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Instability Mechanisms in a Stratified and Rotating Shear Layer with Horizontal Shear ERIC AROBONE, SUTANU SARKAR, University of California, San Diego — One of the least understood scales of the ocean is the submesoscale. Here, rotation is important but does not necessarily control the dynamics. Instabilities and nonlinear cascades are possible in this regime while the influence of stable stratification is significant. Previous work by the authors revealed augmentation of the vertical wavenumber band associated with linear barotropic instability near the state of zero centerline absolute vorticity for strongly stratified flow. Enstrophy budgets from nonlinear simulations show a marked transition corresponding to the changing in sign of centerline absolute vorticity. We performed numerical experiments to examine the effect of both rotation and stratification on coherent dynamics with environmental parameters appropriate for submesoscale flows. Coherent structure evolution will be explored to understand the effect of stratification and rotation, in combination, on possible instability mechanisms, e.g. elliptic, zigzag, inertial, and barotropic instabilities. Additionally, physical mechanisms driving the flow evolution will be discussed with the aid of enstrophy budgets and flow visualizations.

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