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Coupled evolution of near-inertial waves and quasigeostrophic flow[1] GREGORY WAGNER, University of California, San Diego, WILLIAM YOUNG, Scripps Institution of Oceanography — We derive a model describing the coupled nonlinear evolution of three fields: near-inertial wave (NIW) amplitude, quasigoestrophic potential vorticity, and the NIW second harmonic. The model is derived by asymptotic reduction of the Boussinesq equations using the method of multiple scales. The model conserves two distinct quantities: wave action, and coupled energy. Wave action conservation implies energy exchange between NIW kinetic energy and energy in the NIW second harmonic. Coupled energy conservation implies energy exchange between NIW potential energy and quasigeostrophic flow. We explore the implications of the model with two-dimensional numerical solutions meant to approximate NIW evolution in non-uniform quasigeostrophic flow following storm-driven excitation. For this scenario we find good agreement between the model and solutions of the full Boussinesq equations. Preliminary results show the initial transient evolution of the NIW field extracts energy from the quasigeostrophic flow. Further, the quasigeostrophic flow catalyzes an interaction between the NIW and the NIW second harmonic which ultimately leads to the generation of small NIW vertical scales.

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