

Multiphase flow dynamics

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ABSTRACT

Multiphase systems are prevalent in both natural environments and industrial applications. To effectively understand and control these systems, detailed investigations using numerical, analytical, and experimental approaches are required. In this talk, I will provide a brief overview of the projects I have explored so far. I will present my research on two distinct multiphase flow phenomena: cavitation and inkjet printing. The study of cavitation demonstrates-through a combination of experiments, simulations, and theoretical analysis-that the collapse of a spherical cap shaped bubble attached to a wall can generate a jet directed away from the wall. This jet formation is linked to a singularity predicted by potential flow theory. For the inkjet printing case, two specific problems will be addressed: (a) the numerical modeling of surface tension effects, focusing on Marangoni flows commonly observed in evaporating droplets, and (b) the influence of polymer additives on jet formation and breakup as the ink is ejected from the nozzle.

ABOUT THE SPEAKER

Mandeep is enthusiastic about developing advanced finite volume based numerical codes and using them to tackle complex problems in multiphase flows. Currently, he is a Postdoctoral Researcher at the University of Pau in France, working with Dr. Kevin Schmidmayer on numerical simulations of cavitation near kidney stones. Earlier, he was a postdoc in the Physics of Fluids group at the University of Twente, where he collaborated with Canon Production Printing on fundamental challenges in inkjet printing under the guidance of Prof. Detlef Lohse. He earned his PhD from Sorbonne University, focusing on cavitation for biological applications at the Institut Jean le Rond d'Alembert working with Prof. Stephane Zaleski and Dr. Daniel Fuster. He completed a Master's in Mechanical Engineering at IIT Guwahati and a Bachelor's degree at NIT Hamirpur in India. Outside the lab, he enjoys playing badminton and road cycling.

