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Experimental Study of Incipient Cavitation Due to a Pair of Interacting Line Vortices[1] DANIEL KNISTER, ELIZABETH CALLISON, HARISH GANESH, STEVEN L. CECCIO, University of Michigan — Incipient cavitation in turbulent shear flows generally occurs in weaker stream-wise vortical structures that are stretched by stronger span-wise vortices. The rapid stretching leads to a substantial reduction in core pressure in the secondary vortices, which can lead to cavitation inception. Occurrence of cavitation inception depends on the vortex stretching process, the accompanying pressure drop, and size of captured nuclei. An experiment to study this phenomenon has been conducted, with the two parallel tip vortices of a pair of hydrofoils in a re-circulating water tunnel, similar to that of Chang et al. (2012). Cavitation inception and developed cavitation in the interacting vortices are studied with high speed video. In addition, averaged vortex properties of non-cavitating line vortices are measured with Stereo Particle Image Velocimetry (SPIV). Observed vortex interaction in the experiments compares favorably to the dynamics predicted using a linear stability framework following Crow (1970) based on the measured averaged properties. The effect of nuclei size on is explored by measuring the nuclei distribution using a new optical Cavitation Susceptibility Meter.

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