

PURDUE FLUIDS SEMINAR SERIES

RECENT PROGRESS ON LIQUID JET ATOMIZATION

FRIDAY JUNE 12TH, 2026
SEMINAR 2:00PM-3:00PM ARMS B071
DISCUSSION 3:00PM-3:30PM ARMS B071



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Abstract

Atomization is one of the CFD fields with the most striking progress. It has natural, industrial and fundamental interest. In natural sciences, spray formation on wave crests, molten rock breakup in asteroid impacts and lava breakup in volcanic eruptions are all examples of atomization. In engineering, combustion of liquid fuels is the most studied application, although other have emerged such as molten metal atomization for the fabrication of powders used in additive manufacturing, or milk atomization for the production of dried milk powder.

On the fundamental side, atomization is a nonlinear multiscale physical phenomenon with strong analogy with single phase turbulent flow. The fundamental problem of turbulence is to find a statistical probability distribution function for turbulent fields, The spectral energy density is known with some degree of confidence to follow the Kolmogorov $-5/3$ law. What would be the equivalent of such a statistical theory in atomization? Instead of the power spectrum, one may wish to predict the droplet sizes. The PDF is then the equivalent of the spectrum.

In the talk, I shall discuss how numerical simulations of atomization, following the VOF method, allow to make advances on this problem.

Biography

Stéphane Zaleski is Professor of Mechanics at Sorbonne Université and member of the "Institut Jean Le Rond d'Alembert". He spent his early years at the Physics Laboratory of Ecole Normale Supérieure in Paris where he obtained his PhD under the supervision of Yves Pomeau. After three years at the Applied Math group of MIT he joined the Mechanics group at Sorbonne Université. He investigates numerical methods for multiphase flows with applications to atomization, cavitation, porous media flow, nucleate boiling, hydrometallurgy, moving contact lines and droplet impact. Methods include the Volume of Fluid method, the Edge-Based Interface Tracking method and the Diffuse Interface method. He has written several computer codes for the simulation of multiphase flow including PARIS Simulator and is involved in the development of the Basilisk platform. He is Associate Editor of J. Comput. Phys. and of Computers and Fluids. He has led the ERC-Advanced project TRUFLOW on mass transfer at large Schmidt numbers and is a member of Institut Universitaire de France. Awards and honors: 2024: medal of the section of mechanics and informatics of the Paris Academy of Sciences.