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CONTINENTAL SHELF PROCESSES AFFECTING THE OCEANOGRAPHY OF THE SOUTH ATLANTIC BIGHT

MASTER

PROGRESS REPORT

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INTRODUCTION

During the last year significant developments took place in our understanding of the South Atlantic Bight. The papers included in this progress report summarize some, but not all, of these findings.

Some of the results are summarized as follows:

Onslow Bay flusing rates can be determined using a model based on an exponential dilution model.

Eddy induced nitrate flux accounts for most input of new nitrogen into shelf waters.

Tarballs in the Gulf Stream are not transported to the nearshore because of an apparent inner shelf density front.

A major discovery during the year was an intense bloom of chlorophyll associated with eddy and possibly Gulf Stream induced upwelling. Continuous surface mapping for temperature, salinity, and chlorophyll along a 300km segment of the Gulf Stream front defined the spatial scales of a large diatom patch localized within the core of a spin off eddy centered over the 200m isobath off Jacksonville, Florida (see Figure 1). The 2 $\mu g \cdot liter^{-1}$ surface chlorophyll isopleth enclosed an area greater than $1000km^2$ with an alongshore dimension of about 130km. Surface chlorophyll exceeded 5 $\mu g \cdot liter^{-1}$ within the upwelled cold core of the eddy which is 10-100X the concentration found in Gulf Stream or resident shelf surface water. Small diatoms dominated the patch with maximum observed abundance greater than 10^6 $cells \cdot liter^{-1}$. The same species comprised the offshore deep chlorophyll maximum suggesting continuity between it and the surface patch. The results provide the first evidence that eddies propagating along the Gulf Stream front lead to localized zones of very high near-surface productivity. Vertical sections through the upwelling zone demonstrate the intense uplifting of the isopleths (Figure 2). The dome structure is typical of this feature. Upwelling events such as the one described here may partially explain why pelagic fish such as menhadden and bluefish migrate to the South Atlantic Bight to spawn during the winter and early spring.

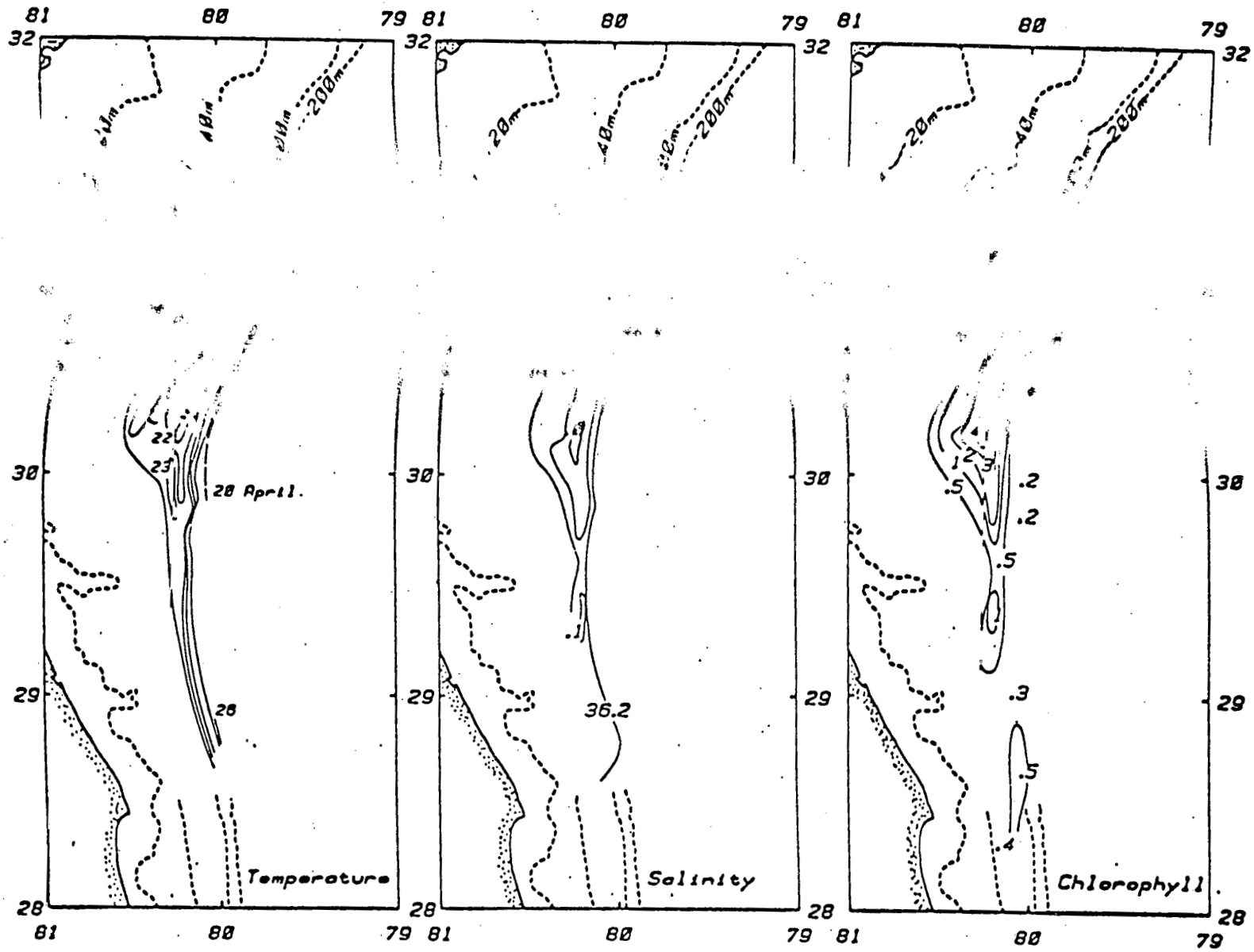

Figure 1. Surface temperature distribution (20-22 April, 1979). Dashed line indicates Gulf Stream front as determined by satellite on 20 April, 1979. Note low temperature (21°C) eddy core.
Surface salinity distribution (20-22 April, 1979). Note low salinity eddy core. Surface chlorophyll distribution (20-22 April, 1979). Note that chlorophyll maximum coincides with the coldest and lowest salinity water that forms the eddy core.

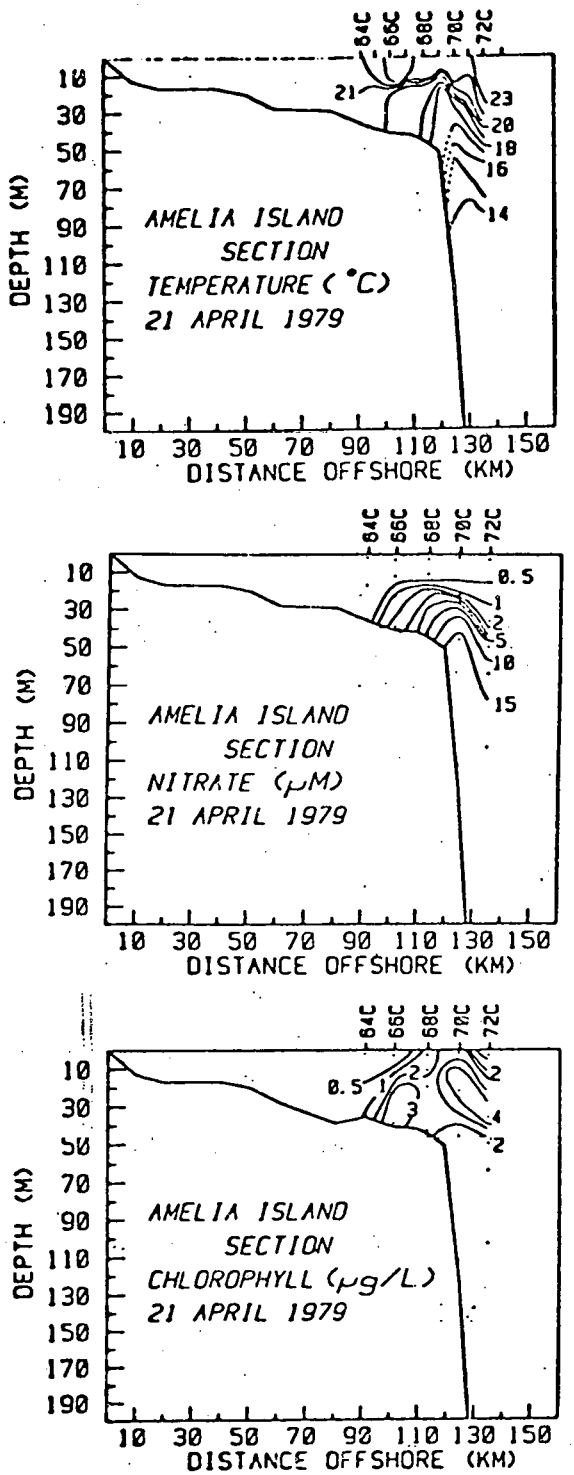

Figure 2. Vertical sections of temperature, nitrate and chlorophyll for transect through eddy.

FIELD OBSERVATIONS DURING THE PAST YEAR

Field work was a smaller part of our effort during '79-'80 as we prepared for GABEX-I. Cruises under this contract or cooperatively with other contracts are summarized in Table 1.

TABLE 1. Department of Energy funded cruises 1975 to 1980.

Date	Cruise #	Data	Comment
6-7 Aug 1975	AD-75-01	14BC	Onslow Bay Mooring Cruise (P)
4-14 Sept 1975	E-9-75	212BC/112XBT	Onslow Bay Intrusion Study (P)
13-14 Oct 1975	AD-75-2	20BC/15XBT	Onslow Bay Mooring Cruise (P)
8-11 Dec 1975	AD-75-3	9BC/59XBT	Onslow Bay mooring Cruise (P)
13 Feb 1976	BF-76-2	4BC	Georgia Bight (NP)
26 Feb 1976	BF-76-3	21BC	Georgia Bight (P)
10 Mar 1976	BF-76-6	6BC/5XBT	Georgia Bight (P)
29 Mar 1976	BF-76-9	7BC/4XBT	Georgia Bight (P)
29 Apr 1976	BF-76-13		Test (NP)
5-6 May 1976	BF-76-15	16BC	Georgia Bight (P)
19 May 1976	BF-76-17		Test (NP)
26 May 1976	BF-76-18	2BC	Georgia Bight (aborted), (P)
7 June 1976	BF-76-23		Test (NP)
17 June 1976	BF-76-24		Test (NP)
14-18 July 1976	BF-76-0B5	42CTD/11XBT	Onslow Bay Study (P)
21-23 July 1976	BF-76-0B6	45CTD	Onslow Bay Study (P)
28 July-6 Aug 1976	BF-76-0B7	30CTD/32XBT	Onslow Bay Study (P)
14-16 Aug 1976	BF-76-0B8	42CTD	Onslow Bay Study (P)
18 Aug 1976	BF-76-0B9	4CTD	Onslow Bay Study (P)
8 Oct 1976	BF-76-30	42CTD	Georgia Bight, Front Hunt 1 (P)
14 Oct 1976	BF-76-32	49CTD	Georgia Bight, Front Hunt 2 (P)
15 Oct 1976	BF-76-33	34CTD	Georgia Bight, Front Hunt 3 (P)
17-18 Oct 1976	BF-76-39	88CTD	Georgia Bight, Front Hunt 4 (P)
9-15 Dec 1976	CI-76-12	37CTD/38XBT	Georgia Bight (P)
8-9 Mar 1977	BF-77-14	35XBT	Georgia Bight (P)
8-16 Apr 1977	AD-77-4	86CTD/30XBT	Georgia Bight (P)
19 Apr 1977	BF-77-29	14XBT	Georgia Bight (P)
21 Apr 1977	BF-77-30	14RSS	Georgia Bight, Front Hunt 5 (P)
26-27 May 1977	BF-77-38	15CTD/1XBT	Georgia Bight (P)
4-10 July 1977	CI-77-03	61CTD/30XBT	Georgia Bight (P)
10-11 Aug 1977	BF-77-54	22XBT	Georgia Bight Intrusion Study I (Paffenhofer)
12-15 Aug 1977	BF-77-54	34XBT	Georgia Bight Intrusion Study II
17-21 Aug 1977	BF-77-54	42XBT	Georgia Bight Intrusion Study III
22-23 Aug 1977	BF-77-54		Georgia Bight Intrusion Study IV
26-27 Aug 1977	BF-77-54	23XBT	Georgia Bight Intrusion Study V
13-14 Sept 1977	BF-77-57	14CTD/12XBT	Georgia Bight (P)
5-9 Nov 1977	CI-77-07	55CTD	Georgia Bight (P)
23-27 Jan 1978	CI-78-01	24BC/24XBT	Georgia Bight (P)
17-21 Feb 1978	BF-78-07	13CTD	Tests (NP)
12-23 Apr 1978	CI-78-04*	59CTD/19XBT	Georgia Bight (IP)
9-12 May 1978	BF-78-21	28CTD/12RSS	Georgia Bight, Front Flux (P)
9-12 May 1978	KJ-78-01	26 RSS	Georgia Bight, Front Flux (P)
3-10 August 1978	CI-78-06(L3)	36CTD/59XBT	Georgia Bight (IP)
8-14 Nov. 1978	CI-78-08**	50CTD/4XBT	South Atlantic Bight (P)
13-19 March 1979	PP-79-01**	43CTD/16XBT	South Atlantic Bight (P)
27 May-2 June 1979	PP-79-02**	52 CTD	South Atlantic Bight (P)
5 July-17 Aug. 1979	BF-79-34	28CTD/194XBT	Georgia Bight Intrusion Study (IP)
22-29 Aug. 1979	PP-79-03**	52CTD	South Atlantic Bight (P)
3-4 Oct. 1979	BF-79-51	8XBT	Georgia Bight (IP)
15-17 Oct. 1979	BF-79-55	4XBT	Georgia Bight (IP)
26 Oct.-3 Nov. 1979	CI-79-02**	55CTD/53XBT	South Atlantic Bight (IP)
6-10 Nov. 1979	CI-79-02(L3)	72CTD	Georgia Bight, Front Flux (IP)
6-10 Nov. 1979	BF-79-59	69RSS	Georgia Bight, Front Flux (IP)
5 Dec. 1979	BF-79-65		Georgia Bight (IP)
7-8 Jan 1980	KJ-80-1		Georgia Bight (IP)

Ships: BF=Blue Fin; CI=Columbis Iselin; E=Eastward; AD=Advance II; KJ=Kit Jones

Abbreviations: NP=not publishable; P=published; IP=in preparation

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** Principally BLM Funded