Webinar
The Raleigh Taylor instability: Double perspective, eigenvalue problem and SPH simulation

Fryday 26/02/2021, 15:00 – 15.40
Link: http://urly.it/3bgvv

Lecturer: prof Leo Miguel González Gutiérrez

In this talk, the classical Rayleigh-Taylor is extended to that situation where the fluid is completely confined, both in the vertical and the horizontal directions. This seminar starts from a previous 2D periodic case where the instability includes viscosity, surface tension and finite thickness. This problem is simulated from a double perspective: first, the linear stability analysis obtained when the Navier-Stokes equations are linearized, regularized in terms of density and discretized using finite elements, and second looking at the weakly compressible version of a multiphase smoothed particle hydrodynamics (WCSPH) method. The evolution and growth rates of the different fluid variables during the linear regime of the SPH simulation are compared to the computation of the eigenvalues and eigenfunctions of the viscous version of the Rayleigh-Taylor stability (VRTI) analysis with and without surface tension. The most unstable mode, which has the maximal linear growth rate is obtained with both approaches, but also other less unstable modes with more complex structure have been computed. The classical horizontally periodic (VRTI) case is now adapted to the case where two additional left and right walls are included, representing the cases where a two phase flow is confined in a accelerated tank. This 2D case where no periodic assumptions are allowed, is also solved using both techniques with tanks of different sizes and a wide range of Atwood numbers. The agreement with the linear stability analysis obtained by a lagrangian method such as multiphase WSPH is remarkable.

Biography: Leo M. González is professor of Mecanica de Fluidos at the Departamento Mecanica De Fluidos y Propulsion Aeroespacial, Escuela Técnica Superior de Ingenieros Navales (ETSIN), Universidad Politécnica de Madrid (UPM), Spain. His interests concern Numerical Methods in Fluid Mechanics, Fluid-Structure Interactions, Turbulence modelling.

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