

Density currents on a sloping bottom in rotating tank.

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The experiments were performed in July and September 1966. The purpose was to investigate the behaviour of density currents on a sloping bottom under the influence of background rotation. The experiments were an extension of earlier experiments performed in 1996 at the same rotating table to smaller Rossby numbers in order to find instabilities of the density current as described in numerical simulations by Jiang and Garwood (1996). All together, in the experiments performed in 1995 and 1996, two different kind of flow regimes have been identified. For low rotation rates, high bottom slope and large source strength, cyclonic vortices developed in the surface layer not due to an instability itself, but due to a direct forcing mechanism through the combination of the density current, return flow, beta-plane and conservation of potential vorticity. A similar behaviour has been found in experiments by Lane-Serff and Baines (1998).

For higher rotation rates, smaller bottom slope and smaller source strength, the density current itself becomes unstable and breaks up into subplumes. Due to Taylor-column effects, these bottom plumes lead to formation of cyclonic vortices in the upper layer as also observed in the numerical simulations of Jiang and Garwood (1996). Both experiments are described extensively in the paper by Etling et al. (1999).

References:

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