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A numerical study of the energy flux in internal bores ZACHARY BORDEN, ECKART MEIBURG, UC Santa Barbara — Internal bores, or hydraulic jumps, arise in many atmospheric and oceanographic phenomena. The classic single-layer hydraulic jump model accurately predicts a bore's behavior when the density difference between the expanding and contracting layer is large (i.e. water and air), but fails in the Boussinesq limit. A two-layer model, where mass is conserved separately in each layer and momentum is conserved globally, does a much better job but requires for closure an assumption about the loss of energy across a bore. It is widely agreed that assuming all the energy loss occurs entirely in one of the layers puts bounds on a bore's propagation speed. However, under some circumstances, both assumptions over-predict the propagation speed, implying an energy gain in the expanding layer. We directly examine the flux of energy within internal bores using 2D direct numerical simulations. We find that although there is a global loss of energy across the bore, there is a transfer of energy from the contracting to the expanding layer causing a net energy gain in that layer. The transfer is largely the result of the horizontal pressure gradient caused by a difference in hydrostatic pressure across the bore.

Eckart Meiburg
UC Santa Barbara

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