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Analysis of turbulent cavitating flow in a micro channel CHRISTIAN EGERER, STEFAN HICKEL, STEFFEN SCHMIDT, NIKOLAUS ADAMS, Institute of Aerodynamics and Fluid Mechanics, Technische Universität München — Associated with the collapse of vapor cavities is the formation of shock waves and liquid micro-jets, which can lead to the damage of material (cavitation erosion) or even failure of engineering devices, e.g. fuel injectors. We performed Large-Eddy Simulations of the turbulent cavitating flow through a micro channel, resembling a throttle valve commonly found in fuel injectors, at two different operating points with the aim of indentifying such erosion sensitive areas. The underlying numerical method of our flow solver INCA solves the compressible Navier-Stokes equations on a Cartesian adaptive grid for a homogeneous mixture of liquid and vapor in order to account for all relevent physical effects, i.e., compressibility of the liquid-vapor mixture as well as transitional flow and turbulence. The effect of non-represented scales on the represented ones is accounted for by the Adaptive Local Deconvolution Method, a non-linear finite volume scheme for the convective fluxes. We will present a comparison of numerical results with experiments as well as a detailed analysis of the interplay between vortical and cavitation structures. Furthermore, tools enabling the automatic detection of erosion sensitive areas will be discussed and applied.

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