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Dynamics of vorticity defects in layered stratified shear flows C.P. CAULFIELD, BPI/DAMTP, U. of Cambridge, A. ROY, Engineering Mechanics Unit, JNCASR, Bangalore, N.J. BALMFORTH, Mathematics/EOS, U. of British Columbia — Layered stratified flows, where relatively deep regions of weak stratification are separated by thinner interfacial layers of substantially stronger density gradient are commonly observed in nature. If such flows are subjected to vertical shear, it is well-known that a wide range of qualitatively different instabilities may develop. For example, the three-layer, two interface case is susceptible to a "Taylor" instability which, although superficially similar to the classic Kelvin-Helmholtz instability, is actually qualitatively different in its growth mechanism. The investigation of the nonlinear dynamics of this instability, and to a lesser extent the single-interface "Holmboe" instability, has proved difficult, as the need to resolve the associated sharp density gradients places heavy demands on the required numerical resolutions for simulation. However, we show that it is possible to gain insight into the key nonlinear dynamics of such layered stratified shear flows by generalizing a reduced matched asymptotic "vorticity defect" model (N. J. Balmforth et al. *J. Fluid Mech.* **333**, 197 [1997]) to include the dynamical effects of density variations. We particularly focus on investigating the finite amplitude structure of the saturated primary Taylor instability, and the properties of the secondary instabilities to which Taylor and Holmboe instabilities are susceptible.

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