### Supplementary Material 2: Velocity update

Subsequently, the damping of the velocity amplitude by dissipation is deduced from the following differential equation (Parker et al., 1986):



where the shear velocity with *C*D the drag coefficient assumed to be a constant set by the user. This assumes that the loss of energy is expressed as a loss due to friction (at the lower boundary). In turbidity currents, the resistance to the flow at the upper boundary by interfacial entrainment of ambient fluid is at least as important or even more important (Middleton and Southard, 1984; Wells et al., 2010). This dissipation is treated when modeling specifically the process of water entrainment.