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Nonlinear generation of harmonics by an internal wave beam incident on a model oceanic pycnocline: laboratory experiments SCOTT WUNSCH, IAN DELWICHE, Johns Hopkins University, PETER DIAMESSIS, Cornell University — The interaction of an internal wave beam with an idealized oceanic pycnocline is examined using laboratory experiments. Laboratory results are compared to weakly nonlinear theory for a thin pycnocline, which succesfully predicts their qualitative features. The data show that harmonic modes with multiples of the incident frequency and wavenumber are generated near the point of pycnocline entry. For incidence angles exceeding 30 degrees, all harmonic modes are trapped within the pycnocline. Trapped harmonics appear to be strongest when their frequency and wavenumber match those of a natural pycnocline interfacial wave mode. For smaller incidence angles, the first harmonic radiates away from the pycnocline. These conclusions are supported by recent 2D numerical simlations. They also may be relevant to internal wave harmonic generation recently observed in the South China Sea and to the local generation of pycnocline internal solitary waves observed in the Bay of Biscay and elsewhere.

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