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Gravity and Turbidity currents

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We present a simple entrainment model to estimate the height of the sediment of a turidity current assuming that the level of r.m.s. turbulence at the base of the head of the turbidity current decays with height linearly, this model keeps the action K=u'l of the turbidity head constant with height as in oscillating drid turbulence.

The entrainment is a complex power function of the local Richardson number, and the value of the empirical exponent n(Ri,Pr) is compared with previous results. The relationship between the Flux Richardson number and the Gradient or local one and the ways in which the interface extracts energy from the turbulence source via internal waves. Internal gravity (or buoyancy) waves are characteristic of the stable gravity current and contribute to its large horizontal transport processes, both directly, and indirectly via internal wave and instability induced turbulence. These processes seen to control entrainment across strong density interfaces as those defined by Turner [1] are used to examine the advance velocity of gravity and turbidity currents. The energetics of the current head are examined using PIV. A comparison of the range of entrainment values from laboratory experiments with those occurring in nature, both in zero mean flows and shear flows shows the importance of modelling correctly the integral length-scales sediment laden buoyant flows in environmental turbulence. The initial decay of the turbidity current head is quite well understood, but the subsequent collapse and in particular, how the internal waves affect mixing efficiency is not resolved yet.