Gravity currents are ubiquitous in nature and industry. They occur when a horizontal density difference causes fluid to move under the action of gravity; density currents are a particular case, for which the scalar causing the density difference is conserved. The front of the current is a very small region of it, but in many cases determines the conditions in which the flow evolves. The front is rich in structures of different scales, arisen from shear and baroclinic instabilities. A defining characteristic of the front is the intense mixing that occurs at its interface. A custom built laboratory facility used allows the study of the front in a stationary setting, and also in its natural advancing state, for the case of a constant input of dense fluid to the system. These two settings are complementary, as the former highlights the mixing processes at the interface of the front, while for the latter the interaction between the current and the channel bed can be examined. Our results characterize the flow in terms of the front velocity, the dimensions of the front, the mixing rate and the bed friction coefficient. Particle Image and Particle Tracking Velocimetry (PIV; PTV) provide the spatial and temporal resolution to examine the velocity field; Laser Induced Fluorescence (LIF) does the same for the density field. Simultaneous measurements with these techniques, while matching the index of refraction, resulted in the development of novel measuring and processing methodologies to characterize the flow, showing in detail the evolution of instabilities at the front interface and associated mixing processes.