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ABSTRACT

Flow field analysis of three in-line turbulent confined impingement jets onto a corrugated target surface

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In this work, two-dimensional time-resolved particle image velocimetry (TR-PIV) measurements are carried out to study the turbulent flow field of three confined in-line impingement jets onto a corrugated target surface. A parametric study is carried out for values of the jets' exit Reynolds number of Re = 3000 and 5000, dimensionless jets'-to-surface target distances of H/D = 3 and 5, and two values of the phase angle (ϕ) defined as the relative position of the corrugations with respect to the jets nozzles. For ϕ = 0° and ϕ = 180°, the center locations of the jet nozzles coincide with the upper and lower undulation of the corrugated target surface, respectively. Flow measurements are acquired in several spanwise planes of the impingement test section, and the dimensionless shedding frequencies (Strouhal numbers) of the oscillating jets have been obtained. The snapshot proper orthogonal decomposition technique (POD) has been applied to extract the dominant vortical structures, and our findings reveal the role of the accumulated cross-flow on the flapping motion of the jets.