Abstract Submitted
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1.5-layer flow along a slope and western boundary JOSEPH KUEHL, CHARLES MCMAHON, University of Delaware, VITALII SHEREMET, NOAA — Analytic and semi-analytic solutions are derived for two important classes of layered geophysical flows: a topographically controlled flow along a slope and a western boundary current. Specifically, a similarity solution approach is used to solve the 1.5-layer shallow water equations. Case A: An analytic solution taking the form of an inverse tangent function is found to describe the flow of a bottom intensified (lower-layer), weak current moving along a broad shelf/slope. Case B: An ordinary differential equation is derived to describe the flow of a 1.5-layer (upper-layer) viscous western boundary current. This equation is solved numerically to study the effect of a deformable layer interface on the structure of the western boundary current and the results are compared with rotating table laboratory experiments. Both cases are formulated as idealized, two-layer, rotating fluid basins with sloping bottom topography. Kuehl, J. J. 2014. Geophysical Research Letters, 41. Ibanez, R., J. Kuehl, K. Shrestha and W. Anderson 2018. Nonlinear Processes in Geophysics, 25, 201-205. Kuehl, J. J. and V. A. Sheremet 2014. Journal of Fluid Mechanics, 740 97-113. Zavala Sanson, L. and G. J. van Heijst 2002. Journal of Fluid Mechanics, 471, 239–255.

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