



ME Seminar



Secrets of Phase-Change : From evaporating drunk droplets to industrial boiler plates!

Prof. Prashant Valluri, University of Edinburgh

ABSTRACT

Droplet evaporation, while common, is pretty complex! Especially, when contaminated by alcohol or anything more volatile. Further, in industry and in real life – droplets are never alone, they are in large populations. Both populations and alcohol can have consequences on drying in multiple droplet populations. In this talk – I will focus on phase-change of binary mixtures. I will demonstrate the three-pronged approach (theory, experiment, and direct numerical simulations) to unravel the physics. I will use boiling as example to show how very large scale direct numerical simulations help understand the role of wettability on heat-transfer coefficients. I will also show how particles in phase-change systems can cause chaos and remixing!

ABOUT THE SPEAKER



Professor Prashant Valluri received his PhD (2004) in Chemical Engineering from Imperial College London. His research focuses on tackling industrial multiphase flows with phase-change using bespoke numerical and theoretical techniques. These include stability analyses to understand interfacial instabilities, and DNS for combined heat-mass-momentum transport such as flows with phase change, and flows with mass-transfer and interfacial reactions. He is a Professor of Fluid Dynamics and the Chair of the UK-wide Multiphase Flows and Transport Phenomena Special Interest Group under the UK Fluids Network. As PI of various ARCHER/HECToR projects he led development of the ultra-fast high resolution TPLS 3.0 (Two-Phase Level-Set: <https://sourceforge.net/projects/tpls/>) and the GIS 1.0 (Gerris Immersed Solid Solver: <https://github.com/eessmann/GISS>) solvers. These solvers have been employed to gain understanding of fundamental phenomena during phase-change cool-

ing for applications including thermal management of microelectronics, industrial scale boiling applications and most recently spray cooling. He is the Coordinator and the PI of the recently concluded five-continent ThermaSMART project (funded by the European Commission) in which Canada was a major contributor with participation of York University Toronto with 20 other major international participants. Recently, he received an EPSRC-ARCHER2 Pioneer Computational Award e643 for Project STALWART: Speedy Industrial Scale Multiphase Flow Simulations for Engineering Energy Efficient Equipment.

December 20th, 2023 (Wednesday)

4:00 PM, A.R. Auditorium