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Characterization of two-dimensional impinging jets[1] XUEQING ZHANG, SERHIY YARUSEVYCH, SEAN D. PETERSON, University of Waterloo — The development of a slot jet impinging on a plate is investigated experimentally using 2D-PIV. The study is performed for two jet Reynolds numbers, Re = 3000 and 6000, and four jet orientation angles relative to the wall ($\theta = 90°, 60°, 45°, 30°$), with the nozzle-to-plate spacing fixed at four slot widths. Within the range of impingement angles considered, the flow is characterized by a stagnation region, followed by a region of flow reorientation into a wall jet. Shallower impingement angles lead to a smaller stagnation region and larger displacement of the stagnation point from the geometric projection of the jet centreline. Increasing Re or decreasing θ results in a reduction of the growth rate of jet half-width in the wall jet region. Coherent structures form in the jet shear layers and merge throughout the reorientation and initial wall jet regions. In all cases considered, POD is employed to identify the coherent structures and quantify their salient characteristics. The results identify the relative contribution of shear layer rollers and merged vortices to the overall turbulent kinetic energy, and elucidate the effect of Reynolds number and impingement angle on the development of coherent structures.

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