

## عنوان مقاله:

Vorticity-Based Flow Structures and Cavitation Evolution in High-Pressure Submerged Waterjet

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## خلاصه مقاله:

The present study aims to describe flow structures and cavitation phenomenon in the submerged waterjet. A non-intrusive experimental work was performed. The waterjet was produced through a nozzle characterized by a short straight segment adjacent to the nozzle outlet. Waterjet pressures were varied from ۵ to ۲۲ MPa. The time-resolved particle image velocimetry (TR-PIV) was used to measure velocity distributions. The proper orthogonal decomposition (POD) method was employed to extract flow structures from the flow-measurement results. Cavitation was created through increasing the waterjet pressure. A comparison of cavitation patterns at different waterjet pressures was implemented. Similarity of the distribution of average velocity is revealed as the waterjet pressure varies. The POD results indicate that two high-vorticity bands close to the nozzle, symmetrically distributed with respect to the nozzle axis, dominate the waterjet stream. Further downstream, small-scale flow structures are sparsely distributed and assume a low percentage of the total energy. Initial cavitation is featured by small-scale cavities which are formed near the high-vorticity zone. As the waterjet pressure increases, the volume fraction of cavitation increases and morphological features of cavitation change significantly as waterjet develops. At a later stage, stable cavity clouds are evidenced. A high relevance between vorticity distribution and cavitation cloud pattern is demonstrated.

## کلمات کلیدی:

Submerged waterjet, TR, PIV, Flow structure, vorticity, Cavitation, POD

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