Abstract Submitted
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Investigation of cavitating flows using LES[1] FILIPE BRANDAO, KRISHNAN MAHESH, University of Minnesota — LES and the homogeneous mixture approach are used to investigate cavitating flow over two geometries: a circular cylinder and a backstep. For the cylinder, different cavitation numbers are considered with different amounts of vapor and non-condensable gas freestream volume fraction. It is observed that the location of boundary-layer separation is largely affected by levels of void fraction in the freestream. Therefore, the upstream movement of the separation point as the cavitation number is reduced, as predicted in Arakeri (J. Fluid. Mech., (1975) 68: 779–799), can be obtained. A dynamic mode decomposition (DMD) algorithm developed in Anantharamu and Mahesh (J. Comput. Phys., (2019) 380: 355–377) is employed to study wake characteristics. DMD reveals that cavitation has a large effect on the primary Kármán vortex street transition. Differences in vortex stretching, dilatation and baroclinic torque between the cyclic ($\sigma = 1.0$) and transitional ($\sigma = 0.7$) regime are also studied. LES of the backstep shows good agreement for mean flow and turbulence intensities with experiments. Cavitation inception in the shear layer downstream of the step is studied and will be discussed.

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