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Temporal length-scale cascade and expansion rate on planar liquid jet instability WILLIAM SIRIGNANO, ARASH ZANDIAN, University of California, Irvine, FAZLE HUSSAIN, Texas Tech University — Using the local radius of curvature of the surface and the local transverse dimension of the two-phase (i.e., spray) domain as length scales, we obtained two PDFs over a wide range of length-scales at different times and for different Reynolds and Weber (We) numbers. The PDFs were developed via post-processing of DNS Navier-Stokes results for a 3D planar liquid sheet segment with level-set and Volume-of-Fluid surface tracking, giving better statistical data for the length scales compared to the former methods. The radius PDF shows that, with increasing We, the average radius of curvature decreases, number of small droplets increases, and cascade occurs at a faster rate. In time, the mean of the radius PDF decreases while the rms increases. The other PDF represents the spray expansion in a more realistic and meaningful form, showing that the spray angle is larger at higher We and density-ratios. Both the mean and the rms of the spray-size PDF increase with time. The PDFs also track the transitions between symmetric and anti-symmetric modes.

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