

Abstract Submitted
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Application of Digital Inline Holography to Quantify the Influence of Dilute Oil-In-Water Emulsions on Sprays¹ STEVEN FREDERICKS, Winfield United, CHENG LI, SANTOSH KUMAR, CHRIS HOGAN, JIARONG HONG, University of Minnesota — Controlling the droplet size distribution (DSD) of sprays is critical for a broad range of applications. Particularly, in agriculture, oil emulsions are generally used to decrease the proportion of small size droplets in sprays by facilitating the earlier breakup of the lamella. Combining high-speed shadowgraphy and digital inline holography, herein we present a systematic experimental study of the droplet dynamics of sprays generated from a flat fan hydraulic nozzle with and without (control case) the addition of oil emulsions. Our results show significant difference of the atomization process between the control and oil emulsion cases, in terms of the lamella perforation rate and the coherent length of the lamella. Specifically, the addition of an oil emulsion increases the frequency of observed perforations within the lamella and decreases the pre-breakup length of the lamella. In addition, the joint probability density function of droplet velocity and size are obtained at different regions in the spray, which is used for establishing a physics-based model for evaluating the effect of oil emulsion on spray dynamics.

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