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[Volume 15, Issue 7 \(July 1985\)](#)

Journal of Physical Oceanography

Article: pp. 963–984 | [Abstract](#) | [PDF \(1.56M\)](#)

Current Variability near the Southeast Newfoundland Ridge

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(Manuscript received November 30, 1983, in final form March 21, 1985)

DOI: 10.1175/1520-0485(1985)015<0963:CVNTSN>2.0.CO;2

ABSTRACT

A cooperative moored array experiment to measure currents and temperatures in the vicinity of the Southeast Newfoundland Ridge was carried out over a 14-month period starting September 1979 and ending December 1980.

Measurements were obtained from an incoherent exploratory array of nine moorings instrumented at 500, 800, 1500 and 4000 m levels. The objectives were to explore the amplitude, spatial variability and time scales of the eddy field in the decay region of the Gulf Stream. An additional experiment and mooring to examine the influx of Norwegian Sea Overflow Water into the western North Atlantic Basin was imbedded in the array. Supplementary CTD and XBT profiles and a single current profile were taken during deployment and recovery cruises to aid in interpretation of the moored measurements and identification of water masses.

A description of the array experiment and preliminary results are reported. Mean velocities were weak compared with rms eddy velocities and were not determined with statistical significance at many locations. Maximum daily-averaged speeds ranged from 0.3 to 0.6 m s⁻¹ at 500 m and 0.09 to 0.3 m s⁻¹ at 4000 m. Eddy kinetic energies at 500 m ranged from 0.034 J kg⁻¹ near the Ridge to 0.005 J kg⁻¹ in the southeastern corner of the array. Deep energies were reduced by a factor of 4 to 12 with the 4000 m level showing bottom intensification at most locations. Topographic effects were noted in the orientation of eddy velocities and reduction of low-frequency components near the Ridge. The eddy field showed no clear-cut evidence of wavelike propagation or advection in streamfunction plots. An increase in time scales is evident north and east of the Ridge towards the Newfoundland Basin and the Mid-Atlantic Ridge, where most of the eddy kinetic energy at 500 m is at time scales of 150–200 days compared with 100 days southwest of the Ridge and about 50–60 days in the central POLYMODE array at 55°W.

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