Turbulence Mixing in Convectively Breaking Internal Solitary Waves

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Considerable efforts and progress have recently been made towards parameterizing the local and remote dissipation/mixing driven by internal tides and internal lee waves in the open ocean and towards establishing the impact of such parameterization on the accuracy of climate models. In contrast, no equivalent parameterizations exist for internal solitary waves (ISW) that operate well below the subgrid scale in larger-scale models. ISWs are subject to considerably different underlying physics, as it is unclear how to parameterize, at a first level, where and when the propagating waves break and, at the next level, how much turbulent mixing results and how wave-driven horizontal transport may be enhanced. In this regard, ongoing uncertainty exists regarding the relative placement of ISW-driven turbulence with respect to the regimes of weak wave-wave interaction and energetic stratified turbulence regimes and the transition between them (D’Asaro and Lien, 2000). Turbulence mixing within convectively breaking ISWs is hard to measure due to the fast propagating speed of ISWs and the intermittent nature of convective instability. A set of Lagrangian float observations was obtained within several convective breaking ISWs. Turbulent kinetic energy dissipation rates, eddy diffusivity, and associated turbulent fluxes are estimated using both Lagrangian and Eulerian inertial subrange methods. Numerical simulations of convectively breaking ISWs on shoaling slope will be performed using 3D LES model. Results of preliminary analysis of model derived turbulent fluxes will be compared with observations. Turbulence parameterizations associated with breaking ISW will be discussed.

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