Abstract Submitted
for the DFD17 Meeting of
The American Physical Society

Shoaling internal solitary waves of depression over gentle slopes[1]
GUSTAVO RIVERA, PETER DIAMESSIS, Cornell University — The shoaling of an internal solitary wave (ISW) of depression over gentle slopes is explored through fully nonlinear and non-hydrostatic simulations using a high resolution/accuracy deformed spectral multidomain penalty method. During shoaling, the wave does not disintegrate as in the case of steeper slope but, instead, maintains its symmetric shape. At the core of the wave, an unstable region forms, characterized by the entrapment of heavier-over-light fluid. The formation of this convective instability is attributed to the vertical stretching by the ISW of the near-surface vorticity layer associated with the baroclinic background current. According to recent field observations in the South China Sea, the unstable region drives localized turbulent mixing within the wave, estimated to be up to four times larger than that in the open ocean, in the form of a recirculating trapped core. In this talk, emphasis is placed on the structure of the unstable region and the persistence of a possible recirculating core using simulations which capture 2D wave propagation combined with 3D representation of the transition to turbulence. As such, a preliminary understanding of the underlying fluid mechanics and the potential broader oceanic significance of ISWs with trapped cores is offered.

[1]Financial support gratefully acknowledged to NSF OCE Grant 1634257

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Date submitted: 21 Jul 2017 Electronic form version 1.4