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A new mechanism for the generation of interface distortions in liquid jets[1] HANUL HWANG, PARVIZ MOIN, M. J. PHILIPP HACK, Center for Turbulence Research, Stanford University — The onset of the atomization process of liquid jets is commonly understood as a sequence of exponential instabilities whose amplification eventually leads to a distortion of the interface and the breakup of the jet into droplets. Our study analyzes the amplification of interface perturbations of liquid jets through an optimization problem within a spatial linear framework. The objective functional is the interface potential energy due to surface tension. We demonstrate that a multi-phase Orr mechanism can serve as an alternative pathway for the generation of interface distortions by redistributing energy from the mean shear into perturbations of the jet surface. Parameter studies show that the amplification of interface disturbances scales with both Reynolds number and Weber number. Analysis of the budget of the perturbation kinetic energy provides further insight into the underlying physics. For high Weber numbers, the amplification of the surface distortion is bounded by viscous effects, whereas surface tension limits the growth in the case of low Weber numbers.

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