Abstract Submitted
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LES of turbulent cavitation[1] ASWIN GNANASKANDAN, KRISHNAN MAHESH, University of Minnesota — Large Eddy Simulation is employed to study two unsteady turbulent cavitating flows: cyclic cavitation over a cylinder and sheet to cloud cavitation over a wedge. A homogeneous mixture model is used to treat the mixture of water and water vapor as a compressible fluid. The governing equations are solved using a novel predictor-corrector method (Gnanaskandan and Mahesh, Int. Journal of Multiphase Flow, 2015, 70:22–34). Cavitating flow over a cylinder at Reynolds number (based on cylinder diameter and free stream velocity) Re = 3900 and cavitation number σ = 1.0 is simulated and the wake characteristics are compared to the single-phase results at the same Reynolds number. It is observed that cavitation suppresses turbulence in the near wake and delays three-dimensional breakdown of the vortices. The role of cavitation-induced vorticity dilatation in suppressing vortex shedding frequency is discussed. Next, cavitating flow over a wedge at Re = 200,000 (based on wedge height and inlet velocity) and σ = 2.1 is presented. The mean void fraction profiles obtained are compared to experiment and good agreement is obtained. Cavity auto–oscillation is observed, where the sheet cavity breaks up into a cloud cavity periodically. The Strouhal number corresponding to auto-oscillation also agrees well with the experiment. The process of transition from sheet to cloud cavitation will be discussed.

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