Abstract Submitted
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Reflection of an internal gravity wave beam off a horizontal free-slip surface[1] QI ZHOU, PETER DIAMESSIS, Cornell University — The reflection of a planar finite-amplitude internal gravity wave beam off a free-slip flat horizontal surface is investigated numerically in a uniformly stratified Boussinesq fluid. Nonlinear effects such as mean currents and harmonics are observed in the wave reflection zone. Mean currents form a stationary, vertically oscillatory, layered structure under the free-slip reflecting surface. The vertical wavelength of the mean-flow layers equals half of the vertical wavelength of the reflecting wave. An empirical predictive model for the steady-state mean flow strength, based on the degree of wave nonlinearity and hydrostaticity, is proposed and subsequently compared to the weakly-nonlinear theory by Tabaei *et al.*, *J. Fluid Mech.*, 2005, *vol.* 526, *pp.* 217-243. Both propagating and evanescent superharmonics are observed, and for waves with steepness of $O(5\%)$, subharmonic instabilities can occur in the late-time of reflection. Other complications to the basic set-up, such as addition of a subsurface mixed layer and spanwise localization of beam, will also be discussed.

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