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A nonlinear self-similar solution to barotropic flow over rapidly varying topography RUY IBANEZ, JOSEPH KUEHL, Baylor University — 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. Attention is paid to the northern Gulf of Mexico slope with application to pollutant dispersion and the Norwegian Coastal Current which sheds eddies into the Lofoten Basin that are believe to influence deep water formation. The solution is found to extend the topographic β-plume solution (Kuehl 2014, GRL) 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 $\eta = Cxy$. The nonlinear solution, valid for topographies $h = h_0 - \alpha xy^3$, takes the form of the Lambert W Function for 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 $-1 \leq \gamma < 1$ which admits expanding jets, while the new result consider the case $\gamma < -1$ which admits intensifying jets.

Ruy Ibanez Amador
Baylor University

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