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Vortex merging in stably stratified fluid LAURA BRANDT, KEIKO NOMURA, University of California, San Diego — The merging of a pair of symmetric, horizontally oriented vortices in a fluid with and without stable stratification is investigated. Two-dimensional numerical simulations are performed for a range of flow conditions. Results show the three phases of vortex merger: the first diffusive/adjustment phase, the convective phase, and the second diffusive phase. In general, the evolution of the flow depends on the relative significance of viscous, convective, and stratification effects, as characterized by the Reynolds number and Froude number. Analysis of unstratified flow elucidates the key underlying mechanisms of convective vortex merger and the relative significance of filamentation and mutual core entrainment; the latter being dominant and initiated by the interaction of strain rate and vorticity gradient near the center of rotation. For flows with low Froude numbers (moderate to strong stratification), the convective phase is significantly reduced and merging occurs sooner. This is attributed to the secondary flow associated with baroclinic torque, which advects the primary vortices towards each other and enhances the strain rate-vorticity gradient interaction, resulting in earlier core entrainment.

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