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A 3D Computational Study on the Air-Blast Atomization of a Planar Liquid Layer ROBERT CHIODI, OLIVIER DESJARDINS, Cornell Univ — The air-blast atomization of a planar liquid layer is a complex fluid phenomenon involving the destabilization of a low speed liquid layer by a high speed gas coflow. While progress has been made in recent years on understanding the instability of the liquid surface, it remains difficult to accurately predict using stability analysis and requires special expertise and equipment to perform thorough experiments. Simulations provide an excellent way to conduct parametric studies to determine the effect of splitter plate geometry and momentum flux ratio on the frequency and wavelengths of instability, however, they are extremely difficult due to the high density ratio and large range of length and time scales present in the flow. Using an accurate conservative level set method in conjunction with a newly reformulated reinitialization equation, we perform 3D simulations of the air-blast atomization of a planar liquid layer and compare them to experiments. We then go on to explore the role momentum flux ratio plays in the longitudinal and transverse wavelengths of instability.

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