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Particle dynamics and heat transfer in a high Reynolds number turbulent flow

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2004 Black Engineering

Abstract
The transport of particles in turbulence occurs in many natural (sediments) or industrial (gas bubbles or solid solutes in industrial mixers) flows, with important repercussions on their heat/mass transfer characteristics. I will present an experimental study of the melting dynamics of large ice spheres immersed in a fully turbulent flow. The results show evidence of what has been called "the ultimate regime of forced convection" on these freely moving particles. As the characteristic melting time is much bigger than those of turbulence, a freely advected ice ball interacts with a large fraction of the flow domain while melting. I will also discuss a multi-scale study of solid particles (same size and density ratio as the ice spheres) in this inhomogeneous turbulent flow. In particular, I will show how large particles sample preferentially the regions with high mean velocity but low turbulence intensity, with larger and larger response times to turbulent fluctuations as their size increases.

Biography
Nathanael completed his BS, MS and PhD in Physics from the Ecole Normale Supérieure de Lyon, France. His PhD focused on the transport and heat transfer of large particles in a highly turbulent flow. Upon completing his PhD in 2014, he moved to Paris to research waves and turbulence in rotating flows. After completing his first postdoc, he moved to the University of Washington, Seattle WA, in August 2016, to work on Multiphysics control of gas-assisted atomization. More information on his research interests can be found at http://faculty.washington.edu/nmachico/research.html.

This seminar counts towards the ME 600 requirement.

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