Abstract Submitted
for the DFD19 Meeting of
The American Physical Society

Transport by vortices formed by breaking internal waves on a continental slope HARRY SWINNEY, University of Texas at Austin, GUILHERME SALVADOR-VIEIRA, MICHAEL ALLSHOUSE, Northeastern University — Oceanic internal waves generated by tidal flow over bottom topography can transport energy for thousands of kilometers, but in the open ocean material transport (a second-order effect) is not significant. However, when an internal wave impinges on a continental slope, it forms coherent vortices (called boluses) that can trap and transport particles and biota along the slope. The magnitude of such transport in the oceans is not known. While most previous studies examined bolus transport for model systems consisting of two layers of uniform density, the present laboratory experiments and numerical simulations examine how transport by boluses depends on the thickness of the pycnocline, the region in which the fluid density changes rapidly with depth. We find that bolus size, upslope displacement, and maximum available potential energy produced are optimized for a particular pycnocline thickness and are significantly larger in continuously stratified fluids than in two-layer models. Linking the observed transport relationships to ongoing observations of coastal boluses should provide more accurate estimates of the importance of bolus transport for global coastal ecosystems.

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Date submitted: 30 Jul 2019 Electronic form version 1.4