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On intrusion in a linearly-stratified ambient: the asymmetric steady-state model

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ABSTRACT

The behavior of the steady intrusive gravity currents spreading into a stratified ambient fluid is investigated. The system configuration is sketched in Fig. 1. The intrusive gravity current of thickness

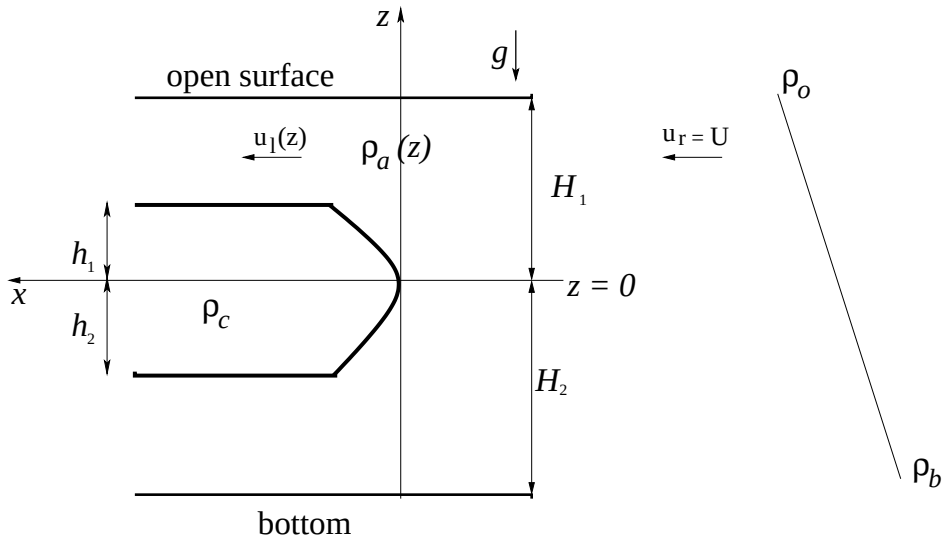

Figure 1: Schematic description of the system

$h = h_1 + h_2$ and density ρ_c which propagates with speed U at the neutral buoyancy level of a long horizontal channel of height $H = H_1 + H_2$ into a stratified ambient fluid whose density increases linearly from ρ_o to ρ_b is investigated. The intrusive and the ambient fluids are assumed to be asymmetric due to axis passing the stagnation point of the system. The Boussinesq, high-Reynolds number two-dimensional configuration is discussed. The Long's model combined with the flow-force balance over the width of the channel and the pressure balances over a density current are used to obtain the desired results. It is shown that the intrusion velocity decreases with decreasing the asymmetry of the system

and approaches its minimum for the symmetric configuration. In additional, the comparison between asymmetric and symmetric configurations shows no significant differences between the models.

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