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New Intermediate Models for Rotating Shallow Water and Boussinesq Flows¹ MARK REMMEL, LESLIE SMITH, University of Wisconsin, Madison — We derive new intermediate models to include physics beyond quasigeostrophic (QG) dynamics in the context of rotating shallow water (RSW) flow. It is known that the 2D QG reduced model results from restricting the nonlinear interactions to include only the vortical eigenmodes of the linearized equations. Our new models are constructed by progressively adding more nonlinear interactions involving gravity waves. The simplest new model, denoted PPG, adds all interactions involving only one gravity wave. Whereas 2D QG has cyclone/ anticyclone symmetry, the PPG model quantitatively captures anticyclone dominance observed in full RSW decay. New intermediate models are also derived to move beyond 3D QG in the context of the Boussinesq equations. Our approach is non-perturbative.

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