Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Stratified shear flow instability: Application to oceanic overflows ROBERT ECKE, Los Alamos National Laboratory, PHILIPPE ODIER, Ecole Normale Superieure Lyon — The Earth's thermohaline circulation provides major oceanic transport of heat and salinity and is an important determining factor in the climate of nearby land areas. We address the stability of overflow currents of heavier water moving into a region of less heavy quiescent fluid using experimental measurement of wall bounded stratified boundary currents under controlled laboratory conditions. In these currents, the stratification acts to stabilize the flow whereas the shear associated with the moving current produces turbulent kinetic energy and has the potential for destabilizing the flow. Our experimental measurements using particle-image velocimetry and laser-induced fluorescence allow the simultaneous acquisition of velocity and density fields, respectively. Rather than using traditional time-averaged statistics, we consider the stability of unperturbed sections of the interface and use a measure of the overturning or mixing called the Thorpe length. We present evidence for universal behavior in the normalized Thorpe length probability distribution and the general properties of the system under increasingly stable conditions. We relate these properties to realistic circumstances in the ocean.

Robert Ecke
Los Alamos National Laboratory

Date submitted: 14 Nov 2014 Electronic form version 1.4