

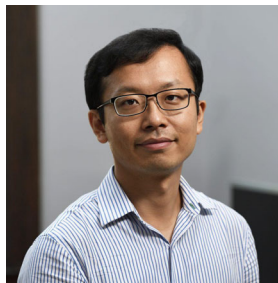


Mechanical Engineering Seminar Series

Fragmentation in Turbulence by Small Eddies

Rui Ni

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Mechanical Engineering
Johns Hopkins University



Tuesday, September 21, 2021

Room 3150 DOW

4:00 p.m.

This seminar will also be streamed live at the following link

[ME Seminar Zoom link](#) (QR Code below)

Password 413824



Abstract

From air-sea gas exchange to flotation bioreactors, fragmentation of bubbles, particles, oil droplets in turbulence constitutes one of the most basic and practically important processes in turbulent multiphase flow. Most phenomenological models and simulations for this problem have been developed based on the classical Kolmogorov-Hinze framework, even though some of the key assumptions have never been tested and challenged. In this talk, I will first introduce a new experimental framework that measures the geometry of breaking bubbles and their surrounding turbulence simultaneously in 3D. From this new result, I will discuss two issues that we found in the classical framework: (i) the Kolmogorov's classical theory of turbulence is not sufficient for quantifying the turbulent stresses on the bubble interface, and (ii) the assumption that the most relevant and energetic scale of the flow is at the bubble diameter is incorrect. Our work underlines the importance of two missing mechanisms and paves the foundation for future studies on the fragmentation of bubbles, droplets, and particles in turbulence.

Bio

Dr. Ni joined the Department of Mechanical Engineering at Johns Hopkins University as an Assistant Professor in 2018 and was appointed as the DOE ORISE professor since then. Prior to joining JHU, he was the endowed Kenneth K. Kuo Early Career Professor at Penn State University. He received his Ph.D. in the Department of Physics from the Chinese University of Hong Kong in 2011, and worked as a postdoctoral scholar at Yale and Wesleyan University. He has received the NSF CAREER award in fluid dynamics, ACS-PRF New Investigator Award, and NASA Early Stage Investigation award. His primary research focus is the development of advanced experimental methods for multiphase flows.

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