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Active sinking particles: Sessile filter-feeders can fundamentally alter the fate of sinking aggregates.[1] DEEPAK KRISHNAMURTHY, MANU PRAKASH, Stanford University, RACHEL PEPPER, University of Puget Sound — Sinking or sedimentation of biological aggregates plays a critical role in carbon sequestration in the ocean and in waste-water treatment plants using "activated sludge" processes. In both these contexts, the sinking aggregates are "active", since they are hot-spots of biological activity and are densely colonized by microorganisms including bacteria and sessile protists, some of which generate feeding currents. However, the effect of these feeding currents on the sinking rates, trajectories, and mass transfer to these aggregates has not previously been studied. Here we use a novel scale-free vertical-tracking microscope (a.k.a. Gravity Machine, Krishnamurthy et al. 2020) to follow model sinking aggregates (agar spheres) with attached *Vorticella* over long distances while simultaneously measuring local flows. We find that attached *Vorticella* cause substantial changes to sinking trajectories, rotation rates, and also re-shape boundary layers near the aggregate. We postulate that these hydrodynamic effects are likely to lead to very different mass transfer rates than for particles without attached organisms, and are also likely to change the sinking dynamics of these aggregates, both in marine and fresh-water contexts.

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Deepak Krishnamurthy
Stanford Univ

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