

HYDROGRAPHIC SURVEY REPORT
Technical Report UNH-OPAL-1998-004

**Convective Overturn Experiment
(CONVEX) CRUISE # 5**

**R/V OCEANUS (OC-315)
(Between 09 and 12 January 1998)**

F.L. Bub, W.S. Brown, P. Mupparapu, and L.C. Smith

Ocean Process Analysis Laboratory (OPAL)

*Institute for the Study of Earth, Ocean and Space
Department of Earth Sciences
University of New Hampshire
Durham, NH 03824*

Research Sponsored by the National Science Foundation

This report is maintained as the web page

~~http://ekman.sr.unh.edu/OPAL/CONVEX/OC315/oc315_report.html~~

(Filed 13 February 1998, last update 05 August 1999)

NOT
working

Report Contents.

- 0. Abstract
- 1. Introduction
- 2. Cruise Narrative
- 3. Data
 - 3a. Data Acquisition
 - 3b. Processing
 - 3c. Corrections
 - 3d. Presentations
- 4. Acknowledgements
- 5. References

Tables.

Table 1. Surface Contours of Properties on Pressure and Density Surfaces.

Table 2. CTD Station Information.

Figures.

Figure 1.a. Cruise Track, CTD Locations and UNH mooring sites. Stations numbered sequentially.

Figure 1.b. Station and mooring locations with Wilkinson Basin bathymetry and water mass analysis region outlined.

Figure 2. Wilkinson Basin mooring configuration showing the Main Buoy (A), thermistor chains (B & C), and guard buoys (D, E & G).

Figure 3.a.. Composite of CTD profiles in Wilkinson Basin. See section 3.d.1 for a description.

Figure 3.b.. Temperature-Salinity Diagram for CTD profiles in Wilkinson Basin.

Figure 4.a. Hydrography Section A to WB to F: Stations 17-13, 03-07. Vertical sections of temperature / salinity / sigma theta.

Figure 4.b. Hydrography Section A to I to WB to G: Stations 17-20, 12-09.

Abstract.

This report describes the hydrographic measurements obtained 9-12 January 1998 as part of the NSF-supported "Observational / Modeling Study of Wintertime Convection and Water Mass Formation" in the western Gulf of Maine (GOM). Herein we document the fifth of seven University of New Hampshire (UNH) cruises aboard the R/Vs ENDEAVOR and OCEANUS as part of this "Convective Overturn Experiment" (CONVEX). This report and these data can be accessed through the RMRP Research Environmental Data and Information Management System (REDIMS) via the WWW address:

<http://ekman.sr.unh.edu/OPAL/CONVEX/>

1. Introduction.

Click here to read an introduction to the CONVEX program.

2. Cruise Narrative.

The RV Oceanus departed Woods Hole at 0900L on 08 January 1998. We passed through Cape Cod

Canal enroute to central Wilkinson Basin in the Gulf of Maine. The first CTD cast was made at 0100Z (0600 L EST) at the mooring site. After surveying the site for bottom bathymetry and locations of the existing guard buoys, a second CTD cast occurred at 1120Z prior to buoy deployment. At 1540Z (1030L), we commenced rigging for deployment of the Main Instrumented Buoy "A" (Figure 2). The anchor was released at 1817Z (1317L) at 42 ° 42.08' N 69 ° 38.07' W. We then placed T-Chain "C" at 1952Z (1452L) and Guard Buoy "G" at 2052Z (1552L). The mooring configuration then consisted of the Main Instrumented Buoy (A), two subsurface T-Chains (B and C), and two Guard Buoys (E and G).

A post-deployment CTD at 2040Z was followed by another 18 profiles in the pattern depicted by Figure 1.a. Water samples were drawn for four nutrient sample profiles and 10 CTD salinity calibrations. The final cast occurred at 0726Z 12 January and the Oceanus returned to Woods Hole via Cape Cod Canal and docked the evening of 12 January 1998.

2.a. Scientific Party:

F. L. Bub (Chief Scientist), W. S. Brown, R. Regnier, and B. Strully. Coast Guard observer - M. Brooks. Woods Hole Technician - L. Stein.

2.b. Cruise Photos

[Click here to see OC-315 Cruise photos.](#) GIF photos of the OC-315 scientific party and cruise work are included.

3. Data.

3.a. Hydrographic Data Acquisition.

The R/V OCEANUS' SeaBird SBE 911 Plus CTD Profiler was used to measure vertical profiles of electrical conductivity and temperature versus pressure at 22 hydrographic stations during 9-12 January 1998 (Figure 1.a).

Sensors on the CTD were factory calibrated on 9 October 1996. This CTD samples at a rate of 24 scans per second. Salinity profiles were computed from these data using SeaBird software. Additional sensors on the SBE-911 also recorded data for the measurement of dissolved oxygen, water transmissivity, fluorescence (Chl-a), and irradiance (PAR). See Figure 3.a. for a composite of profiles. CTD data acquisition, display and storage were managed by an on-board computer using the SeaBird software package SEASOFT.

At each station, the CTD was lowered at a rate of approximately 30 meters per minute to depths within 5-10 meters of the bottom. Three to eight water samples were collected with a rosette of 5-liter Niskin bottles, and specimens for nutrient and oxygen isotope analyses were gathered. At selected stations, the conductivity of one water sample was determined using the UNH Guildline 8400A Autosol and the corresponding salinities were used to correct salinity values derived from the raw CTD measurements.

3.b. Data Processing.

The CTD data were processed using a series of SeaBird SEASOFT programs (listed in parentheses) in

which:

- a. Raw hexadecimal CTD output is converted into engineering units (DATCNV). Only downcast data were used to produce station profiles. Bottle samples were taken during upcasts and average CTD data at each bottle depth were stored (ROSSUM).
- b. Noise contamination greater than 2 standard deviations from 50 point sections was removed (WILDEDIT). In addition, CTD downcast data associated with downward velocities of less than 25 cm/s (due to looping) were discarded (LOOPEDIT).
- c. Data were filtered to ensure consistent response times using a low pass filter with time constant 0.15 sec (FILTER).
- d. Data were averaged into 1 decibar (dbar) bins (BINA VG) to produce profiles of temperature, salinity, etc., versus pressure from the unequally-spaced cast data from each station.
- e. These profile data were stored as ASCII files on floppy disks for post-processing and plotting.

3.c. Data Descriptions, Corrections and Estimated Accuracy / Precision.

[Click here for a summary of data descriptions, corrections and estimated accuracy / precision.](#)

3.d. Data Presentations.

The corrected hydrographic data are presented as:

1. Station profile plots and property-property diagrams,
2. Vertical section contour plots, and
3. Horizontal pressure and density surface contour plots.

3.d.1. Vertical CTD Profile Plots.

Individual profiles may be viewed via Table 2. A composite of all CTD profiles is shown as Figure 3.a and an expanded T-S diagram as Figure 3.b. Data are presented on two pages per station:

- **Page A** - Station profiles of temperature, salinity, sigma-theta density, stability (N-squared) and a temperature-salinity diagram. The upper three plots (surface to 100 m deep) represent zoomed details of water property structure in the main thermocline (halocline, pycnocline) zone (horizontal scales vary). The middle plots present these water property structures for the entire water column. These plots are all on the same depth / property scale for intercomparison. A Brunt-Vaisala frequency (N-squared) plot indicates water column stability.
- **Page B** - When data are available, this page shows station profiles of measured dissolved oxygen, transmissivity, fluorescence (Chl-a), solar irradiance (PAR), as well as computed sound velocity, temperature - dissolved oxygen, and salinity - dissolved oxygen diagrams.

3.d.2. Vertical Hydrographic Sections.

Potential temperature, salinity, and sigma-theta sections for the following transects are presented. Each plot spans 200 km and horizontal scales are preserved. Contour intervals are indicated on plots. The CTD station numbers are shown along the top horizontal axis and the ocean bottom (based on depths at CTD stations) is shaded.

Point A to F, tracking southeastward through Jeffreys and Wilkinson Basins on Figure 4.a, and

Point A to G, tracking southeastward through Jeffreys and Wilkinson Basins on Figure 4.b.

3.d.3. Horizontal Pressure and Density Surfaces.

Contoured surfaces may be accessed via Table 1. Contours of temperature, salinity and density fields on the 5, 25, 50, 100, 150 and 200 dbar pressure surfaces (equivalent to depth in m) and the sigma theta 26.00 density surface (mid water column) are presented for information. The 5 m field is the mean of the 0-10 m layer. Dynamic height fields indicate geostrophic shear. Cyan regions show where the ocean bottom is shallower than the plotted surface. CTD profiles at the red dots (x indicates no data). Wilkinson Basin mooring marked by the wheel. Red lines bound region of the CONVEX water mass analyses. Plotted contour intervals, along with data extrema and search epsilon, are indicated in captions.

3.d.4. Data Files.

Profiles can be made available as (a) **ASCII files** upon request to frank.bub@unh.edu. Upon final quality control, we will provide (b) **JGOFS** default files through a ftp site.

Other OC-315 Cruise data including enroute ADCP, TSAL, navigation, bathymetry and observed weather records will also be made available upon further processing.

4. Acknowledgements

The valuable work of Ken Morey, Dan Howard and Karen Garrison resulted in the successful deployment of the Wilkinson Basin Buoy and hydrographic survey. We appreciate the efforts of Captain Bearse and crew of R/V OCEANUS as they helped us conduct this field program. We are grateful for the help provided by T. Loder and A. Wang / V. Pilon in processing the bottle salinities.

F. Bub, W. Brown, and P. Mupparapu are supported by NSF Grant OCE-9530249.

5. References.

Fofonoff, N. P. and R. C. Millard Jr., 1983. Algorithms for compilation of fundamental properties of seawater, UNESCO Technical Papers in Marine Science, no. 44. UNESCO, Paris, France, 53 pages.

Garrison, K. M. and W. S. Brown, 1989. Hydrographic survey in the Gulf of Maine July-August 1987, UNH Tech. Rpt. No. UNHMP-T/DR-SG-89-5, Univ. of NH, Durham, NH.

Morgan, P. P., 1994, SEAWATER Software Version 1.2b, CSIRO Division of Oceanography, Hobart, AUS.

Table 1. Surface Contours of Water Properties.

These fields are briefly described in section 3.d.3. Pressure (P), Temperature (T), Salinity (S), Density (D), and Dynamic Height (DH) are contoured at the specified pressure or density levels.

PRESSURE SURFACE	POTENTIAL TEMPERATURE (deg C)	SALINITY (psu)	DENSITY: SIGMA-THETA (kg/m³)	DYNAMIC HEIGHT (cm, ref surface)
05 dbar	T05	S05	D05	X X X
25 dbar	T25	S25	D25	X X X
50 dbar	T50	S50	D50	X X X
100 dbar	T100	S100	D100	DH100
150 dbar	T150	S150	D150	DH150
200 dbar	T200	S200	D200	X X X

DENSITY SURFACE (kg/m³)	PRESSURE (dbar)	POTENTIAL TEMPERATURE (deg C)	SALINITY (psu)
26.00 sigma theta	P26.00	T26.00	S26.00

Table 2. CTD Profile Plots.

Hydrographic station information for the R/V OCEANUS Cruise OC-315 (09 - 12 January 1998). Position, depth, date, and time are for the bottom of the cast. Profiles, which are described in section 3.d.1, may be viewed by clicking on ##A or ##B. See Figure 1.a for station locations.

CTD station number	Latitude (deg min N)	Longitude (deg min W)	Water Depth (meters)	Time (Z)	Date (DD/MM/YY)
01A 01B	42.7052	69.6415	270	0122	10/01/98
02A 02B	42.6988	69.6338	265	1130	10/01/98
03A 03B	42.7002	69.6357	265	2040	10/01/98
04A 04B	42.5268	69.4137	235	2248	10/01/98
05A 05B	42.3527	69.1927	240	0036	11/01/98
06A 06B	42.1763	68.9677	157	0225	11/01/98
07A 07B	41.9990	68.7477	140	0401	11/01/98
08A 08B	42.2462	68.7463	205	0546	11/01/98
09A 09B	42.4955	68.7467	185	0736	11/01/98
10A 10B	42.5670	69.0457	170	0914	11/01/98

11A	11B	42.6343	69.3395	210	1049	11/01/98
12A	12B	42.7037	69.6307	265	1238	11/01/98
13A	13B	42.7985	69.8230	240	1846	11/01/98
14A	14B	42.8990	70.0012	140	2013	11/01/98
15A	15B	42.9983	70.1997	170	2136	11/01/98
16A	16B	43.0723	70.3488	110	2245	11/01/98
17A	17B	43.2000	70.4883	031	2357	11/01/98
18A	18B	43.1185	70.1400	140	0133	12/01/98
19A	19B	43.0875	69.7813	165	0311	12/01/98
20A	20B	42.8933	69.7083	175	0430	12/01/98
21A	21B	42.6970	69.6290	270	0550	12/01/98
22A	22B	42.5468	69.8160	255	0726	12/01/98

RECEIVED
NATIONAL SEA GRANT LIBRARY

July 16

~~JUN 11 2001~~

Pell Bldg. URI Bay Campus
Narragansett RI 02882 USA