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Secondary instability of a horizontally oscillating, viscous interface[1] SHREYAS JALIKOP, ANNE JUEL, The University of Manchester — When a closed vessel containing two stably stratified, immiscible liquids is oscillated in the horizontal direction, the flat interface separating the liquids can become unstable to two-dimensional 'frozen waves' driven by interfacial shear, similar to the Kelvin-Helmoltz instability. We find that the onset of the frozen waves in the experiment is accurately predicted by a two-dimensional viscous linear stability model based on Floquet theory. As the forcing acceleration is increased, the growth of the two-dimensional 'frozen waves' is followed by a subcritical bifurcation to three-dimensional oscillatory waves with a response frequency that is locked to the forcing frequency. Secondary transition to three-dimensional waves underpin the dynamics of a variety of fluid flows, e.g. the oscillatory intability of rolls in thermal convection and the formation of streamwise vortices in mixing layers. We characterize the secondary instability of our oscillating interface by comparison with these systems and discuss the physical mechanism that leads to the onset of three-dimensional waves.

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