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The Weakly Nonlinear Evolution of Superharmonics Generated by Model Oceanic Internal Tides[1] BRUCE SUTHERLAND, University of Alberta, LOIS BAKER, Imperial College London — It is now well-established that a vertically confined, horizontally periodic internal mode in non-uniformly stratified fluid self-interacts through the advection terms resulting in the forcing of superharmonics with double the horizontal wavenumber and frequency of the parent mode. The work presented here examines the linear and weakly nonlinear response to this forcing resulting from mode-1 "parent" waves in stratification typical of the ocean. It is shown that the forcing results in the excitation of a near-pure mode-1 ("sibling") internal wave with double the horizontal wavenumber of the parent, though the natural frequency of this mode differs slightly from double the frequency of the parent. As a result, the sibling wave first grows and decays, doing so periodically at the beat frequency set by the difference of the natural frequency of the mode and double the parent-mode frequency. A weakly nonlinear analysis is necessary to predict the maximum amplitude of the superharmonic. This considers how the interaction between the parent-mode and its superharmonic sibling put energy into or take energy out of the parent-mode.

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