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Characteristics of colliding density currents: a numerical and theoretical study

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This poster presents a new set of numerical experiments of two colliding density currents in a idealized framework, integrating the Boussinesq vorticity equation in a rectangular bounded domain. These simulations are used to examine the dynamical features of the collision, in the light of recent laboratory experiments.
The collision dynamics present various interesting features to examine in detail. Here we have focussed on the interface slope at the front of the two unequal density currents and on the maximum height reached by the fluid after the collision. For the secondary triggering of atmospheric convection by colliding convective cold pools, these may affect the positioning and the momentum of the collision uplift, respectively.
The interface slope has been shown to be dependent on the current buoyancy ratio, whereas the maximum height has no strong dependence, for a given initial current depth.
A theoretical steady-state model, based on an analogy with a vortex pair, has been proposed to explain and to predict the interface-slope dependence, taking as input the buoyancy ratio of the two currents and the propagating speed. This model agrees reasonably well with the observed experimental values.
Therefore the interface slope can be predicted using as input parameter only the buoyancy ratio, prior to the running of the numerical model.