

Abstract Submitted  
for the DFD08 Meeting of  
The American Physical Society

**Suppression of Tip Vortex Cavitation by Water and Polymer Injection**<sup>1</sup> NATASHA CHANG, RYO YAKUSHIJI, STEVEN CECCIO, Univ. of Michigan — Tip vortex cavitation (TVC) is typically the first form of cavitation observed in propellers; therefore a delay of its inception is desirable. In this study, TVC inception was delayed via mass injection from the tip of a modified NACA-66 elliptic plan-form hydrofoil. The injected mass used were water and Polyox WSR 301 solutions with concentrations from 10 to 500 ppm. The free-stream nuclei content was measured using a Cavitation Susceptibility Meter, and the TVC inception event rate was quantified with a light scattering system. The vortical flow field in the region of inception was characterized using Stereo Particle Imaging and Velocimetry (SPIV), with measurements taken from 0.25 to 1 chord length at various concentrations and injection rates. It was observed that TVC inception was delayed with injection by a  $\Delta\sigma$  of 0.03 to 1.8 from a baseline of  $\sigma = 3.5$ . Injection with higher polymer concentrations and higher volume flux led to larger delays. A saturation effect for the TVC suppression was observed for both the polymer concentration (125ppm) and volume flux rate ( $\dot{Q}_j/\dot{Q}_c = 0.48$ ). These effects are related to the SPIV flow field.

<sup>1</sup>Funded by the Office of Naval Research and the National Science Foundation.

Natasha Chang  
Univ. of Michigan

Date submitted: 01 Aug 2008

Electronic form version 1.4