JOHNS HOPKINS
Center for Environmental & Applied Fluid Mechanics

# FALL 2021 CEAFM VIRTUAL SEMINAR SERIES

## *"Interface-Resolved DNS of Multiphase Flows of Complex Fluids"*


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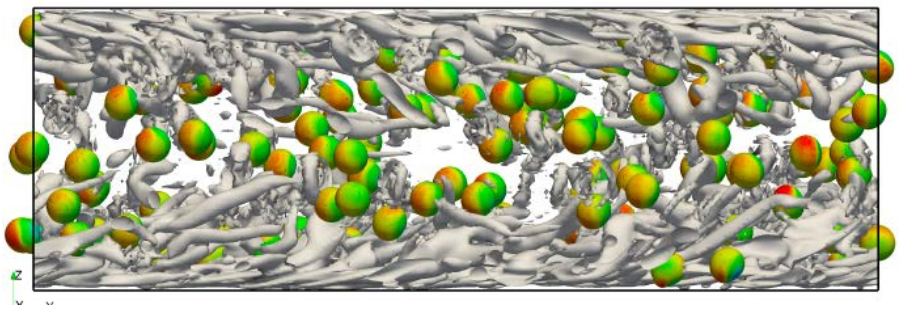
Department of Mechanical Engineering
Hosted by Gretar Tryggvason (MechE)



Interface-resolved direct numerical simulations are performed to examine the sole and combined effects of soluble surfactant and viscoelasticity on the structure of mono- and poly-dispersed bubbly turbulent channel flows for the friction Reynolds number in the rage between $Re_t$=127.3 and $Re_t$=250. A soluble surfactant and FENE-P viscoelastic models are coupled to the incompressible flow equations. In the clean case, small bubbles move toward the wall due to the inertial lift force, resulting in the formation of wall-layers and a significant reduction in the flow rate while larger bubbles tend to move toward channel center. An addition of strong enough surfactant alters the direction of lateral migration, i.e., the contaminated bubbles move toward the core region and spread out across the channel. For the viscoelastic case, shear-thinning effects and elastic forces promote formation of bubbly wall-layers leading to a strong decrease in the flow rate. Formation of a wall-layer is determined by the intricate interplay of the inertial lift, elastic and Marangoni forces when they coexist. Finally, preliminary simulations are performed to investigate complex interactions of buoyancy-driven bubbles in a viscoelastic ambient liquid in the regime where a "negative wake" forms in the presence of soluble surfactant for a range of governing non-dimensional parameters.

Friday, September 3, 2021 at 3:00 PM EDT

https://wse.zoom.us/j/93762992307