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# NUMERICAL METHODS FOR INTERFACE-RESOLVED MULTIPHASE FLOWS

## TRACK 800

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## ABSTRACT

Multiphase flows are found in many mechanical, process, chemical, maritime, civil, and biomedical applications. Their features include heat and mass transfer in bubbles, droplets, films, and sprays, potentially in a reacting environment; turbulence modulation and drag reduction in bubbly flows, fluid-structure interactions in free surfaces or cavitation in rotating machinery, among others [1]. The assessment of such critical features requires describing fundamental physical phenomena including bubble growth, detachment, dispersion, deformation, coalescence, and collapse; film instability and breakage; jet atomization, phase change, Marangoni convection, or electro-wetting, among others. All these physical phenomena share the core role of the two fluids interface in their underlying mechanisms.

To gain a deeper understanding of such multiphase flow physics, numerical simulation is an invaluable tool, particularly using the one-fluid approach. Nonetheless, it requires resolving a moving, deformable, two-phase interface; treating potentially huge differences in physical properties, and including interfacial phenomena itself (like surfactants surface diffusion). Consequently, the numerical simulation of multiphase flows is still a rich field of research with several open questions, as proven by the coexistence of several techniques.

The numerical treatment of multiphase flow physics is then challenged to develop better numerical schemes [2] that improve conservation (mass, momentum, energy), surface tension, interface reconstruction (surface area, normal vector, curvature), interface transport; and computational techniques for time-stepping, variable coefficient Poisson equation, Adaptive Mesh Refinement, or numerical instabilities, among others.

In this mini-symposium, we want to gather practitioners of interface-resolved multiphase flows from different techniques (e.g.: F-T, VOF, (C)LS, PF, etc) and different application areas to exchange their experiences in solving the numerical challenges highlighted above and discuss pros and cons of each technique.

## REFERENCES

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