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Characterizing Wall Shear Stress from Underexpanded Impinging Jets PATRICK FILLINGHAM, University of Washington — Normalized wall shear stress is characterized for underexpanded axisymmetric impinging jets. The flow field and wall shear stress are calculated using Computational Fluid Dynamics. A normally impinging jet is modeled with varying impingement height, nozzle diameter, fluid properties and nozzle pressure ratios. Schlieren photography is used to visualize the density gradient of the flow field while pressure sensitive paint is used to determine pressure profile of the impingement surface; these experiments are used to validate the CFD. A *Dimensionless Jet Parameter* (DJP) is developed to characterize magnitude and location of maximum shear stress as a function of nozzle parameters. A local Reynolds number is calculated and characterized as a function of jet parameters. This local Reynolds number is used to develop relationships for wall shear stress at all locations along the impingement surface. Two distinct regimes, with separate relationships for wall shear stress and local Reynolds number, are present along the impingement surface; the near impingement region and the down plate region. The culmination of this work allows for the prediction of wall shear stress and local Reynolds Number in the compressible boundary layer from underexpanded impinging jets based upon nozzle flow conditions as well as local flow measurements.

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