Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Energy Dissipation when Internal Wave Beams Reflect from a Slope JOHN DANIEL, BRUCE RODENBORN, Centre College — Internal waves propagate in the bulk of the ocean because it has a vertically varying density profile. These waves may be important in determining the global ocean circulation patterns because they redistribute tidal energy. Reflection of internal waves from a uniform sloping boundary is often analyzed using linear or a weakly nonlinear inviscid theory. Under these assumptions for a linearly stratified fluid, Tabaei et al. (J. Fluid Mech. 526, 2005) predicted the partitioning of energy between the reflected and second harmonic waves. We previously conducted experiments and simulations that tested these theories (Rodenborn et. al., Phys. Fluids, 2011). In the previous study, we used integrated kinetic energy as a measure of beam energy. We compare previous results with a method using energy flux determined from the velocity and pressure fields. We also calculate the rate at which energy is dissipated in the reflection process by finding the energy flux into and out of a surface above the reflection region E_{out}/E_{in}. We find high rates of energy dissipation $O(90\%)$ even for weakly nonlinear wave beams and with the viscosity reduced by an order of magnitude, which implies dissipation may be relevant to internal wave reflection in the ocean.

Bruce Rodenborn
Centre College

Date submitted: 09 Nov 2016 Electronic form version 1.4