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The Dynamics of Partial Cavities and Effect of Non-Condensable Gas[1] SIMO A. MAKIHARJU, HARISH GANESH, STEVEN L. CECCIO, University of Michigan — Partial cavitation is encountered in a variety of common applications, from fuel injectors to lifting surfaces, and in general it has detrimental effects on the system wear and performance. Partial cavities undergoing auto-oscillation can cause large pressure oscillations, unsteady hydrodynamic loading, and significant noise. In the present study, experiments were conducted focusing on the dynamics of shedding cavities forming in a canonical geometry (downstream of a wedge apex). The inlet cavitation number was fixed at 2.0 and the Reynolds number based on the hydraulic diameter was $6x10^5$. The effects of dissolved gas content and of non-condensable gas injection into the cavity were carefully studied utilizing dynamic pressure transducers and x-ray densitometry. Gas was injected either immediately downstream of the wedge's apex or further downstream into mid-cavity. The gas injected near the wedge apex was found to end up in the separated shear layer, and relatively miniscule amounts of gas were enough to significantly reduce the vapor production rate and dampen the cavity's auto-oscillations. In addition, the results suggest that non-condensable gas injection can cause the shedding mechanism to switch from one dominated by condensation shock to one dominated by re-entrant liquid jet.

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