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The influence of symmetric and inertial instabilities on the evolution of oceanic fronts AARON WIENKERS, JOHN TAYLOR, DAMTP, University of Cambridge — Isolated fronts with large lateral density gradients in geostrophic and hydrostatic balance are common in the upper ocean. Such strong fronts may be the result of baroclinic frontogenesis or of sharp freshwater interfaces as are found in the northern Gulf of Mexico near the Mississippi-Atchafalaya river plume. These fronts may be unstable to symmetric or inertial instabilities which further enhance small-scale mixing and encourage vertical transport between the surface and the abyss. Here, we consider the problem of an initially balanced front of finite width and which is bounded by flat no-stress horizontal surfaces. We examine how the evolution and equilibration depends on the front strength and aspect ratio using nonlinear numerical simulations, and develop a model to predict the profile and effective width of the final equilibrated state in the absence of external forcing. While fronts with $Ro > 2.6$ collapse to a self-similar profile dependent only on the deformation radius, we find that for small enough $Ro < 1$, frontlets form as the front equilibrates. These frontlets increase both the kinetic and potential energy of the final balanced state, but are also found to interact with the boundaries if the front exhibits inertial oscillations.

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