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Shear flow and viscosity in single-layer hydraulics ANDREW HOGG, GRAHAM HUGHES, Research School of Earth Sciences, Australian National University — We calculate solutions for one-layer hydraulically controlled flows with viscosity. Viscosity and bottom drag produce two key modifications to inviscid hydraulic theory: the position of the hydraulic control point is altered, and the solution requires knowledge of the velocity profile over the entire domain. Hence, analytically tractable solutions are not generally possible and a numerical technique is developed to calculate such flows. In this presentation, bottom drag and fluid viscosity are treated as independent parameters, allowing the influence of each parameter on flux, flow dissipation and position of hydraulic control to be quantified. We find that the flow is determined primarily by the bottom drag, and, surprisingly, the largest perturbation from this state occurs for intermediate values of fluid viscosity. These new solutions have implications for the use of hydraulic models in turbulent or viscous geophysical flows.

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