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Compression wave structure on droplets under supersonic conditions ERIC LIN, JAMES HERMANSON, University of Washington — The compression wave structure in the vicinity of droplets deforming in a continuously accelerating, supersonic flow was examined in a draw-down supersonic wind tunnel. This flow configuration allowed droplets to achieve a Mach number of up to 1.7 relative to the surrounding air stream. Neat 2-propanol droplets 100 microns in diameter were generated upstream of the tunnel entrance using a Droplet-On-Demand generator. Schlieren imaging was performed to visualize the deforming droplets and to image the shock wave structure. Theoretical predictions provided a first estimate for bow shock parameters under these flow conditions such as shock thickness, standoff distance, and shock reaction time, suggesting that detached shock waves can be expected to be present for droplets experiencing the locally supersonic conditions in this investigation. The observed shock waves have characteristics broadly consistent with those expected for detached bow shock waves in front of a bluff body. The relative droplet Mach numbers, inferred from the Mach angle suggested by the schlieren images, are consistent with droplet Mach numbers determined previously in this flow configuration by direct imaging.

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