Finite Element Simulations of two-phase flow and floating bodies using FEniCS-HPC

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We present a variational multiscale stabilized finite element method to solve the variable density incompressible Navier-Stokes equations for the simulation of two-phase flow. We introduce a level-set method based on the compression technique similar to [1]. For the simulation of floating devices we make use of a simplified rigid body motion scheme and a deforming mesh approach [2]. The mesh deforms elastically following the movement of the body. An implicit turbulence model is used where turbulence is modelled by the numerical stabilization. The described methods are implemented in the open source software framework FEniCS-HPC [3] provided with an automated methodology for discretization and error control. We are working in a project for marine energy generation together with Tecnalia R&I. In this context we simulate floating platforms that will be used for marine energy generation or device experimentation in the ocean. The aim is to study the dynamics of this kind of off-shore devices. Our simulation results are compared against the experimental data obtained by Tecnalia R&I company in the experimental tank of CEHIPAR in Spain. We also participate in the IEA-OES Task 10 project where different simulations of floating bodies are

carried out. The results are compared against other groups simulations that use different methodologies.

References

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