96°24.07'	27	5
129	10NOV94	1302	28°07.80'	96°30.02'	19	5
130	10NOV94	1408	28°12.62'	96°36.05'	10	4
131	10NOV94	2037	27°15.43'	97°16.09'	17	4
132	10NOV94	2132	27°14.40'	97°09.61'	25	5
133	10NOV94	2226	27°13.56'	97°03.14'	32	6
134	10NOV94	2326	27°12.71'	96°56.24'	42	7
135	11NOV94	0024	27°11.93'	96°49.59'	57	9
136	11NOV94	0136	27°11.04'	96°42.91'	72	8
137	11NOV94	0242	27°10.17'	96°36.37'	89	10
138	11NOV94	0347	27°09.09'	96°29.79'	113	11
139	11NOV94	0504	27°08.09'	96°22.81'	184	12
140	11NOV94	0612	27°06.87'	96°16.95'	314	12
141	11NOV94	0715	27°05.99'	96°12.58'	446	12
142	11NOV94	0837	27°05.27'	96°05.25'	618	12
143	11NOV94	0956	27°04.31'	95°58.91'	730	12
144	11NOV94	1658	26°00.95'	95°58.31'	1026	12
145	11NOV94	1958	26°00.95'	96°05.16'	828	12
146	11NOV94	2136	26°00.61'	96°11.56'	654	12
147	11NOV94	2306	26°00.79'	96°18.67'	207	12
148	12NOV94	0032	26°00.73'	96°25.28'	84	9
149	12NOV94	0129	26°00.98'	96°31.86'	59	8
150	12NOV94	0225	26°00.96'	96°38.62'	49	7
151	12NOV94	0315	26°00.97'	96°44.98'	45	6
152	12NOV94	0407	26°00.97'	96°51.46'	37	6
153	12NOV94	0501	26°01.51'	96°58.14'	29	6
154	12NOV94	0559	26°01.37'	97°04.58'	19	4
155	12NOV94	1227	26°08.61'	96°19.96'	229	12
156	12NOV94	1406	26°19.81'	96°17.84'	251	12

Table 3.4.3. Station times and positions for LATEX A cruise H10 (continued).

Station	Date	Time (UTC)	Latitude N	Longitude W	Depth	Niskins
157	12NOV94	1548	26°31.82'	96°19.95'	288	12
158	12NOV94	1734	26°43.78'	96°26.26'	205	12
159	12NOV94	1911	26°55.81'	96°26.25'	208	12
160	12NOV94	2051	27°06.32'	96°20.74'	227	12
161	12NOV94	2228	27°16.79'	96°15.20'	205	12
162	13NOV94	0044	27°25.85'	96°06.30'	202	12
163	13NOV94	0237	27°32.41'	95°54.47'	267	12
164	13NOV94	0435	27°39.04'	95°42.70'	247	12
165	13NOV94	0624	27°42.49'	95°30.14'	303	12
166	13NOV94	0816	27°45.69'	95°17.22'	266	12
167	13NOV94	1010	27°47.92'	95°02.91'	314	12
168	13NOV94	1236	27°50.16'	94°48.58'	233	12
169	13NOV94	1443	27°50.13'	94°35.33'	271	12
170	13NOV94	1635	27°50.04'	94°21.67'	170	12

3.4.2 Instrumentation, Calibration and Sampling Procedures

Instrumentation and sampling procedures for the hydrographic surveys are described in section 2.4.2.1 of Jochens and Nowlin (1994b) and in section 3.4.2 of Jochens and Nowlin (1995). Minor variations from the procedures set out in that reference occurred due to time constraints and the actual instruments used.

Instrumentation available for the year three cruises is shown in Table 3.4.4. At each station location, continuous profiles with depth were taken of temperature, conductivity, dissolved oxygen, transmissometry, fluorescence, optical backscatter, and downwelling irradiance. Routine meteorological data were collected every six hours during all cruises and were recorded on National Weather Service forms for later transmittal to NWS. The SEAS III system that was used for transmitting these data from the ship in years one and two was removed from the vessels by NWS prior to the year three cruises. Secchi disk depth readings were taken at every daylight station.

In field years one and two, the D&A Instruments optical backscatter sensor (model OBS-3) did not provide the sensitivity needed to measure turbidity except in the murky waters near shore. Transmissomtery measurements provided turbidity information. In 1993 SeaTech, Inc. marketed an instrument with greater sensitivity than the D&A Instruments unit used on cruises H01-H07. A SeaTech sensor was provided to LATEX at no cost to the program by Dr. Wilford Gardner of TAMU for cruises H08-H10. D&A Instruments sensors were available for back up, but were not needed. Suspended particulate material determinations were used to calibrate the SeaTech backscatter sensor.

3.4.3 Summary of Hydrographic Data Collection

Table 3.4.5 summarizes the data collected and the scientific participation on cruises H08, H09, and H10. In addition, visiting researchers on each cruise collected data for use in their individual research projects. Table 3.4.6 summarizes these complementary programs.

Table 3.4.4. Hydrographic equipment available on each hydrography cruise.

Instrument	Type	Quantity
CTD System + oxygen	Sea-Bird SBE-911*plus*	2
Rosette	General Oceanics 12 place	2
Rosette frame	TAMU fabrication	2
Niskin Bottles	GO Level Action, 10 liters	12
Niskin Bottles	GO Standard, 10-12 liter	12
Transmissometer	SeaTech 2000 m	2
Fluorometer	SeaTech 3000 m	1
Fluorometer	Chelsea Instruments	1
Backscatter Sensor	D&A Instruments OBS-3	2
Backscatter Sensor	SeaTech, Inc.	1
Altimeter	Datasonics PSA-900	2
PAR Sensor	Biospherical QSP-200L	2
Secchi Disk	TAMU fabrication	2

Table 3.4.5. Summary of data collected and scientific participation in the LATEX A standard grid hydrography surveys in the third field year.

Description	H08 May 1994	H09 Aug. 1994	H10 Nov. 1994
Cruise Duration (days)	15	12	13
Cruise Track (km)	3393	3393	3393
Total Hydro Stations	170	171	170
CTD Stations	170	171	170
Nutrient Stations	170	171	170
Oxygen Stations	153	154	170
Salinity Stations	87	88	104
Pigment Stations	154	150	154
Particulate Stations	118	119	119
Secchi Disk Stations	85	103	68
Weather Obs	56	40	44
Nutrient Samples	1465	1482	1473
Salinity Samples	728	739	940
Oxygen Samples	1267	1297	1473
Pigment Samples	1266	1235	1279
Particulate Samples	235	238	239
Total Scientific Party	20	17	19
LATEX Scientists	15	15	17
Guest Investigators	5	2	2
Graduate Students	6	4	5
Complementary Studies	7	4	5

Table 3.4.6. Complementary programs on LATEX A hydrography surveys in the third field year.

Description	H08 May 1994	H09 Aug. 1994	H10 Nov. 1994
Guest Investigators	5	2	2
Phytoplankton Stations	32	31	31
Zooplankton Stations	36	—	37
Isotope Stations	52	59	59
Productivity Stations	34	26	31
Drifter Launches	3	—	3
Bottom Samples	138	—	—

3.5 Acoustic Doppler Current Profiler Measurements

Underway ADCP surveys were made on all three hydrographic surveys during the third field year. Survey tracks are along the lines of stations shown in Figures 3.4.1, 3.4.2, and 3.4.3. Table 3.5.1 shows the dates and quantities of data collection and the ADCP configurations for the three cruises. There were no changes in instrumentation, calibration, or sampling procedures from those discussed in section 3.5 of Jochens and Nowlin (1995).

Table 3.5.1. ADCP data collection and configurations.

	H08	H09	H10
Data start - stop	04/29 - 05/05/94	07/27 - 08/07/94	11/02 - 11/14/94
Length of survey (km)	3393	3393	3393
Quantity of data collected	300 Mbytes	300 Mbytes	300 Mbytes
Averaging interval (min)	5	5	5
Depth cell length (m)	4	4	4
Number of depth cells	100	100	100
Time between pings (sec)	0.67	0.67	0.67
Transmit pulse length (m)	4	4	4
Blank after transmit (m)	4	4	4
Navigation type*	DGPS+GERGNAV	DGPS+GERGNAV	DGPS+GERGNAV
Data recorded	Raw data Averaged data Navigation	Raw data Averaged data Navigation	Raw data Averaged data Navigation

* DGPS = differential global positioning system; GERGNAV is navigation software developed by Dr. Norman L. Guinasso, Jr., for the Geochemical and Environmental Research Group at TAMU. During ADCP operation, data from both systems were recorded for precise tracking.

3.6 Collateral Data

Collateral data has been collected from other programs engaged in physical oceanography on the Texas-Louisiana shelf during the LATEX field years and from historical sources. These data will be used in analyses of the LATEX A data set and in the final synthesis report. Following the collection plan described in Nowlin et al. (1991), we summarize here progress in assembling the bibliography of papers and reports dealing with the physical oceanography of the Gulf of Mexico, shelf physical oceanographic data collected by non-LATEX programs, and relevant historical data from the Gulf of Mexico.

3.6.1 Bibliography

The LATEX Gulf of Mexico bibliography continues to be maintained and updated. It presently contains 733 entries related to the physical and hydrographic characteristics of the Gulf. Notice of the bibliography's availability was posted to the GULF.MEX bulletin board on Omnet until that service was discontinued in December 1994. The bibliography was mentioned in every issue of the *LATEX Fortnightly* until publication ended in December 1994.

Nine copies of the LATEX bibliography were distributed during the period of this report. Two individuals requested and received diskette versions. In addition, SAIC requested a digital copy for inclusion of selected citations in an annotated bibliography they are developing for the National Biological Service. This will compose part of a Department of the Interior, NBS-funded study entitled "Northeastern Gulf of Mexico Coastal and Marine Ecosystem Program: Data Search and Synthesis" (NBS contract number 1445-CT0009-95-002).

3.6.2 Concurrent Data Collection

LATEX A acquired relevant data sets from other programs operating in the Gulf and from various commercial and government sources. Many of the data sets were obtained via data sharing agreements that limit further distribution. Major data sets obtained during the third field year are listed in Table 3.6.1.

3.6.3 Historical Data Collection

LATEX A acquired additional historical data for the Gulf of Mexico for the purpose of assisting in the intepretation of LATEX data sets. Sets obtained since the last report (Jochens and Nowlin 1995) are included in Table 3.6.1.

Table 3.6.1. Collateral and historical data assembled.

Entity	Description of Data Obtained
LATEX B LSU	Preliminary data from cruises P941 and P942 AVHRR images posted to GULF.MEX April 1993 through March 1994
LATEX C SAIC	XBT and drifter data posted to GULF.MEX April through December 1994
GulfCet TAMUG	Hydrographic data from selected cruises
SOOP TAMU	Hydrographic data from *Gyre* cruises TAMU Oceanography Tech. Rpt. 94-2-T TAMU Oceanography Tech. Rpt. 94-3-T
NOAA-NCDC	Surface marine data from the 1970s to present SAMSON data from 1990-1995
NOAA-NDBC	3rd quarter 1993 meteorological data from buoys 42019 and 42020 4th quarter 1993 meteorological data from buoys 42019 and 42020 1st & 2nd quarter 1994 meteorological data from buoys 42019 and 42020
NOAA-NODC	Meteorology, oceanography, and wave spectra from all Gulf of Mexico buoys (August 1992 - April 1994)
NOAA-NOS	Tide gauge data for the Gulf of Mexico, 1993-1994
NOAA-NWS-NMC	Historical wind data for the Gulf of Mexico Meteorological data from coastal airport stations in Texas and Louisiana
Army Corps of Engineers	Daily discharge of the Atchafalaya River at Simmesport, LA, and the Mississippi River at Tarbert Landing, MS, for the years 1992 and 1994 Daily computed discharges for theAtchafalaya & Mississippi Rivers for 1994 Nutrient data for the Mississippi River Sediment loads for the Mississippie, Atchafalaya Rivers and the Old River for 1992-1993
USGS	Texas river discharge data for 1994
FNOC	Precipitation index data for the GOES satellite
Shell Offshore, Inc.	Current meter data from job 8507 in Garden Banks (22 Sep - 12 Nov 1994)

4 DATA QUALITY ASSURANCE AND CONTROL

4.1 Introduction

This section discusses data processing efforts and quality assurance/quality control (QA/QC) methods for each data type and summarizes the results. Data processing was conducted in accordance with procedures set out in section 9 of Nowlin et al. (1991), section 3 of Jochens and Nowlin (1994b), and section 4 of Jochens and Nowin (1995).

Data QA/QC and preliminary analyses were performed by the LATEX A Data Office. In general, data sets are grouped by the cruise during which the data are recovered, then processed into engineering units and stored in hierarchical directories on hard disks. Preliminary data products are examined and obvious errors corrected. The preliminary products are then given to other investigators for further examination. After all corrections are made, the data are moved to distribution directories where investigators can access them.

4.2 Moored Measurements

The QA/QC processing procedures for the current meter, wave gauge, and meteorological data sets were discussed in sections 3.2.1, 3.2.2, and 3.2.4, respectively, of Jochens and Nowlin (1994b) and in section 4.2 of Jochens and Nowlin (1995). Complete examinations of moored instrument data and procedures can be found in Nowlin et al. (1996) for current meters, DiMarco et al. (1995a and b) for wave gauges, and Wang et al. (1996) for meteorological buoys.

4.3 Drifting Buoy Measurements

The methodology for data analysis and QA/QC for the drifting buoys is provided in Nowlin et al. (1991), in section 2.3 of Jochens and Nowlin (1994b), and in section 4.3 of Jochens and Nowlin (1995). A summary of times of operation is given in Table 3.3.1 of this report. Drifter trajectories were posted to the GULF.MEX electronic bulletin board weekly until the OMNET service ceased operations in December 1994. A complete examination of drifter data and procedures can be found in Howard (1996).

4.4 Hydrographic Measurements

Hydrographic data were processed following methodologies described in section 3.4 of Jochens and Nowlin (1994b) and section 4.4 of Jochens and Nowlin (1995). A complete examination of hydrographic data and procedures can be found in Jochens et al. (1996).

4.5 Acoustic Doppler Current Profiler Measurements

QA/QC procedures for the ADCP data sets are discussed in section 3.5 of Jochens and Nowlin (1994b) and in section 4.5 of Jochens and Nowlin (1995). A complete examination of ADCP data and procedures can be found in Bender et al. (1996).

A departure from previous ADCP data handling was in the treatment of profiles collected on the continental slope. A comparison was made of the estimates of ship velocity obtained from bottom tracking (BT) and from Differential GPS (DGPS). They agreed very well over the continental shelf to depths of 200 m, but over the continental slope the

DGPS estimates were substantially better than those obtained from BT. For the H08, H09 and H10 ADCP data sets, BT was used inshore of the 100-m isobath, and DGPS was used seaward of it. Although the cruise track followed the 200-m isobath, the 100-m isobath was selected because the ship could not follow the 200-m line exactly. Had the 200-m isobath been selected, the reference would have oscillated between BT and DGPS

5 DATA MANAGEMENT AND INFORMATION TRANSFER

5.1 Introduction

This section is an overview of data archiving and sharing and of information transfer activities of LATEX A, including summaries of data submitted to the National Oceanographic Data Center (NODC) and given to others. Information transfer activities include postings to the GULF.MEX electronic bulletin board, public notices, organization of a LATEX meeting, and publication of the bi-weekly newsletter.

5.2 Data Archiving

The NODC project identification code for LATEX A data is 0212. Data collected from current meter moorings (Table 3.2.3), wave gauges (Table 3.2.4), meteorological buoys (Table 3.2.5) on mooring cruises M15 - M18 have been submitted to NODC. CTD, ADCP, and other continuous profile data and bottle nutrients, oxygen, and salinity data collected on hydrographic surveys H08 - H10 have been submitted to NODC. Drifting buoy data were posted to GULF.MEX. Analyses of filters for pigments and total suspended particulates from cruises H08 through H10 have been sent to NODC. All data submitted to NODC are classed as preliminary. Corrections will continue to be made to all the data sets prior to their final submission to NODC.

5.3 Data Sharing

Community interest in LATEX A data remained strong in the third field year, and numerous requests for data were filled. Individuals requesting data were asked to document their intended use and to sign a data sharing agreement. This agreement was designed to protect the interests of LATEX A scientists and their work with these data. LATEX A field data were only released after having been sent to NODC. Table 5.3.1 summarizes data sharing activity.

Table 5.3.1. LATEX A data shared with others.

Requestor	Data Description	Date Sent
Robin Stagg Consultant	Currents from moorings 15, 16, and 20 for Aug 1992	April 1994
John Hubertz COE-WES	Mooring 23 MiniSpec data for Jul - Sep 1993	April 1994
Tom Meyers SAIC	Meteorological data from LATEX and NDBC stations for Mar - Jul 1993	May 1994
Douglas Evans Evans-Hamilton Inc.	Currents, CTD, and meteorological data from selected stations for Jul - Aug 1992	June 1994
Alan Hart Continental Shelf Assoc.	Current meter data from mooring 9 top for Apr 1992 - Sep 1993	August 1994
Peter Hamilton SAIC	Current meter data from moorings 4-13, 45, and 47-49 for the first field year	September 1994
Lee Estep ACOE	Secchi data for H01 - H07	September 1994

Table 5.3.1. LATEX A data shared with others (continued).

Requestor	Data Description	Date Sent
M.P. Krishna Raj Old Dominion Univ.	Currents, meteorological, MiniSpec data for Aug 92 and Mar 93	September 1994
David Brock Texas Water Devel. Bd	Salinity and nutrients from H03	November 1994
Guiletta Fargion TAMUG - GulfCet	Drifter data from buoys 2447, 2449, 6938, and 7837	November 1994
Melissa Seymour LSU	Selected LATEX and NDBC meteorological data for 1992-1993	November 1994
Victor Bierman NECOP	CTD and Niskin bottle data from H02	November 1994
Peter Santschi TAMUG	CTD and Niskin bottle data from selected stations during H08.	January 1995
Dong-Ping Wang SUNY - Stony Brook	All currents and meteorological data for Apr - Jul 1992	February 1995
Walter Johnson MMS	All NDBC data Oct 1993 - Nov 1994	February 1995
Andrew MacNaughton LSU	T, S, and DO from selected stations from H01 - H03	April 1995
H. James Herring Dynalysis of Princeton	All current, hydrography, and meteorology data through second field year	April 1995
Thomas Berger SAIC	All LATEX-A drifter data	April 1995
Khaled Al-Abdulkader TAMU	Selected CTD parameters from H05 - H09	May 1995
Victor Bierman NECOP	CTD, Niskin, and Secchi data from H05 and H06	May 1995
Greg Stone TAMU	Selected wave data from mooring 16	July 1995
Victor Vidal University of Mexico	Historic hydrographic and oxygen data from *Hidalgo* cruises	July 1995
Cortis Cooper Chevron	Current meter data for all deployments for mooring 12 and 13	August 1995
Var Ransibrahmanakul LSU	Density/depth data for H07-H09	October 1995
H. James Herring Dynalysis of Princeton	Gulf tide data	October 1995
Alexis Lugo-Fernandez MMS	Current roses	November 1995
Scott Dinnel UTMSI	Current meter data from 10 moorings	November 1995
Nan Walker LSU	Current meter data for 7 moorings for October - December 1994	December 1995
Scott Stewart UTMSI	Surface temperature, salinity, bottle data from H08-H10	December 1995

5.4 Information Sharing

5.4.1 GULF.MEX Bulletin Board

LATEX A maintained the GULF.MEX bulletin board on ScienceNet of Omnet, a commercial electronic mail service. LATEX A posted to GULF.MEX all cruise plans and reports, meeting announcements, weekly drifter trajectories, weekly meteorological summaries, the LATEX calendar, and other information relevant to the project until Omnet ceased operation on 31 December 1995.

5.4.2 Public Notices

Throughout LATEX A field operations, substantial changes in the positions of moorings located away from offshore platforms were reported to the United States Coast Guard, the Defense Mapping Agency, and the U.S. Navy Submarine Command. On 22 December 1994, forms were submitted to the Coast Guard to discontinue all the private aids to navigation deployed by LATEX A. On 2 January 1995, the Defense Mapping Agency and the Navy were notified of the removal of our equipment from the Gulf.

5.4.3 LATEX Meetings

In this report year, LATEX A organized one meeting on the oceanography of the Texas-Louisiana continental shelf. The fourth general meeting (LATEX IV) was held at LSU in Baton Rouge, 21-23 February 1995; the Science Advisory Panel met on 23 February after participating in the general sessions. Presentations were made by program managers and key researchers of LATEX A, B, and C, the MMS-sponsored modeling efforts, and collateral programs to an audience of about 60 individuals, representing educational institutions, federal and state government, and industry Presentations focused on the coastal regime, the shelf and slope region, and modeling the LATEX Shelf. Table 5.4.1 gives the agenda for this meeting.

Table 5.4.1. Agenda for the LATEX IV meeting, February 1995.

Description	Speaker
February 21, 1995	
Welcome, introductions, and opening remarks	W. Nowlin
Session I: The Coastal Regime	
Characteristics of circulation in the coastal current during LATEX B cruise III, April 1993	N. Pettigrew
Circulation during the summer regime: data from LATEX B cruise IV & pre-SCULP drifters	S. Murray
Circulation and hydrography in the vicinity of the Mississippi River delta	L. Rouse
Water mass census: Galveston plume	C. Ebbesmeyer
Repeat section study with ADCP and towed CTD: observations from current meters	E. Weeks
Sedimentation and resuspension across the Louisiana central shelf	Y. Zhang
Phytoplankton in the coastal current	Q. Dortch
and with Nancy Rabalais: Consequences of the 1993 Mississippi River flood	Q. Dortch
Numerical modeling study of the Gulf of Mexico	S. Welch
SCULP Project	P. Niiler

Table 5.4.1. Agenda for the LATEX IV meeting, February 1995 (continued).

Description	Speaker
Surface temperature fronts on the LATEX shelf: causes, variability, and longevity	N. Walker
Biological presentation	R. Shaw
Drag coefficient over LATEX Shelf	S. A. Hsu
February 22, 1995	
Session II: The Shelf and Slope Regime	
General shelf-scale circulation in the LATEX region	W. Nowlin
Nutrient and particle distributions on the Texas-Louisiana Shelf during May 1993	D. Wiesenburg
Bottom oxygen concentrations on the Texas-Louisiana Shelf	D. DeFreitas
Seasonal comparison of the subsurface chlorophyll maximum on the Louisiana shelf	C. Neuhard
Phytoplankton distributions on the Louisiana shelf during May 1992 and 1993	P. Bontempi
Spatial scales from hydrography	Y. Li
Altimetry/buoy comparisons in the Gulf of Mexico: animation of the TOPEX/ERS-1 blended time series	R. Leben
LATEX C hydrography and drifter data—September 1993 to December 1994	P. Hamilton
Ship and satellite studies of the Loop Current and Eddy Yucatan, 1994	D. Biggs
Session III: Modeling the LATEX Shelf	
Eddy- and wind-forced circulation on the LATEX Shelf	L. Oey
Modeling description	R. Patchen
Energetics on the LATEX Shelf: model vs. observation	S. Jin
Temperature and salinity: model vs. observation	M. Inoue
Simulation of inner shelf response to the March 1993 storm	R. Reid
Assimilation of satellite altimetric data into a circulation model of the Gulf of Mexico	J. Choi
Closing remarks	A. Lugo-Fernandez
February 23, 1995	
Workshop for informal examinations of LATEX B results and indications from LATEX A, B, and C of analyses and manuscripts under consideration.	

5.4.4 The *LATEX Fortnightly*

The *LATEX Fortnightly News* was sent to approximately 2500 addresses by bulk mail. Publication of the newsletter ceased with the end of the field program in December 1994. Table 5.4.2 lists the issues published during the third field year.

Table 5.4.2. Volume 3 *LATEX Fortnightly News*, 11 April - 15 December 1994.

Volume 3:	Date:	Titles:
Iss. 8	4/11/94	LATEX-A Spring Hydrography Cruise (story) LATEX 94H Cruise Track (figure) Winds from 28 March - 10 April 1994 (back map)
Iss. 9	4/25/94	Ambitious LATEX-A Hydrographic Cruise Underway (story) LATEX Wave Interest Group Formed (story) Winds from 11 April - 24 April 1994 (back map)
Iss. 10	5/9/94	Mississippi River Plume Cruise – LATEX-B (story) Phase 1 and 3 Salinity Fields at 1m Depth (2 figures) Winds from 25 April - 8 May 1994 (back map)
Iss. 11	5/23/94	Microzooplankton Grazing Across the Texas-Louisiana Shelf (story) LATEX Observations Support Investigation of Fish Kill (story) Winds and Drifters from 9 May - 22 May 1994 (back map)
Iss. 12	6/6/94	Fourth GOOMEX Cruise Now Underway (story) Scientists to Meet to Discuss Gulf of Mexico Fish Kills (story) Locations of the GOOMEX Field Study (figure) Winds and Drifters from 23 May - 5 June 1994 (back map)
Iss. 13	6/20/94	Joint Program Examines Oil Seeps in Green Canyon (story) Scientists Revise Estimate of Waves during Hurricane Andrew (story) Significant Wave Height - Hurricane Andrew (figure) Winds and Drifters from 6 June - 19 June 1994 (back map)
Iss. 14	7/4/94	Wiesenburg Heading to University of Southern Mississippi (story) LSU Plans 6th Mississippi River Plume Hydrographic Survey (story) Winds and Drifters from 20 June - 3 July 1994 (back map)
Iss. 15	7/18/94	LATEX-A Summer Hydrography Cruise (story) Sixteenth LATEX-A Mooring Cruise (story) LATEX 94I Cruise Track (figure) Winds and Drifters from 4 July - 17 July 1994 (back map)
Iss. 16	8/1/94	NR-1 to Use Laser Line Scan System in Gulf (story) NOAA Report on 1993 Mississippi Flood (story) Winds and Drifters from 18 July - 31 July 1994 (back map)
Iss. 17	8/15/94	SOOP Hydrography Surveys Continue (story) July 1994 XBT Section (figure) Winds from 1 August - 14 August 1994 (back map)
Iss. 18	8/29/94	Ninth Standard Grid Hydrography Cruise Completed (story) LATEX 94I Station Locations (figure) Winds from 15 August - 28 August 1994 (back map)
Iss. 19	9/12/94	TAMU SOOP: Ship of Opportunity Program (story) LATEX A to Conduct 17th Mooring Cruise (story) LATEX Wave Meter Comparison Study Presented (story) Winds from 29 August - 11 September 1994 (back map)

Table 5.4.2. Volume 3 *LATEX Fortnightly News,* 11 April - 15 December 1994 (continued).

Volume 3:	Date:	Titles:
Iss. 20	9/26/94	R/V *Powell* to Survey New Loop Current Ring (story)
		Loop Current Infrared Satellite Image (figure)
		Winds from 12 September - 25 September 1994 (back map)
Iss. 21	10/10/94	Fall Expedition Will Be Last LATEX-A Hydrography Cruise (story)
		Planned Station Locations for Cruise 94J (figure)
		Winds from 26 September - 9 October 1994 (back map)
Iss. 22	10/24/94	LATEX A Field Program Ends (story)
		Fire & Rain, Oil & Water (story)
		LATEX Buoy Deployed Near Eddy Y (story)
		LATEX Calendar Final Update (story)
		Winds from 10 October - 23 October 1994 (back map)
Iss. 23	12/15/94	LATEX-A Field Work Completed (story)
		Summary Calendar (story)
		Many Thanks to the *Fortnightly* Staff (story)
		Gulf Bibliography (story)
		LATEX, GULFCET, SOOP/Tiger Fieldwork 1992-1994 (back table)

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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 **Royalty Management Program** 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.