CONTINENTAL SHELF PROCESSES EFFECTING THE
OCEANOGRAPHY OF THE SOUTH ATLANTIC BIGHT
Annual Report - Period 6-1-75 thru 5-31-76

Submitted to

U. S. ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION

Contract E(38-1)889

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by

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MASTER

Larry P. Atkinson
Principal Investigator

12 March 1976

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PROGRESS REPORT

This completes the first year of the ERDA funded South Atlantic Bight study and much of the activity involved equipment acquisition and historical data analysis. However, in spite of the lack of equipment, we did run a full scale experiment in Onslow Bay in September 1975 and data acquired forms the principal scientific results for the year. Data reports and publications are attached. The accomplishments, scientific and otherwise, are summarized on the next few pages followed by a more lengthy discussion and appendices.

SUMMARY OF ACCOMPLISHMENTS

1. Equipment acquisition
 - a) Plessey conductivity-temperature-pressure system including data logger and H-P analog recorder (tested at sea with Plessey and now in shipment).
 - b) General Oceanics Rosette Sampler with 12 1.7L Niskin bottles and appropriate connectors (received).
 - c) Plessey portable CTD winch (not yet received).
 - d) Plessey Laboratory Salinometer (tested and accepted).
2. Computer program development and data management for:
 - a) CTD data
 - b) Hydrographic data, nutrients, oxygen, specific volume anomaly, T-S plots.
 - c) Recording thermograph data.
3. Analysis of previously acquired Georgia Bight data and initiation of nearshore observations. Intrusion frequency and volume were determined and Mississippi River water was observed during one cruise (September 1975).
4. Four Onslow Bay Intrusion Study cruises identified stranded intrusions, active intrusions, cascading, and wind mixing.
5. Publications are as follows:

Papers In Reviewed Journals

Atkinson, L. P. and D. Wallace. 1975. The source of unusually low surface salinities in the Gulf Stream off Georgia. Deep-Sea Res., 23:913-916.

Papers Submitted to Journals

Atkinson, L. P. and W. M. Dunstan. 1976. Gulf Stream intrusions and nitrate supply to the Georgia Shelf.

Papers in Preparation

Atkinson, L. P., W. M. Dunstan and G.-A. Paffenhofer. Observations of a Gulf Stream intrusion off St. Augustine.

Atkinson, L. P., W. M. Dunstan, E. B. Haines, D. Perlmuter. Oceanographic observations in the Georgia Bight: 1973-1974.

Atkinson, L. P. and L. Jaffe. Drift bottle observations in the Georgia Bight and the relationship to baroclinic and wind forcing.

Atkinson, L. P. and E. B. Haines. Freshwater volumes and the flushing rate of the Georgia Bight.

Technical Reports in Preparation

Atkinson, L. P., J. J. Singer, W. M. Dunstan and L. J. Pietrafesa. Hydrographic observations in Onslow Bay, North Carolina: September 1975 (OBIS II).

Atkinson, L. P., J. J. Singer, W. M. Dunstan and L. J. Pietrafesa. Hydrographic observations in Onslow Bay, North Carolina: August, October and December 1975 (OBIS, I, III, IV).

The following diagram shows the proposed and accomplished field programs.

SUMMARY OF PROPOSED AND ACCCOMPLISHED FIELD OBSERVATIONS

JUNE

JULY

AUGUST

SEPTEMBER

OCTOBER

NOVEMBER

DECEMBER

JANUARY

PROPOSED

- - - OBIS I - - -
Install meters,
Intensive grid survey

- - OBIS II - -
Install & retrieve
meters, grid survey
before & after

ACCOMPLISHED

OBIS I
Meters in,
brief survey

OBIS II
Intensive grid
survey

OBIS III
Meter mainten-
ance, grid sur-
vey

OBIS IV
Meter mainten-
ance, grid
survey

FEBRUARY

MARCH

APRIL

MAY

JUNE

PROPOSED

- - - OBIS III -
Same as OBIS II

ACCOMPLISHED

DISCUSSION OF ACCOMPLISHMENTS

Equipment Acquisition

As is well known the delivery times for most equipment is becoming quite lengthy. Although our grant period begins 1 June we did not receive official word until 11 June. The listed equipment was immediately put out to bid. The Rosette Sampler analog recorder arrived in late fall, the CTD will be delivered in late February 1976 and the winch in late March 1976. The primary sensing system will not be in our hands until early April, with 2 months left in the first study year! These delays could cause problems this summer if we have any difficulty in setting up the equipment aboard ship.

Dr. Atkinson spent three days at Plessey Environmental Systems in San Diego (18-20 February 1976) to examine and sea-test the CTD system. The CTD system performed well and should prove to be a most useful instrument. The visit was well worthwhile since the application of CTD systems to shallow water studies is new, and fruitful discussions were held with the engineers concerning our unique problems. The CTD is now in transit to Skidaway and is yet to be tested in the field by us. However, based on the experience with the unit in San Diego we expect the system to perform well and without complications.

The characteristics of the CTD system are as follows:

Conductivity

<u>Sensor</u>	
Sensor Frequency	4995-7901hz
Sensor Range	0-6mmhos

<u>Digital</u>	
Time Base	0.132140
Preset	-42243
Binary Range	0-24576
Resultant Digital	
Resolution	0.002mmhos

<u>Analog</u>	
Full Scale	0-80mmhos
Ranges	8
Folded Range Scale	1 V/mmho
Scale on Paper	2.5cm/mmho
Finest Line Reading	0.2mmho

Temperature

<u>Sensor</u>	
Sensor Frequency	2127-4193hz
Sensor Range	-2-35°C

<u>Digital</u>	
Time Base	0.229235
Preset	-28748
Binary Range	2457-32768
Resultant Digital	
Resolution	0.001°C

<u>Analog</u>	
Full Scale Range	-5-35°C
Ranges	8
Folded Range Scale	2 V/°C
Scale on Paper	5.0cm/°C
Finest Line Reading	0.02°C

Depth

<u>Sensor</u>	
Sensor Frequency	9712-11288hz
Sensor Range	0-600m

<u>Digital</u>	
Time Base	0.162437
Preset	-100966
Binary Range	0-16384
Resultant Digital	
Resolution	0.006m

Analog

Full Scale Range	0-600m
Ranges	4
Folded Range Scale	.06666V/m
Scale on Paper	.25cm/m
Finest Line Reading	.4m

Computer Program Development and Data Management

Data obtained from CTD profiling and water sampling are merged to form a typical hydrostation formatted data set. Through special arrangement with NODC we submit the completed NODC forms for key punching with a high priority so that we can receive the cards as soon as possible. This assures NODC timely acquisition of data, and saves our operation much manpower and cost. Over the last few years the arrangement has worked well for both parties. The returned cards are then read into our direct access mass storage system and are then ready for reduction.

The first operations are to run a station list (STALIST) and physical/chemical list (CEMLIST) which are shown on the following pages. These are produced in page format and go directly into data reports.

Additional programs do general plotting such as the T-S plot shown.

Part of the initial Georgia Bight studies is to maintain a recording thermograph on the bottom, mid-shelf off Brunswick, Georgia. These data are processed by computer and a sample output listing and plot are attached.

Program STALIST Printout

STATION SUMMARY FOR EASTWARD CRUISE E-9-75

STATION	LATITUDE	LONGITUDE	YR	MM	DAY	HOUR	DEPTH M	CONSEC NUMBER
35	33 57.7N	76 53.9W	75	9	4	10.3	36	1
37	33 49.5N	76 46.0W	75	9	4	13.5	44	2
35	33 58.0N	76 54.0W	75	9	4	16.3	37	3
33	34 5.5N	77 2.7W	75	9	4	19.0	33	4
35	33 57.6N	76 54.4W	75	9	4	22.0	37	5
37	33 49.5N	76 46.0W	75	9	5	1.6	46	6
35	33 57.5N	76 54.5W	75	9	5	4.0	37	7
33	34 4.5N	77 2.7W	75	9	5	7.0	33	8
35	33 57.3N	76 54.2W	75	9	5	10.2	37	9
14	34 16.3N	76 39.2W	75	9	5	13.6	34	10
15	34 12.0N	76 35.0W	75	9	5	14.7	32	11
16	34 8.0N	76 30.8W	75	9	5	0.0	41	12
26	34 7.7N	76 40.7W	75	9	5	17.4	41	13
25	34 4.5N	76 44.9W	75	9	5	18.5	39	14
24	34 9.4N	76 49.1W	75	9	5	19.6	36	15
23	34 12.9N	76 53.3W	75	9	5	21.0	32	16
22	34 17.0N	76 57.4W	75	9	5	22.2	30	17
21	34 21.2N	77 16.2W	75	9	5	0.0	26	18
30	34 17.5N	77 16.2W	75	9	6	1.3	23	19
31	34 13.4N	77 12.0W	75	9	6	2.4	27	20
32	34 9.5N	77 7.5W	75	9	6	3.5	31	21
33	34 5.4N	77 3.2W	75	9	6	4.2	35	22
34	34 1.4N	76 59.0W	75	9	6	5.5	37	23
35	33 57.4N	76 54.9W	75	9	6	6.6	37	24
36	33 53.2N	76 50.4W	75	9	6	8.5	40	25
46	33 45.9N	77 .5W	75	9	6	10.5	39	26
45	33 50.0N	77 4.4W	75	9	6	11.7	37	27
44	33 54.0N	77 8.5W	75	9	6	12.7	34	28
43	33 58.2N	77 12.8W	75	9	6	13.8	32	29
42	34 2.1N	77 17.0W	75	9	6	14.9	32	30
41	34 6.5N	77 21.5W	75	9	6	15.9	27	31
40	34 10.2N	77 25.4W	75	9	6	16.9	23	32
51	33 58.7N	77 30.9W	75	9	6	18.9	24	33
52	33 54.6N	77 26.6W	75	9	6	20.8	27	34
53	33 50.6N	77 22.5W	75	9	6	22.2	30	35
54	33 46.5N	77 18.2W	75	9	6	23.3	35	36
55	33 42.8N	77 14.2W	75	9	7	.5	36	37
56	33 38.6N	77 10.0W	75	9	7	1.7	37	38
40	34 10.5N	77 25.5W	75	9	7	12.5	24	39
42	34 2.3N	77 16.8W	75	9	7	14.3	34	40
40	34 10.6N	77 25.5W	75	9	7	17.3	23	41
38	34 18.4N	77 33.2W	75	9	7	19.3	15	42
40	34 10.5N	77 25.3W	75	9	7	22.3	23	43
42	34 2.5N	77 16.7W	75	9	8	1.4	34	44
40	34 10.6N	77 25.2W	75	9	8	4.4	24	45

Program CEMLIST Printout

EASTWARD CRUISE 9 STATION 42 8/ IX/75 1.4 GMT CONSECUTIVE STATION 44

LAT. = 34 2.5N LONG. = 77 16.7W DEPTH = 34M DIST LAST STA = 19.8KM

WEATHER DATA

WIND FORCE = 3
WIND DIRECTION = 136-144 DEGR
AIR TEMP = 27.00
WEATHER CODE = 2
BAROMETRIC PRESSURE = 1018.3 MB

SEA STATE =
WAVE DIRECTION = 136-144 DEGR
CLOUD TYPE = 8
CLOUD AMOUNT = 8
VISIBILITY CODE =

OBSERVATIONS

Z	T	S	D	SYA	O2	O2'	ADU	O2R	PO4	NO3	SI	M/P
2	28.09	35.82	23.00	487	4.80	5.23	.43	-.42	.02	.2	2.5	10.0
15	28.02	35.93	23.11	477								
16	27.95	35.91	23.12	476	4.66	5.24	.58	-.26	.04	0.0	5.4	
19	27.10	36.12	23.55	435								
32	26.69	36.14	23.70	421	5.10	5.39	.29	-.61	.11	.2	1.9	1.8

Recording Thermograph Data Printout

18

RECORDING THERMOGRAPH DATA CONT'D

YR MN DY HOUR TEMP

75	10	20	605	25.3
75	10	20	805	25.3
75	10	20	1005	25.3
75	10	20	1205	25.3
75	10	20	1405	25.3
75	10	20	1605	25.3
75	10	20	1805	25.2
75	10	20	2005	25.2
75	10	20	2205	25.1
75	10	21	5	25.1
75	10	21	205	25.1
75	10	21	405	25.0
75	10	21	605	25.0
75	10	21	805	25.0
75	10	21	1005	25.0
75	10	21	1205	25.0
75	10	21	1405	25.0
75	10	21	1605	25.0
75	10	21	1805	25.0
75	10	21	2005	25.0
75	10	21	2205	24.9
75	10	22	5	24.9
75	10	22	205	25.0
75	10	22	405	24.9
75	10	22	605	24.9
75	10	22	805	24.9
75	10	22	1005	24.9
75	10	22	1205	24.9
75	10	22	1405	24.9
75	10	22	1605	24.9
75	10	22	1805	24.9
75	10	22	2005	24.8
75	10	22	2205	24.8
75	10	23	5	24.8
75	10	23	205	24.8
75	10	23	405	24.8
75	10	23	605	24.8
75	10	23	805	24.8
75	10	23	1005	24.8
75	10	23	1205	24.8
75	10	23	1405	24.8
75	10	23	1605	24.8
75	10	23	1805	24.8
75	10	23	2005	24.8
75	10	23	2205	24.7

Thermograph Data Graph Output

Initiation of Georgia Bight Studies

The longer term plan is to move our studies to the Georgia Bight in late 1976. To do this requires considerable planning, analysis of existing data and in some cases the acquisition of appropriate data to fill in gaps. Several shorter cruises were scheduled to acquire nearshore data to test various methods of identifying river plumes, especially the Savannah River. A recording thermograph (on loan from NCSU) was installed on the bottom on the mid-shelf off Brunswick, Georgia, to give us more data on the frequency of intrusions and the form of seasonal heating and cooling.

A large amount of data was gathered during the 1973 and 1974 Georgia Bight studies and is now being analyzed. Several papers resulting from this work are listed in the first section of this report.

Onslow Bay Intrusion Studies

Four cruises were made in Onslow Bay (OBIS I-IV) between June and December 1975. The data are now completely reduced and in the analysis phase. The attached manuscript discusses and presents the results of the cruise OBIS II.