Turbulence in particle-laden gravity currents trough iLES

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Hyperpycnal gravity currents are formed due to a streamwise density gradient when a denser fluid runs below a lighter fluid. This density difference can be attributed to temperature and/or salinity or to suspended sediments. Both gravity currents present some similarities and differences; a mixing zone is developed in the interface between the fluids, where complex structures are generated by shear, buoyancy and turbulence interaction, triggering processes like entrainment and mixing. Here we present some turbulence features for gravity currents with different settling velocities (u_s) compared to the canonical case without sediment particles. The incompressible Navier–Stokes equations under the Boussinesq assumption are used in order to numerically describe the dynamics of the phenomenon formed in a channelized lock-release configuration. This equation system was solved using the high-order flow solver *Xcompact3d*[1] with an Implicit Large Eddy Simulation (iLES) methodology[2].

Figure 1 shows the relevant terms of the kinetic turbulent budgets and snapshots of Q criterion for two gravity currents (with $u_s = 0$ and $u_s = 0.029$) for $Re = 9000$ where some evidences of damping of production, dissipation and bouyancy terms can be observed. For the Conference complete comparison for three different settling velocities will be presented.

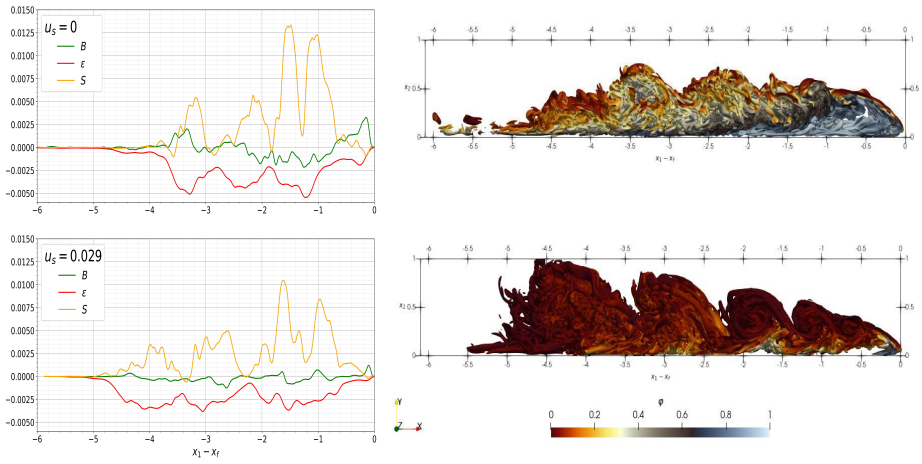

Figure 1: Results for a ($u_s = 0$) density current (top) and a particle-laden gravity current with $u_s = 0.029$ (bottom). Left: turbulent kinetic energy budget, Right: Q criterion isocontour $Q = 2$ for $t = 12$.

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[1]Bartholomew et al., *Software X* **12**, 100550, (2020).
[2]Frantz et al., *Computers & Fluids* **221**, 104902 (2021).