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Reconciling simulations of theoretical and experimental laboratory scale seiche motion

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Experimental realizations of internal seiches typically start with a tilted tank that is abruptly brought to a horizontal position. When the isopycnal surface is thin, a linear interface results from this action. Theoretical analysis, especially that related to the energy cascade, instead builds upon a Fourier synthesis with a single cosine of wavelength twice the tank length providing the simplest possible initial condition. We report on numerical simulations of large amplitude seiches in the supercritical regime, or in other words the regime in which shear instability induced by the seiche can occur. Using a modal analysis we contrast the evolution of energy for the single cosine and regularized linear slope initial conditions. In particular we demonstrate the manner in which nonlinear wave trains interact with the shear instabilities to broaden the isopycnal surface. We conclude by speculating on the implications of our results for parametrizations of mixing in layered models.