Abstract Submitted
for the DFD20 Meeting of
The American Physical Society

Cavitation inception during vortex pair interaction[1] ADITYA MADABHUSHI, KRISHNAN MAHESH, University of Minnesota — Cavitation inception during vortex pair interaction is commonly observed in the wakes of propeller blades, in jets and other shear layer flows. Here, DNS is employed to study the interaction between two counter-rotating vortices of unequal strength at Re = 200000. The growth of the Crow instability on the weaker filament results in its stretching and wrapping around the stronger filament. The axial stretching causes a significant drop in the weaker filaments core size, and hence its core pressure, for most of the evolution. This axial stretching is found to be non-uniform and its effect on the core size reduction is discussed. As the filaments approach very close to each other, the cores start to break up due to large mutual strain. During this break-up process, a combination of axial jet and local axial stretching results in a further drop in the core pressure of both the filaments, possibly leading to inception. Also, the effect of initial secondary core size on the minimum pressure attained in both the filaments is analyzed. A compressible Euler-Lagrangian model to accurately predict the dynamics of the sub-grid bubbles during inception is discussed. A modified Rayleigh-Plesset equation is presented and compared to the traditional Rayleigh-Plesset equation, for this purpose.

[1]Supported by the Office of Naval Research

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Date submitted: 03 Aug 2020 Electronic form version 1.4