Numerical Investigation of Cavitation Bubble Dynamics Between Oblique Plates

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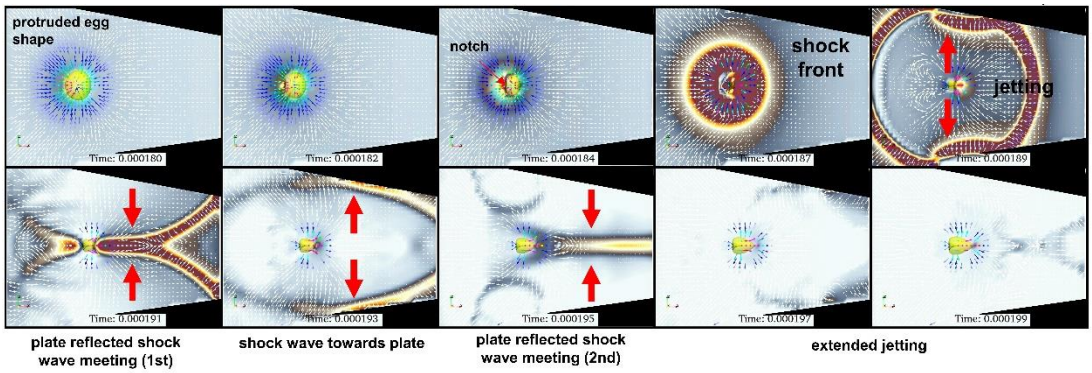
ABSTRACT

We investigated the dynamics of single laser induced cavitation bubble dynamics between oblique plates. The dynamics of bubble varies significantly from the dynamics of bubble between parallel plate and bubble dynamics near flat surface. To confirm our experimental results, we performed numerical investigation using open-source the computational fluid dynamics code 'OpenFOAM'. It is believed that compressibility and phase change can reflect more realistic multiple collapses. Therefore, in our current numerical investigation, we used the compressible solver based on the barotropic equation of state. Fully three-dimensional numerical simulations showed their capability to reflect the similar dynamics of bubble shown in experiments. The bubble collapsing between oblique plate showed jetting in the water without physically interacting with the oblique plates. Experiments and simulation reflected clear three collapse of the bubble. Simulation results provided detailed information beyond the experimental capabilities or restriction. Extended long duration jetting was one of the important features reflected in simulations. An extensive numerical as well as experimental investigation is required to see the interaction of the shock wave propagation on bubble dynamics. Overall, simulation results agreed well to the experiments. Numerical method and assumptions can be used further to solve bubble dynamics related problems in detail. The information regarding shock wave propagation between oblique plates seems interesting and that of the propeller vibration and noise radiation can be realized, where cavitation clouds collapse between propeller blades.



Shock wave propagation between oblique plates

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