Center for Environmental & Applied Fluid Mechanics

"The Deformation and Fragmentation of Biological Marine Aggregates in Turbulence"

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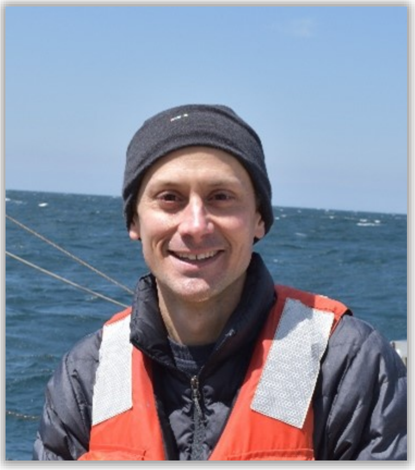

Abstract: Much of the particulate matter in aquatic systems is biological in origin. These particles, which include everything from bacteria and algae to fecal pellets and other detritus from organisms, have a profound effect on material transport at all scales. These particles are cohesive and readily aggregate with themselves and other particles. This aggregation packages small particles into larger, faster-settling clumps and is one of the main drivers of particle sedimentation in our lakes, estuaries, and oceans. However, these bio aggregates and their response to hydrodynamic forces are poorly understood. This talk summarizes recent efforts performed collaboratively between engineers and oceanographers to measure and parameterize the breakup behavior of these aggregates when exposed to hydrodynamic shear. In particular, the application of engineering concepts to benefit this interdisciplinary topic are highlighted. These efforts include integrated laboratory and field investigations performed specifically to quantify the breakup strength of naturally occurring aggregates. Additionally, our lab experiments, which rely on high-speed imaging and particle tracking, have captured how deformation and restructuring leading up to the point of fragmentation are critical for determining aggregate strength and breakup mass distribution. These results are discussed along with new investigations focused on expanding our understanding of aggregation in the presence of biopolymers, their adhesive characteristics, and how they affect large-scale transport in aquatic systems.

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