Abstract Submitted
for the DFD19 Meeting of
The American Physical Society

Impacts of inertial/symmetric instabilities on ocean fronts[1] NICOLAS GRISOUARD, University of Toronto — Oceanic submesoscale density fronts are structures in geostrophic and hydrostatic balance. They tend to be small (100 m to 10 km wide at mid-latitudes) and ubiquitous features of the near-surface of the oceans. They tend to be unstable, which may be key to understanding the kinetic energy budget of the ocean, as well as their effects on gas and nutrient exchanges between the surface and the abyss. In this presentation, we focus on the inertial or symmetric instability. We present a series of numerical experiments to investigate energetic impacts of these instabilities on fronts. Our set of experiments covers the submesoscale portion of a three-dimensional parameter space consisting of the Richardson and Rossby numbers, and a measure of stratification or latitude. We first argue that contrary to parameterization prototypes that are currently being developed, drainage of available potential energy from the geostrophic flow can be a leading-order source of their growth. We also argue that a front is relatively robust when experiencing this instability, and provide hints as to its contribution to the shape of fronts. We also caution modellers about a possibly large impact of the choices of the dissipation operator on the dynamics of the instability.

[1]Financial support by the Canadian Space Agency and the Natural Sciences and Engineering Research Council is acknowledged

Nicolas Grisouard
University of Toronto

Date submitted: 01 Aug 2019 Electronic form version 1.4