Abstract View

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The Mean and Near-Inertial Velocity Fields in a Warm-Core Ring

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ABSTRACT

Velocity and temperature profiles collected in warm-core ring 82-I in January 1983 are used to describe the mean and fluctuating fields of the ring. The ring was relatively small, containing no Sargasso See water. Its signature vanished below 600 m and its velocity maximum was 50 cm s^{-1} at 35 km radius. The mean flow was in cyclogeostrophic balance and much of the core in solid body rotation with vorticity $-0.5f$. Potential vorticity was uniform along isopycnals below the depth of atmospheric influence. Horizontal Reynolds-stress forces did not contribute significantly to the mean momentum balance.

Downward-propagating near-inertial waves account for the most energetic of the fluctuating velocities. Energy levels four times greater than typically observed were found inside the ring, consistent with the expectation of trapping and critical-layer amplification of near-inertial waves in regions of negative vorticity as a consequence of a depressed lower bound of the internal waveband, $f_{eff} = f + \zeta/2$. A single wavepacket at the base of the core was responsible for the excess. The waves vertical and horizontal wavelengths were 250 and 60 km. respectively. Enhanced wave energy was not found in the verlocity maximum.