

Aerodynamic Effect on Liquid Breakup

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Dr. Sallam's presentation will examine both experimental and phenomenological analyses of liquid jet and sheet breakup, drawing inspiration from the seminal work of Prof. G.M. Faeth—under whom Dr. Sallam trained as one of his last Ph.D. students at the University of Michigan. By leveraging these methodologies, the study aims to elucidate the influence of injector geometry, liquid turbulence, and aerodynamic forces on atomization phenomena, with relevance to applications in liquid atomization, agricultural spraying, spray coating, and other industrial processes.

The work employs shadowgraphy and holography to visualize and characterize flow structures, linking the resulting measurements to phenomenological theories that help quantify how aerodynamic forces drive both primary and secondary breakup mechanisms. The analysis covers the breakup regimes of liquid jets and sheets in stationary gases and in crossflow, highlighting critical Weber number thresholds and identifying the aerodynamic conditions that govern transitions between distinct breakup modes. By integrating experimental observations with robust phenomenological frameworks, this presentation provides a deeper understanding of atomization mechanisms and the dominant aerodynamic factors at play.

Biosketch

Dr. Khaled Sallam is the associate head of the School of Mechanical and Aerospace Engineering at Oklahoma State University. He is an expert in the thermal-fluid sciences, with a particular focus on atomization and spray processes, high-speed propulsion, and energy conversion. He received his Ph.D. in Aerospace Engineering from the University of Michigan, Ann Arbor, in 2002. Over the course of his career, Dr. Sallam has authored more than 75 journal articles and conference papers. His research contributions in atomization and spray systems have been recognized by the Institute for Liquid Atomization and Spray Systems (ILASS) – North and South America, where he received the W.R. Marshall Award, as well as through a Summer Faculty Fellowship at the Air Force Research Laboratory at Wright-Patterson Air Force Base. Dr. Sallam has demonstrated leadership within the engineering community, serving as Chair of the ASME Mid-Continent Section. He is an Associate Fellow of the American Institute of Aeronautics and Astronautics (AIAA).