Abstract Submitted
for the DFD09 Meeting of
The American Physical Society

Internal waves in nonuniform stratifications[1] MANIKANDAN MATHUR, BRIAN DOYLE, THOMAS PEACOCK, Department of Mechanical Engg., Massachusetts Institute of Technology — Internal waves are propagating disturbances in a stably stratified fluid. Linear internal wave propagation in a stratification with constant Brunt-Vaisala frequency N is well-understood, both theoretically and experimentally. When N varies with the vertical coordinate z, however, propagating internal waves bend with respect to the vertical, and can get scattered in a non-trivial manner, depending on the exact profile $N(z)$. Here, we discuss two scenarios, (i) a finite-thickness N_2-layer sitting atop a semi-infinite N_1-layer, and (ii) a finite-thickness N_2-layer sandwiched between two semi-infinite N_1-layers. The former is shown to support wave beam ducting even in the absence of evanescent layers, and is used to explain the observations of a vanishing wave beam near the upper ocean at the Keana ridge, Hawaii. The latter scenario, in the inviscid limit, is shown to be equivalent to the classical multiple beam light interferometer, and hence results in selective wave transmission based on spatial wavelengths. Results from laboratory experiments and linear viscous theory are presented for both the cases.

[1]This work is partially supported by the ONR grant N00014-09-0282.

Manikandan Mathur
Department of Mechanical Engg., Massachusetts Institute of Technology

Date submitted: 05 Aug 2009 Electronic form version 1.4