Abstract Submitted
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Nonlinear dynamics of forced baroclinic critical layers[1] CHEN WANG, NEIL BALMFORTH, University of British Columbia — Baroclinic critical levels are singularities of waves propagating in inviscid stratified shear flow, and they play a crucial role in the self-replication of 'zombie vortices'. Our previous work has shown that for baroclinic critical layers under continuous forcing, the linear evolution features secular growth of density and decreasing thickness, and the following nonlinear evolution is characterized by a jet-like mean flow, which is focused exponentially at later times. In the present work, we show that thermal diffusion can arrest the focussing. A coherent structure of density is formed instead, which drifts in the cross-stream direction and leaves behind a growing defect in the mean-flow velocity. We explore detailed properties of the drifting coherent structure, and conjecture that it could be responsible for the expansion of critical layers as observed in the zombie vortices.

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