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Asymptotically reduced equations for rapidly rotating and stably stratified flow DAVID NIEVES, KEITH JULIEN, Univ of Colorado - Boulder — Observations by van Haren Millot (2005) of the deep Western Mediterranean Sea and by Timmermans et al. (2006) of the deep Canadian Basin find vertical fluid motions to be as significant as horizontal motions for ocean dynamics. Since the classical quasi-geostrophic equations do not allow for such vertical motions reduced equations for geostrophically balanced flow with O(1) vertical motions are presented alongside their numerical solutions and results. The reduced equations describe flow constrained by rapid rotation and stable stratification and, in fact, are the stably stratified counterpart to the reduced equations used by Julien et al. in successful studies of rapidly rotating Rayleigh-Benard convection. Specifically, the equations are valid in the small Rossby number (Ro 1) and O(1) Froude number limit. The focus here is a comparison to similar studies of rotating and stratified flow by Smith Waleffe (2002), Wingate et al. (2011), and Marino et al. (2013) among others.

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