Institute of Thermomechanics Seminar

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Lecture No. 136

Institute of Thermomechanics, Czech Academy of Sciences

invites you to a lecture within the lecture series **Institute of Thermomechanics Seminar**

Unraveling multiphase flow physics via interface-resolved numerical simulations

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Multiphase flows involving droplets, bubbles, and particles are omnipresent in environmental and industrial applications. These flows are inherently complex, spanning a wide range of spatiotemporal scales and featuring strong physical interactions. Gaining detailed insight into the underlying physics of such systems is often beyond the reach of experimental or analytical approaches. To address this challenge, highly-resolved numerical simulation techniques are often employed, in which the interface between the phases is explicitly resolved on the computational grid. Depending on the nature of these interfaces, different interface-resolved methods are employed, including interface-capturing approaches such as the volume of fluid (VOF) method for droplets, bubbles and deformable interfaces, and immersed boundary method (IBM) for rigid particles.

This presentation aims to demonstrate how the VOF, IBM, and their coupling enable the unraveling of complexities in multiphase flow physics and the extension of existing theories across a range of problems from single bubble hydrodynamics and small-scale bubble-particle interactions to droplet-laden turbulent flows. Finally, the broader applicability of these methods is illustrated through the extension to biomedical flows, where IBM is employed for the modelling of red blood cell mechanics and upscaling cell-level blood flow simulation.

The lecture will be held on Tuesday, April 21th, 2026 at 9:30 a.m.
in the building of the Institute of Thermomechanics (Lecture Hall),
Dolejškova 5, 182 00 Prague 8

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