Abstract Submitted
for the DFD16 Meeting of
The American Physical Society

Direct Measurements of the Baroclinic Instability in the Ocean[1]
MAHMOUD SADEK, HUSSEIN ALUIE, University of Rochester, MATTHEW HECHT, Los Alamos National Lab, GEOFFREY VALLIS, University of Exeter
— The ocean is mechanically driven by wind and buoyancy at the surface which produce sloping isopycnals with a reservoir of available potential energy (APE). Large scale APE can be converted to kinetic energy via the baroclinic instability, which produces mesoscale eddies. Mesoscale eddies are ubiquitous in mid- and high-latitudes, and play a primary role in determining the strength and trajectories of currents and in generating intrinsic climate variability. The widespread belief that mesoscale eddies are generated through baroclinic instability is based on general accord between observations and linear stability analysis and the predicted behavior of nonlinear models. However, these models are unable to give us quantitative evidence of the extent to which the instability is responsible for eddy generation at various locations in the ocean. To this end, we implement a new coarse-graining framework, recently developed to study flow on a sphere, to directly analyze the baroclinic instability as a function of scale and geographic location, and implement it using strongly eddying high-resolution simulations in the North Atlantic and in the Southern Ocean. The results give us new information about location and intensity of the instability in both physical and spectral space.

[1]Partial support was provided by National Science Foundation (NSF) Grant OCE-1259794, US Department of Energy (US DOE) Grant DE-SC0014318, and the LANL LDRD program through project number 20150568ER

Mahmoud Sadek
University of Rochester

Date submitted: 28 Jul 2016 Electronic form version 1.4