Abstract Submitted
for the DFD19 Meeting of
The American Physical Society

Critical Reflection Dissipates Internal Wave Energy[1] BRUCE RODENBORN, CLAYTON BELL, CHARLOTTE MABBS, Centre College — Ocean measurements show that continental slopes are eroded to the critical angle of local internal waves (Cacchione et al., Science 296, 2002). However, the feedback mechanism modifying the slopes over geologic time is not clearly understood. Other work shows that tidal motion over topography creates strong boundary flows but weak tidal conversion (Dettner et al, Phys., Fluids, 25, 2013). We find a similar boundary response in internal waves reflecting from critical slopes; most of the internal wave energy is dissipated near to the boundary. We use experiments with a Reynolds number, $Re \sim 1000$, and numerical simulations that solve the full Navier-Stokes equations in the Boussinesq limit with $Re \sim 10^3 - 10^5$. Our data show that the rate of energy dissipation at the critical angle remains high even when viscous effects are minimized in the simulations. We also present laboratory data showing reflection from a turning depth and find high rates of energy dissipation though the no slip boundary condition is not present. The data suggest that critical reflection dissipates energy from the internal wave field at high Reynolds numbers, and therefore, may contribute to the erosion of continental slopes.

[1]Louis Stokes Alliances for Minority Participation

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Date submitted: 31 Jul 2019 Electronic form version 1.4