Abstract Submitted
for the DFD17 Meeting of
The American Physical Society

A nonlinear self-similar solution to barotropic flow over rapidly varying topography[1] RUY IBANEZ, University of Rochester, JOSEPH KUEHL, Baylor University, KALYAN SHRESTHA, WILLIAM ANDERSON, University of Texas - Dallas — Beginning from the Shallow Water Equations (SWE), a nonlinear self-similar analytic solution is derived for barotropic flow over rapidly varying topography. We study conditions relevant to the ocean slope where the flow is dominated by Earth's rotation and topography. Examples of the solution's relevance are presented. The solution is found to extend the topographic β-plume solution of Kuehl (2014) in two ways: 1) The solution is valid for intensifying jets. 2) The influence of nonlinear advection is included. The SWE are scaled to the case of a topographically controlled jet, then solved by introducing a similarity variable, $\eta = cx^{n_x}y^{n_y}$. The nonlinear solution, valid for topographies $h = h_0 - xy^3$, takes the form of the Lambert W Function for sudo velocity. The linear solution, valid for topographies $h = h_0 - \alpha xy^{-\gamma}$, takes the form of the Error Function for transport. Kuehl's results considered the case $\gamma = 1 < 1$ which admits expanding jets, while the new result consider the case $\gamma < -1$ which admits intensifying jets and a non-linear case with $\gamma = -3$.

[1]Texas General Land Office and AFOSR Young Investigator Program

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Date submitted: 28 Jul 2017 Electronic form version 1.4