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Water Column Thermal Structure Across the Shelf and Slope Southeast of Sandy Hook, New Jersey in 1983

by

Steven K. Cook

Atlantic Environmental Group, National Marine Fisheries Service,
National Oceanic and Atmospheric Administration, U.S. Department of Commerce
Narragansett, Rhode Island, USA, 02882

Monitoring of the shelf water and upper continental slope water events in the New York Bight continued in 1983 for the eighth year. Temperature-depth profiles were constructed from 21 expendable bathythermograph (XBT) transects extending from the entrance of New York Harbor through the 106-Mile Dumpsite (Fig. 1). The transects collected and the oceanic features monitored in the New York Bight are presented in Table 1.

A "station through time" diagram (Fig. 2) and a bottom temperature diagram (Fig. 3) depict the major oceanographic/climatological events occurring in the New York Bight in 1983. The "station through time" diagram was constructed by plottting through time the temperatures in the water column above the 65 m isobath, using 1°C contour intervals. The 65 m isobath was selected for its mid-shelf location, a position in the cold pool not influenced by the Hudson Canyon. The bottom temperature diagram was constructed following Chamberlin's (1977) method, by deriving bottom water temperatures from each contoured section, plotting these temperatures against depth and date and contouring at 1°C intervals.

Two distinct water masses, shelf water and slope water, reside in the New York Bight. A thermal transition zone, the shelf/slope front (SSF) separates the inshore shelf water from the offshore slope water. The surface position of the SSF usually occurs over the 200 m isobath,

while the bottom indicator, the intersection of the 10°C isotherm with the bottom, occurs between 80 and 120 m depths (Wright, 1976).

Only four Gulf Stream warm core rings interacted witih this transect in 1983; one less than last year. Only one ring (83-D) made an impact on the upper continental slope.

Shelf Water Events

The sea surface temperatures near shore ranged from a minimum of 1.6°C in mid-February to a maximum of 24.0°C in early September. (Fig. 3). Sea surface temperatures at mid-shelf ranged from 6.2°C in March and April to 23.3°C in August, reflecting the normal timing lag and temperature increase from nearshore to offshore (Fig. 2). Shore station data shown as temperatures at 0 meters on Figure 3 show a slight warming event occurring in early February.

An unusual warming event from offshore ring 83-D occurred from early October to mid-November between 140 and 240 meters depth. Warm water of temperatures greater than 13°C was injected onto the upper continental slope, (Fig.3). We've seen these warm water intrusions in the past. In 1980, there was water of greater than 13°C injected onto the shelf to depths as shallow as 70 meters. These occurrences appear to be associated with warm core rings in close proximity.

Thermocline development began as usual in late April to early May and reached maximum intensity of about 1°C/meter in mid-August. Normal deepening and thermocline erosion occurred throughout the summer until mid-November, when overturn was complete (Figure 2).

Bottom Temperature Events

This year cold pool water (water <10°C) lasted until the last half of October, compared to 1982 when it only lasted until the end of September.

The presence of 5°C water (a subjective way of estimating winter intensity) was less than normal in 1983. Usually 5°C water lasts until the end of March with other 5°C parcels occurring as late as the end of May. In 1983, 5°C water only lasted until mid-March and occupied only about 2/3 of its usual area on the continental shelf. No separated parcels of 5°, 6°, or 7°C water were observed in 1983, as compared to the 2 significant parcels we observed in 1982.

Summary

Cold pool temperatures were warmer than usual earlier in the year, but 10°C water lasted on the bottom until mid-October, about 2 weeks longer than usual.

One warming event from offshore due to ring activity impacted on the upper continental slope to depths as shallow as 135 meters.

Fall overturn was about two weeks later than last year and was about 1°C cooler than last year.

References

CHAMBERLIN, J. L. 1977. Temperature structure on the continental shelf and slope south of New England during 1975. *In* Effects on the marine fisheries resources of the United States, J. R. Goulet and E. D. Haynes (ed.). Section 16, MARMAP Contrib. N. 130, NMFS, Washington, D.C.

WRIGHT, W. R. 1976. The limits of shelf water south of Cape Cod, 1941 to 1972. J. Mar. Res., 34: 1-14.

Table 1. Water Column Thermal Structure in 1983.

Vessel	Cruise No.	Date	Depth Range of Cold Pool (10°C or less)	Rings Present Along Transect
"Oleander"	83-01	15-16 Jan	Isothermal	-
"Oleander"	83-02	28 Jan	Isothermal	-
"Oleander"	83 03	02-03 Feb	Isothermal	-
Oleander"	83-04	18-19 Feb	Isothermal	-
"Oleander"	83-05	11-12 Mar	Isothermal	-
"Oleander"	83-06	16-17 Mar	Isothermal	-
"Oleander"	83-07	16-17 Apr	Isothermal	82-I
"Oleander"	83-08	14-15 May	20-75 m	-
"Oleander"	83-09	20 May	20-105 m	-
"Oleander"	83-10	10-11 Jun	20-110 m	-
"Oleander"	83-11	15-16 Jun	25-100 m	-
"Oleander"	83-13	08-09 Jul	25-90 m	83-E
"Oleander"	83-14	05 Aug	35-80 m	-
"Oleander"	83-15	10-11 Aug	25-95 m	-
"Oleander"	83-16	23-24 Sep	40-90 m	-
"Oleander"	83-17	14-15 Oct	65-100 m	83-D
"Oleander"	83-18	19-20 Oct	70-87 m	83-D
"Oleander"	83-19	18-19 Nov	Isothermal	-
"Oleander"	83-20	22-23 Nov	Isothermal	-
"Oleander"	83-21	02-03 Dec	Isothermal	-
"Oleander"	83-22	07-08 Dec	Isothermal	-

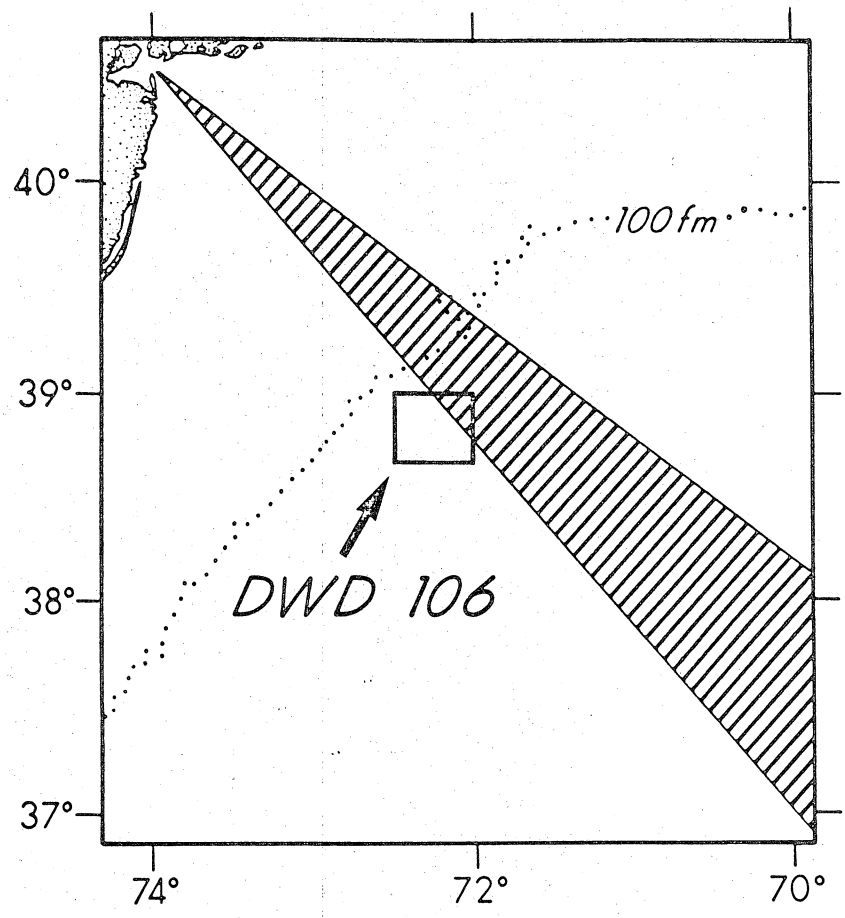

Figure 1. Envelope of 1983 transects in the New York Bight from the entrance of New York Harbor to the 106 Dumpsite.

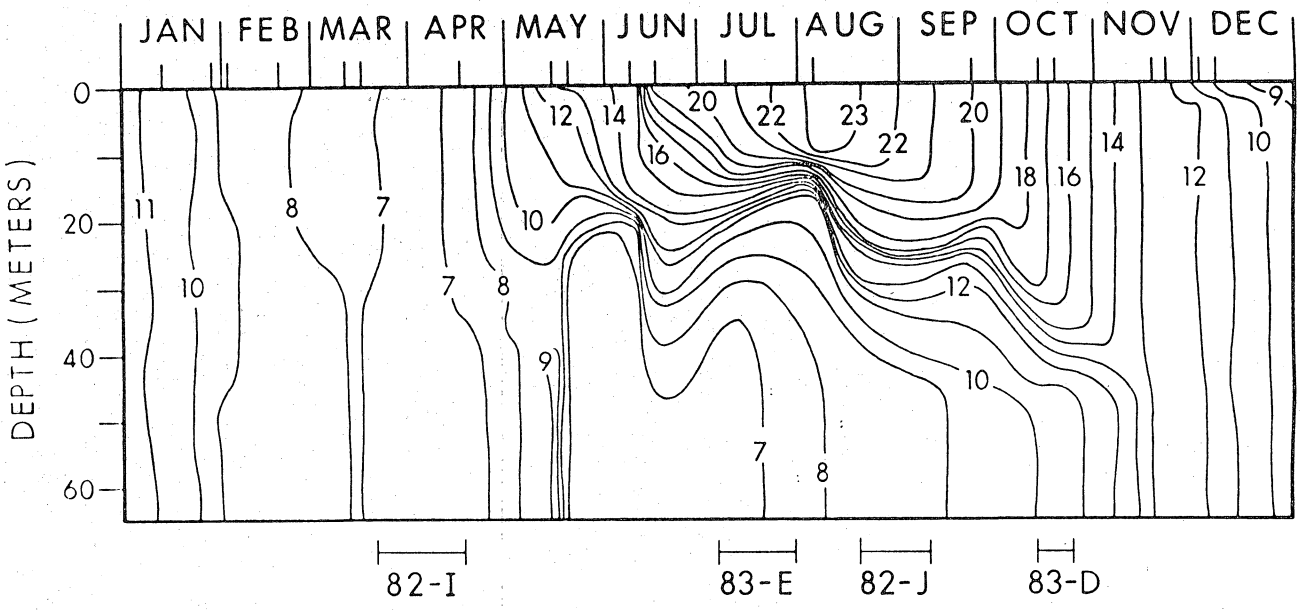

Figure 2. Station through time depicting seasonal water column temperatures at 65 M. Lines at the bottom of the diagram indicate the duration of warm core Gulf Stream Rings in the New York Bight area.

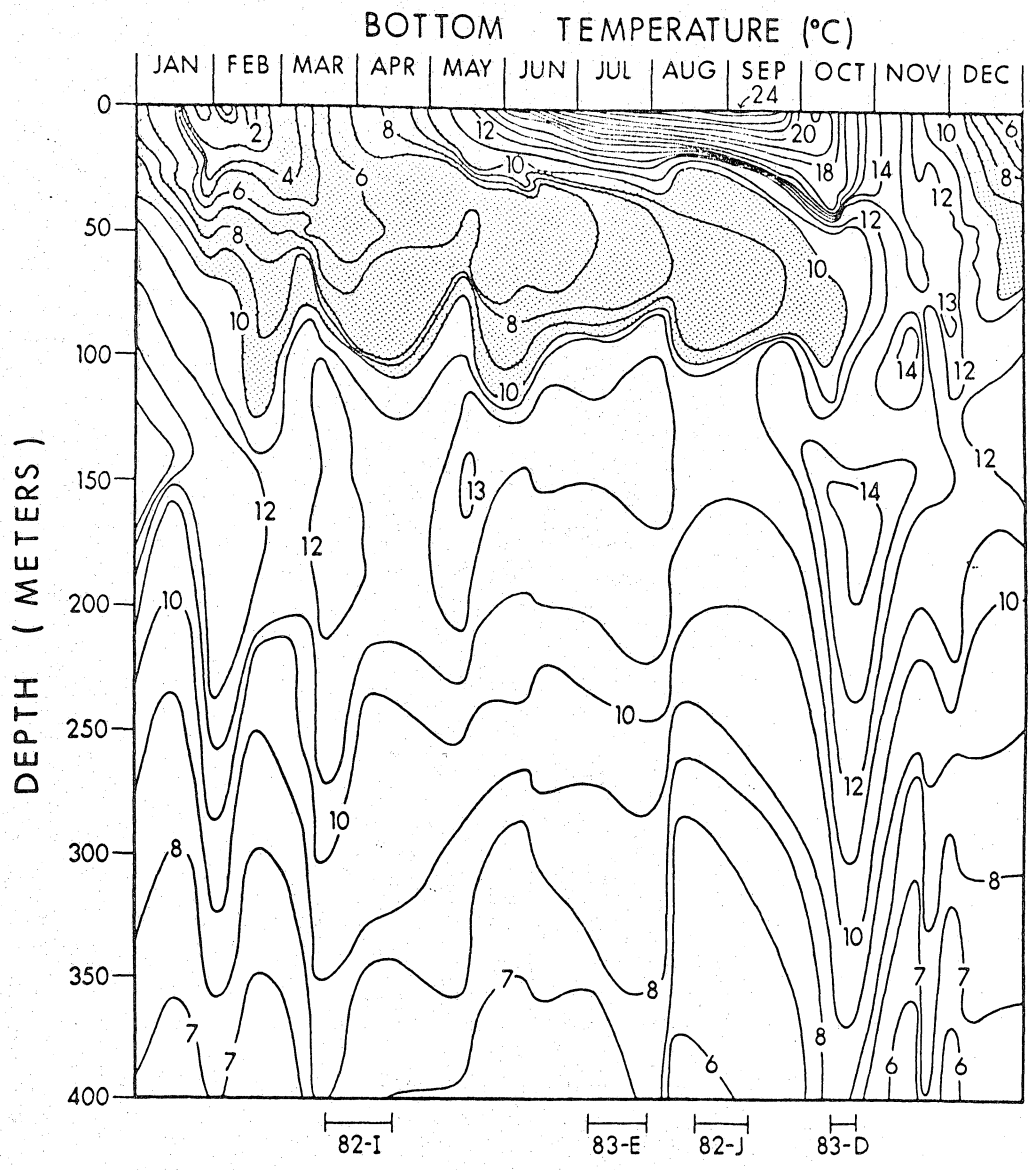

Figure 3. Bottom temperature diagram of the continental shelf and slope waters from New York Harbor to the 106 Dumpsite. Lines at the bottom of the diagram indicate the duration of warm core Gulf Stream rings in the New York Bight area.