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Time evolving bed shear stress due the passage of gravity currents estimated with ADVP velocity measurements

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Density or gravity currents are geophysical flows driven by density gradients between two contacting fluids. The physical trigger mechanism of these phenomena lays in the density differences which may be caused by differences in the temperature, dissolved substances or concentration of suspended sediments. Saline density currents are capable to entrain bed sediments inducing signatures in the bottom of sedimentary basins. Herein, saline density currents are reproduced in laboratory over a movable bed. The experimental channel is of the lock-exchange type, it is 7.5 m long and 0.3 m wide, divided into two sections of comparable volumes by a sliding gate. An upstream reach serves as a head tank for the dense mixture; the current propagates through a downstream reach where the main measurements are made. Downstream of the channel a tank exist to absorb the reflection of the current and thus artifacts due to the limited length of the channel. High performance thermoplastic polyurethane simulating fine sediments forms the movable bed. Measures of 3D instantaneous velocities will be made with the use of the non-intrusive technique of the ADV (Acoustic Doppler Current Profiler). With the velocity measurements, the evolution in time of the channel-bed shear stress due the passage of gravity currents is estimated. This is in turn related to the observed erosion and to such parameters determinant for the dynamics of the current as initial density difference, lock length and channel slope.
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