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ADVANCES ON COMPUTATIONAL METHODS FOR MULTIPHASE FLOWS WITH PHASE CHANGE

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ABSTRACT

Multiphase flows with phase change such as cavitating flows, boiling and flashing flows are found in numerous engineering applications ranging from aerospace to nuclear technologies, and are relevant also in other fields such as medicine and geophysics. These flows are typically characterized by complex phenomena: vapor cavities or bubble formation and collapse, interfaces, shocks, wave interactions. Important advances have been made in computational methods for the simulation of these multiphase flows, based on various mathematical and physical models and different numerical approaches, e.g. [1,2,3]. Yet there are many open challenges towards the accurate prediction of these flows in realistic configurations. First, there is a need for models and methods allowing a more precise description of the flow physics and thermodynamics. For instance several difficulties concern the accurate description of heat and mass transfer processes and non-equilibrium thermodynamic effects such as the occurrence of metastable states. To this aim, it is important to be able to account for precise complex equations of state and arbitrary relaxation times for the thermodynamic transfer. In some problems, additional multiphysics and multiscale effects should be also taken into account, for instance surface tension, turbulence or complex wall effects in boiling processes. Furthermore, the simulation of realistic problems demands time-affordable computational tools applicable to multi-dimensional complex geometries and to a large range of Mach number regimes. The aim of this minisymposium is to bring together scientists working on computational models for multiphase flows with phase change to share and exchange ideas, discuss challenges, new trends and innovative methods in the field. The minisymposium will be open to a broad spectrum of modelling techniques and numerical approaches.

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