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Nonlinear processes in reflecting internal waves : theory and experiments.

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Internal waves propagate obliquely through a stratified fluid with an angle that is fixed with respect to gravity. Upon reflection on a sloping bed, striking phenomena are expected to occur close to the slope. A better understanding of the nonlinear processes involved during the interaction of internal gravity waves and the topography in the oceans is necessary. We present here laboratory observations at moderately large Reynolds number. PIV and Synthetic schlieren methods are used to provide time resolved velocity and density fields in large volumes. The generation of the second and third harmonic frequencies are clearly demonstrated in the impact zone. The mechanism for nonlinear wavelength selection is also discussed and experimentally demonstrated for the first time. Evanescent waves with frequency larger than the buoyancy frequency are detected and experimental results agree very well with theoretical predictions. The role of evanescent waves trapped along the seafloor are carefully studied. The amplitude of the different harmonics after reflection are also obtained.