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Vortex merging in stably stratified fluid LAURA BRANDT, KEIKO NOMURA, University of California, San Diego — This study investigates the effects of stable stratification on the two-dimensional vortex merging process. Numerical simulations of two horizontal co-rotating vortices in a vertically stably stratified fluid are performed. The merging process in both unstratified and stratified flows occurs in three stages: adaptation (initial diffusion and deformation), convective merger, final diffusion. The convective merger is associated with the structure of the mutually induced flow field. As in previous studies, analysis in the rotating frame reveals the existence of two recirculation regions with rotation in the opposite sense to that of the primary vortices which lead to the formation of filaments. In stably stratified fluid, horizontal density gradients are established as the flow stirs the fluid, generating vorticity of opposite sign through baroclinic torque. In the case of weak to moderate stratification levels, the baroclinic vorticity appears outside the recirculation regions and assists in the formation of the filaments. An earlier onset and a more rapid convective merger are observed; thus, merging is accelerated. In the case of strong stratification, the baroclinic vorticity significantly alters the ghost vortices and causes the primary vortices to shed their filaments. Results provide further insight into the physics of vortex merging.

Keiko Nomura
University of California, San Diego

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