Abstract Submitted
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Cluster formation and self-assembly in stratified fluids: Particle imaging velocimetry and modified Stokesian dynamics[1] ROBERT HUNT, ROBERTO CAMASSA, University of North Carolina at Chapel Hill, DANIEL HARRIS, Brown, ZELIHA KILIC, Arizona State University, RICHARD MCLAUGHLIN, University of North Carolina at Chapel Hill — We report on a new fundamental attractive mechanism we have found at the UNC Joint Fluids laboratory by which particles suspended within stratification may self-assemble and form large aggregates without need for short range binding effects (adhesion). This phenomenon arises through a complex interplay involving solute diffusion, impermeable boundaries, and the geometry of the aggregate, which produces nontrivial fluid flows. Numerical simulations are directly compared with particle imaging velocimetry for a single oblate spheroid and are shown to agree both qualitatively and quantitatively with PIV data. Numerical simulations with two spheres at an array of fixed separation distances allow for the calculation of an effective force between pairs of particles. With this two-body information, we extend to multiple bodies by modifying a Stokesian dynamics solver to include these forces. Simulations with hundreds of spheres reproduce many of the features of our self-assembly experiment.

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