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Analysis of Column Instability Modes in Liquid Jet in Crossflow Atomization[1] SINA GHODS, Arizona State University, MARCO ARIENTI, MARIOS SOTERIOU, United Technologies Research Center, MARCUS HERRMANN, Arizona State University — Atomizing liquids by injecting them into crossflows is a common approach to generate fuel sprays in gas turbines and augmentors. The mechanisms by which the liquid jet initially breaks up, however, are not well understood. To analyze the instability mechanism of the liquid column, we perform proper orthogonal decomposition of side view images extracted from detailed simulations of the near injector primary atomization region. This analysis shows a single dominant wavelength with the associated interface corrugation traveling downstream with the jet. Using consistent temporal averaging of the simulation data we extract mean interface geometries and boundary layer velocity profiles. These are used to calculate the most unstable wavelength of the shear layer instability following the procedure of Boeck & Zaleski (2005). The theoretical wavelengths are comparable to those extracted from the simulation data. In addition to shear layer instability we analyze Rayleigh-Taylor as a potential instability mechanism of the liquid column.

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