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Experimental simulation of gravity currents in erodible bed

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Gravity currents are commonly met in nature, when a flow of denser fluid moves into a less dense one. A typical example of a gravity current is given by the sea water which flows into the bottom of a river during the summer, in correspondence of the estuary, when the river's discharge attains low values. In this case, dangerous consequences can occur, because of the polluting of the aquifer caused by the salty water. Density currents also occurs in lakes and reservoirs, because of a change in temperature or because a flood, both can produce some environmental impacts that are of interest to the local water Agency of the different countries. Of particular relevance is also the interaction of the gravity current with the movement of the sediments from the bottom of the bed.
The international state of the art is particularly concerned with experimental and numerical investigation on gravity currents on fixed and porous bed [1-2-3], while, to the authors' knowledge, the interaction of a gravity current with an erodible bed is still an open field of investigation.
In this paper experiments concerning with the propagation of a gravity current over fixed and erodible bed are presented. The experiments, conducted at the laboratory of Hydraulics of the Universitat Politecnica de Catalunya (actually in the Prof. Bateman's blue room), were concerned with a transparent tank 2 m long, 0.2 m wide and 0.3 m deep, partly filled with salty water and partly with fresh water, up to a depth of 0.28 m. The salty water, whose density was in the range 1050<r<1150 kgm-3, was separated by the fresh water by a gate. After the sudden removal of the gate, the formation of gravity current occurred. The experiments were repeated both with fixed and erodible bed. In this latter case a homogeneous sand (d50=0.3 mm) was used. The results, concerned with the visualisation of the flow and the measurement of the wave front velocity, were obtained. Also the size and the frequency of the new vortices were measured using the characteristic plane.

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