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Mass loss of density currents travelling over a fissured bed.

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Polluted liquids leaking from their storages over the surrounding gravel beds or oil spilling into aquifers, are examples of gravity currents moving over a porous terrain. Density-driven flows provoked by saline or temperature differences or turbidity currents, travelling over fissured lakes and ocean beds, may disrupt deposits of gases and fluids which eventually may be released into the environment. To prevent and confine the environmental impact of such events, it is thus crucial to understand the mass exchange processes of gravity currents travelling over porous terrains, and how their internal structure is affected by the interaction with the porous bed. In this study we characterized experimentally the mass loss of a continuously injected brine over a fissured bed, for different initial excess densities. The porous media was simulated by means of staggered prismatic PVC sticks. Different sticks spacing reproduce terrains of varying permeability and porosity. 2D (averaged over channel width) density maps are acquired over and inside the porous bed by means of an image analysis technique based on ink-light absorption. Simultaneously, an Acoustic Doppler Velocimetry Profiler synchronized with the camera, allows to acquire 3D quasi-instantaneous velocity profiles. Results quantify the mass loss rate and characterize its evolution in time. Its dependence on the channel bed porosity and on the current initial excess density is investigated.