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Probe into the gas leakage dynamics from the bubbly wake of a ventilated supercavity[1] SIYAO SHAO, JIARONG HONG, University of Minnesota — Understanding the liquid-gas interface instability and associated gas leakage mechanisms is critical for developing new strategies for sustainable ventilated supercavitation in practical applications. However, despite recent effort from Wu et al [JFM, 2019, 862, 1135-1165], to directly characterize the gas leakage through the cavity internal flow measurement is challenging, particularly across a broad range of cavity regimes. Here we probe into the gas leakage mechanism by investigating bubbly wake generated from a ventilated supercavity with various closure modes including re-entrant jet, twin and quad vortex closures. The size and shape of bubbles and their 3D distribution in the wake are captured using a high speed digital inline holography (DIH). The instantaneous gas leakage rate, estimated from the size and velocity of bubbles at each time instant, shows a strong intermittent behavior while the average gas leakage from DIH agrees well with the ventilation input under all experimental conditions. In addition, the detailed spatial and temporal characteristics of bubble distribution in the wake are found to vary under different closure conditions, connecting strongly with the interface instability and bubble breakup mechanism at the closure of the supercavity.

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