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The stability of an overturning stratified fluid JOHN MCHUGH, Univ of New Hampshire — Previous studies have shown that a weak vortex pair with horizontal axis that is released in a stratified fluid will quickly disintegrate, while a strong vortex pair will remain intact. The critical Froude number is unity, and values less than unity will disintegrate, as shown by Garten, et. al. (JFM, 1998) using two-dimensional numerical simulations. An eigenvalue stability approach to this two-dimensional configuration is difficult, as there is no equilibrium base flow for Froude number less than the critical value. Here we consider a similar configuration using a single vortex in three dimensions with a spiral density pattern. This spiral density is steady and approximates the flow that develops behind one side of a lifting surface. The disintegration still happens with a single vortex, since it is due to the inversion a statically stable density profile by the vortex motion. The base state flow is a distorted vortex, determined for weak stratification. Axial periodicity is assumed, which restricts the ratio of azimuthal to axial velocities to be constant. Only global stability is treated. The results show that the critical Froude number is strongly dependent on axial wavenumber.

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