Abstract Submitted
for the DFD15 Meeting of
The American Physical Society

Layering from anticyclonic vortices in a rotating stratified medium with combined salinity and temperature effects[1] JOEL SOMMERIA, MICHAEL BURIN[2], SAMUEL VIBOUD, LEGI/CNRS — We generate anticyclonic vortices by a fluid source in a rotating and uniformly stratified medium, a laboratory model of long lived vortex lenses in the ocean. Experiments are performed in the large Coriolis rotating platform at Grenoble, 13 m in diameter, providing previously unaccessible turbulent regimes. The other novelty is to combine temperature and salinity effects, like in meddies, vortices formed by intrusion in the Atlantic ocean of warm and salty water from the Mediterranean Sea. For both heated an unheated cases, we observe shear driven instability at the vortex periphery, leading to the emission of material filament from a large-scale m=2 instability. Heated vortices behave much the same way but with two key additions. One, prominent at early times, is that the vortex edge appears serrated around most of its circumference in the upper part of the lens. Two, clearer for later times, a staircase density profile develops above the eddy. We explain this small scale turbulence as thermal convection in the statically unstable density profile resulting from selective vertical diffusion of temperature (while salinity is less diffusive). The resulting turbulent mixing generates horizontal intrusions at the upper part of the vortex, unlike the double-diffusive instability.

[1]This work has been funded by Agence Nationale de la Recherche (ANR), project 'OLA'
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Date submitted: 31 Jul 2015 Electronic form version 1.4