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Tentative topic of the invited talk

Dances with Droplets

Abstract of the invited talk

We explore various avatars of droplets, focusing on their formation, transport, interaction, and eventual settlement on surfaces.

The first section of the talk highlights the generation of sprays and droplets using a custom-developed lab atomizer and follows their journey through different fluidic environments, ranging from laminar flows to vortical structures. A key focus is the transport of sprays and pesticides via vortex rings, emphasizing their potential for cost-effective and highly efficient micro- to milli-scale substance delivery by leveraging coherent vortical structures.

In the second section, we delve into how these transported droplets interact with different materials. We examine the physics of droplet impingement on both liquid and solid substrates (porous and non-porous), utilizing bio-inspired materials to better understand impact dynamics and explore practical applications of these interactions.

Finally, we address the behavior of droplets after impingement, including the drying patterns that form as droplets of varying compositions evaporate. This section spans phenomena from evaporation to crystallization of water to more complex fluids like pesticides, respiratory fluids, urine and blood with an emphasis on applying the resulting patterns to develop AI/ML-driven point-of-care diagnostic solutions.