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Quantifying biogenic turbulence through 3D scanning particle image velocimetry[1] MATTHEW FU, Caltech, ISABEL HOUGHTON, Sofar Ocean, JOHN DABIRI, Caltech — Biogenic turbulence from aggregates of vertically migrating swimmers remains a poorly understood, and potentially underrepresented, source of scalar transport and ocean mixing. Though turbulent scales created by a single swimmer might be limited to those of the individual organism, the larger motions associated with the swimmer aggregates can introduce mixing scales relevant to the surrounding water column. Quantifying this process requires a volumetric, three-component velocimetry technique (3D-3C) capable of resolving the full range of flow scales in and around the swimmer aggregate. Here, we present a scanning particle image velocimetry system for reconstructing the three-dimensional configurations of vertically migrating swimmers and quantifying their volumetric, three-component velocity fields. The approach relies on a laser sheet that rapidly scans through the volume of interest, selectively illuminating slices of seed particles and swimmers. These images slices are captured by a single high-speed camera, encoding information about the third spatial dimension within the image time-series. The capabilities of the technique are evaluated on an induced vertical migration of brine shrimp *Artemia salina*.

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