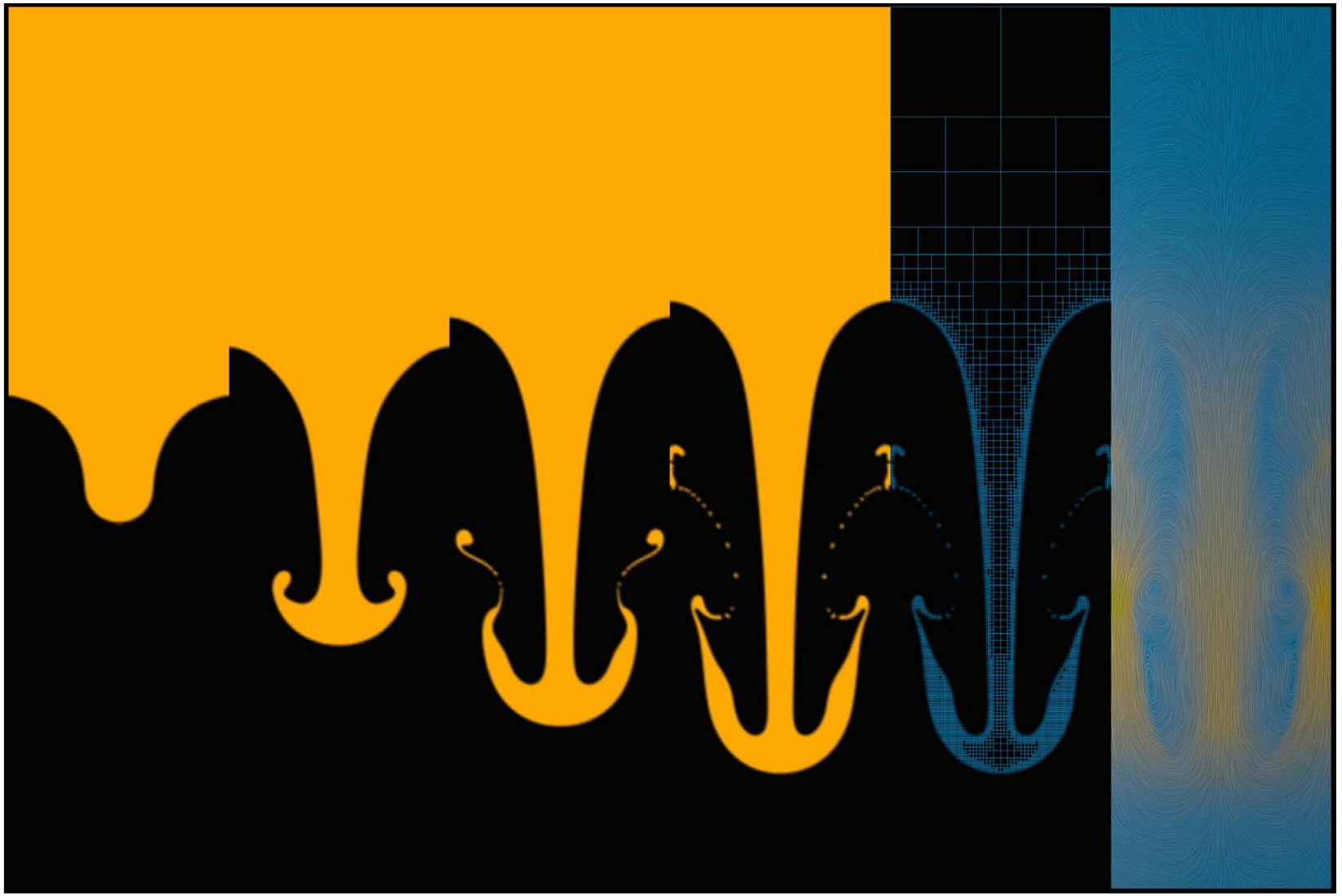

# Rayleigh-Taylor instability

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The visualization presents a few results of the simulation [1] of the famous Rayleigh-Taylor instability. By definition, it is the instability of the interface between two fluids of different densities, as the heavier fluid penetrates into the lighter one.

Typically we consider the heavy fluid (yellow) on top of the light one (black), initially at rest, under the influence of only the gravitational force. In the first four image sections from left to right, we visualize the interface's evolution in time. As the top fluid penetrates into the bottom fluid we see the formation of a peculiar mushroom-like geometry. The free-slip & impermeable boundary conditions of the simulation reveal a periodicity of the geometry along the interface.

The fifth image section exhibits the mesh structure used in the simulation. In fact, it is solely based on initially coarse squares that can be refined by splitting into smaller squares if it contains the interface. In this way, a high resolution of the interface is obtained, where the high curvature demands successive refinements. Looking at two periods, we can observe that as two mushroom shapes evolve side by side, a counter mushroom-like geometry of the lighter fluid forms in the opposite direction. Finally, the far right image section shows the velocity field with a particular peak around the recirculation region, chiefly at the bottom of the "mushroom stem" and around the folding edges. They are plotted by using the surface line integral convolution (Surface LIC) available as a plug-in in the open-source ParaView software [2] used for the entire visualization.

[1] Simulation performed by Stéphane Popinet using Gerris, an open-source Euler, Stokes & Navier-Stokes solver, http://gfs.sourceforge.net/wiki/index.php/Main_Page
[2] ParaView visualization application, http://www.paraview.org