9th European Congress on Computational Methods in Applied Sciences and Engineering (ECCOMA2024)
June 3-7, 2024, Lisbon, Portugal

COMPUTATIONAL METHODS FOR MULTIPHASE FLOWS WITH LIQUID-VAPOR TRANSITION

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Key words: Multiphase flows, liquid-vapor transition, cavitation, boiling, computational fluid dynamics.

ABSTRACT

Multiphase flows with liquid-vapor transition such as cavitating flows, sprays, boiling and flashing flows are found in numerous engineering applications and science fields. These flows are characterized by complex multiscale phenomena involving the dynamic formation of phase interfaces and inter-phase thermodynamic transfers. 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. [1,2,3,4,5]. 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 providing a more precise description of the flow physics and thermodynamics. For instance some difficulties concern the modeling of non-equilibrium phenomena in heat and mass transfer processes such as metastability and the description of nucleation mechanisms. In some problems additional multiphysics and multiscale effects should be taken into account, for example surface wettability in boiling and evaporation processes, or the possible presence of multiple species in the phase changing flow. This entails additional difficulties in the design of accurate and efficient numerical algorithms. 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 liquid-vapor phase change to share and exchange ideas, discuss challenges 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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