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Time Resolved 2D X-ray Densitometry of a Cavitating Wedge[1]
SIMO MAKIHARJU, HARISH GANESH, STEVEN CECCIO, University of Michigan — A canonical cavitating two dimensional wedge experiment was setup to provide quantitative validation quality data for CFD through the use of time resolved x-ray densitometry. The x-ray system was used to the measure the spatial distribution of void fraction of the cavitating flow. The water tunnel's dissolved gas content was controlled and dissolved oxygen content measured. The flow was nominally two dimensional, and time resolved 2D projections of the void fraction distribution were measured with resolution of the order of $1/100^{th}$ of the cavity length. FFT of void fraction revealed the frequencies inherent to the cavitating wedge at Strouhal number on the order of 0.3. The pressure in the region of cavitation was recorded simultaneously with the x-ray measurement to compare the detected frequencies. As ongoing work, we are incorporating a 2D electrode array onto the surface of the model to have a second measure of the void fraction within $\sim$1 mm of the surface, thus providing a consistency check for the x-ray densitometry and revealing any near surface 3D features of this nominally 2D flow. The data covered the incipient sheet cavity, intermittent cloud shedding and fully shedding periodic cavity regions for a range of cavitation numbers.

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