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Lobe and Cleft Formation at the Head of a Gravity Current

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Gravity current experiments were carried out in which the formation, and subsequent evolution, of lobes and clefts was examined in detail. This was achieved by calculating the curvature of the level-set of first-arrival times. The results show that there is a weak dynamical linear instability when the radius curvature of the front is similar to the height. The formation and evolution of the clefts is then a nonlinear kinematic phenomenon, caused by the front propagating with a roughly constant normal velocity. Three different mechanisms for the initial instability are discussed and the subsequent evolution of the front is explained in detail.

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