Abstract Submitted
for the DFD15 Meeting of
The American Physical Society

Numerical simulations of turbulence and mixing induced by submesoscale instabilities MEGAN STAMPER, JOHN TAYLOR, University of Cambridge — Submesoscale features in the upper ocean with horizontal scales between 1-10km have received significant attention in the oceanography community in recent years. Previous work has found that submesoscales play an important role in setting the stratification of the upper ocean, and these scales are associated with large vertical velocities that modify biological productivity. Submesoscales bridge the dynamical gap between the mesoscale ($\sim$100km) where the earth's rotation plays a major role, and turbulent overturning scales ($\sim$1-10m) where the earth's rotation is not directly felt. Here, we use very high resolution direct numerical simulations (DNS) to explore the interaction and feedbacks between submesoscales and small scale turbulence. In simulations with submesoscale motions generated via symmetric and baroclinic instability, we find that the emergence of secondary instabilities leads to significant small-scale turbulence and mixing, even in the absence of wind and convective forcing. From the DNS results, we quantify the additional mixing, dissipation, and vertical fluxes induced by small scale turbulence, and its feedback on the primary submesoscale instabilities.

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Date submitted: 01 Aug 2015

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