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**Effects of three-dimensionality on frontal instability** ERIC AROBONE, Stanford University, SUTANU SARKAR, University of California, San Diego — The pure symmetric instability (SI) is a frontal instability that is independent of the along-front coordinate. Observational evidence suggests that along-front variability in vertical velocity and SST anomaly is not negligible (D'Asaro et al. Science. 2011 and Thomas et al. DSR2. 2013). We examine the three-dimensional evolution of frontal shear instabilities from both linear and non-linear perspectives. Linear stability suggests that significant growth rates are possible when along-front and across-front variabilities are comparable. Additionally, along-front variability results in misalignment of perturbations with respect to isopycnals. A suite of three-dimensional Direct Numerical Simulations (DNS) are performed exploring a horizontally homogeneous front with differing domain lengths in the along-front direction. For sufficiently large along-front domain lengths, the front develops along-front variation and a pure symmetric instability is not found in the DNS. The consequence of asymmetry in the instability on frontal evolution will be discussed. The effect of three-dimensionality of initial conditions will also be explored.

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