

## An energy model for the front speed of intrusive gravity currents

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If a fluid, under gravity, has horizontal variations in density, it always flows and the form of the flow is known as a gravity current. If the fluid also has vertical density stratification, then intrusive gravity currents are formed. A beautiful and classical example is the Morning Glory in northern Australia in late October. A simple model for this phenomenon is an Intrusive Gravity Current (IGC) where fluid of one density propagates along an interface between two homogeneous layers. Although this is a very simple flow it has not been possible to predict its speed of propagation, a crucial property in the formation of the Morning Glory. We have carried out new numerical calculations of an IGC, supported by new laboratory observations, that determine the speed and, more importantly, provide insight into the physics of the flow. Using these insights we have been able to construct a new theory for the IGC speed based on simple energy arguments. The theory predicts the front speed of IGC for an arbitrary interface-height and density configuration.