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Internal Waves Scatter Energy into Interharmonics at the Critical Angle[1] BRUCE RODENBORN, Centre College, VRINDA DESAI, North Carolina State University, YICHEN GUO, Centre College, MICHAEL ALLSHOUSE, Northeastern University — The reflection of internal wave beams from a solid boundary in a linearly stratified fluid has been studied theoretically (Kataoka and Akylas 2020) and experimentally (Rodenborn et al. 2011) to understand the partition of the reflected wave energy into propagating harmonic modes. Theory accurately predicts the dominant harmonic modes, but we use low Reynolds number experiments ($Re \sim 500$), a 2D pseudo-spectral code and a 2D finite volume solver to show that the amount of energy after the wave beam reflects becomes vanishingly small when the boundary angle approaches the wave beam or the critical angle. We increase the Reynolds number to $Re \sim 10^4$ in the simulations and find that at low boundary angles, most of the energy is transferred into the first harmonic wave. However, near the critical angle, reflection creates multiple waves at interharmonic frequencies so that the energy in harmonic modes is again very small, as we found at low Re. We attribute this energy loss in the primary modes to the growth of highly nonlinear processes in the reflection region as described by Korobov and Lamb (2008) in the case of internal wave generation.

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