Abstract Submitted
for the DFD12 Meeting of
The American Physical Society

Lifetime and layering of vortices in rotating stratified fluids ORIANE AUBERT, MICHAËL LE BARS, PATRICE LE GAL, IRPHE - CNRS — Ocean and atmosphere are natural stratified fluid layers influenced by the rotation of the planet through the Coriolis force, where it is common to observe long-lived anticyclonic vortices sometimes surrounded by layers of constant density as the ocean Meddies. In the continuity of the experiments of Griffiths & Linden (1981) and Hedstrom & Armi (1988), we reproduce a rotating and linearly stratified layer in a tank where freely-decaying or sustained laboratory anticyclonic vortices are created via a short or continuous injection of isodense fluid. We quantify their long term evolution using PIV measurements. The Rossby number Ro of the freely-decaying vortices decreases in time, which is theoretically described by the energy conservation equations applied to a gaussian model that fits both laboratory and oceanic vortices. Using this theory and numerical simulations, we investigate the respective roles of rotation and stratification to explain the longevity of the vortices. Ro for the sustained vortices remains large and allows for the formation of layers above and below the vortices, following the double-diffusive instability of McIntyre (1970). Typical length and time scales of the instability are well described by a linear stability analysis based on our gaussian model.

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Date submitted: 27 Jul 2012 Electronic form version 1.4