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The role of interactions between waves and baroclinic critical layers in zombie vortex self-replication CHUNG-HSIANG JIANG, SUYANG PEI, UC Berkeley, PEDRAM HASSANZADEH, Harvard University, AARON WIENKERS, CALEB LEVY, PHILIP MARCUS, UC Berkeley — Inertio-gravity waves are triggered from various types of perturbations in numerical simulations of rotating, vertically-stratified and horizontal-shearing flows (Marcus et al. 2013 PRL). The interactions of these waves and baroclinic critical layers can create large vortices when the shear is sufficiently strong. An important feature of these flows is that an instability at one critical layer can excite an instability at its neighboring critical layers and spawn new generations of waves and vortices. Because the self-replication of these vortices in simulations of "dead zones" in protoplanetary disks reminds us of zombies multiplying by infecting each other, we call them "zombie vortices." However, not all interactions between waves and critical layers produce zombie vortices. The manner in which one "infected" critical layer infects its neighbor is not clear. The interaction of waves and critical layers are sensitive to the local Brunt-Vaisala frequency and to the wavelengths of the waves. Here we discuss how the interactions and formation of vortices depend upon the Brunt-Vaisala frequency (including its change in value as a function of vertical position) and our progress in understanding how the instability passes from a critical layer to its neighbor.

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