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The Physical Oceanography of Two Rings Observed by the Cyclonic Ring Experiment. Part II: Dynamics

Donald B. Olson

Department of Oceanography, Texas A&M University, College Station 33149

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ABSTRACT

Data from the 1977 Cyclonic Ring Experiment is used to examine the, density, velocity, vorticity and energy distributions in a Gulf Stream cyclonic ring. A time series on ring BOB provides information on the temporal changes in these parameters. The rings are shown to have an interior in near-solid-body rotation surrounded by a frontal jet exhibiting a maximum in potential vorticity. There is evidence that the baroclinic structure of the rings extends to the bottom and that there is significant energy in vertical modes higher than the first baroclinic mode. Calculations of available potential energy (APE) and kinetic energy are presented along with the time rates of change in the APE. The APE is partitioned into the energy in the mean ring and a set of perturbations about the mean. The temporal variations in the perturbation APE are large enough to be important to the adjustment and decay of mean APE in the ring. Ring spindown is discussed in terms of the observations and several ring models proposed by other authors. Finally, new initial conditions for numerical ring models are suggested.

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Headquarters: 45 Beacon Street Boston, MA 02108-3693
DC Office: 1120 G Street, NW, Suite 800 Washington DC, 20005-3826
amsinfo@ametsoc.org Phone: 617-227-2425 Fax: 617-742-8718
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