OCEANUS 269 CRUISE SUMMARY: A STUDY OF DEEP WESTERN BOUNDARY CURRENT VARIABILITY (PART II)

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The second phase of BOUNCE (for deep BOUNdary Current Experiment) was successfully carried out in May-June, 1995. BOUNCE II consisted of a 22-day hydrographic/tracer/float cruise to re-occupy the BOUNCE I stations of November, 1994. The overall goal of the experiment is to characterize the variability of the DWBC and help sort out the role of regional versus upstream (climate) forcing. The observational plan was to re-do the BOUNCE I station grid and launch the remaining RAFOS floats, and (time permitting) occupy additional stations. As described below, these objectives were successfully completed.

Hydrography and Tracers

The five sections of BOUNCE I were re-occupied, and a sixth section was added further west (a repeat of a 1990 DWBC crossing). All the sections were along TOPEX/POSEIDON altimetric subtracks.

As before, measurements of oxygen and CFCs (F-11, F-12, F-113) were taken, and a lowered ADCP / POGO float combination was employed at each station in order to determine the absolute velocity field. Because the lowered ADCP is a relatively new technology, near the end of the cruise we did a time series of four casts at one sight over half an inertial period. This will help determine better what the lowered ADCP signal actually tells us in terms of the large scale flow.

Shortly after each section was completed, the CTD and water sample variables were contoured as vertical sections. This first look at the data revealed intriguing changes from conditions encountered during BOUNCE I. For example, the tracer data revealed significant alongstream and temporal changes in the width of the DWBC, reminiscent of a varicose wave variability. Such fluctuations are precisely what we need to identify and understand. Also during the cruise, using the BOUNCE I data, we computed difference sections of all the variables. Figure 2 shows the difference in potential temperature and salinity between fall 94 and summer 95. This is dominated by vertically aligned variations in the deep water (warmer coinciding with saltier; colder coinciding with

fresher). It is suspected that this type of variability is due to topographic Rossby waves. Obviously this needs to be investigated, and the next step is to consider changes along density surfaces to look beyond such wave fluctuations.

Both BOUNCE I and II have been closely coordinated with ongoing work at Bedford Institute of Oceanography (BIO; Allyn Clarke, Ocean Circulation Division). BIO had fall 94 and spring 95 cruises (coincident with the BOUNCE work) in the Newfoundland basin, which included numerous DWBC crossings. Altogether the combined experiments produced 9 repeat DWBC sections covering portions of both the subpolar and subtropical gyre. Both experiments included the full suite of tracers (including CFCs), and we supplied BIO with a lowered ADCP for their spring cruise. Thus, the two data sets are fully compatible, providing the opportunity for an effective and exciting collaboration.

RAFOS floats

Six floats were deployed along the hydrographic sections of BOUNCE II. These floats were left over after BOUNCE I, when bad weather prevented the deployment of all 30 floats designated for the experiment. The deployment information for the six floats is given in the attached table. In summary, four floats were launched along the 58W section in a manner identical to BOUNCE I, with two floats ballasted for 3000 m and two for sigma-t = 27.73 (nominally at 800 m). This was done under the assumption that most of the floats launched during BOUNCE I have probably drifted west of 60W, and the new floats would in essence extend the along-stream extent of the sampling. The two remaining floats, one deep and one shallow, were launched along the 69W section at two locations also seeded during BOUNCE I (the 1500 and 3500 m isobaths). The idea here was to try to make sure that at least some floats reach the cross-over. The presence of rings in the slope water, particularly one that has been located southeast of Georges Bank for several months, may prevent some eastern floats from reaching Cape Hatteras. Note however, that at the time of the BOUNCE II cruise, there was a small ring between the 69W section and Cape Hatteras, that may influence the tracks of these two floats.

RAFOS Float Deployment Information: BOUNCE II

Float #	Lat (N)	Lon (W)	Depth	Line	CTD #	Isobath
280	43.0309	58.1417	3000	2	13-14	3850
256	43.3312	58.4380	3000	2	15	3500
278	43.3313	58.4390	800	2	15	3500
272	43.7928	58.7737	800	2	16-17	1500
257	38.5377	68.9543	3000	5	38	3500
274	39.7857	69.8526	800	5	33-34	1500