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Simultaneous measurements of jellyfish bell kinematics and flow fields using PTV and PIV[1] NICOLE XU, JOHN DABIRI, Stanford University — A better understanding of jellyfish swimming can potentially improve the energy efficiency of aquatic vehicles or create biomimetic robots for ocean monitoring. *Aurelia aurita* is a simple oblate invertebrate composed of a flexible bell and coronal muscle, which contracts to eject water from the subumbrellar volume. Jellyfish locomotion can be studied by obtaining body kinematics or by examining the resulting fluid velocity fields using particle image velocimetry (PIV). Typically, swim kinematics are obtained by semi-manually tracking points of interest (POI) along the bell in video post-processing; simultaneous measurements of kinematics and flows involve using this semi-manual tracking method on PIV videos. However, we show that both the kinematics and flow fields can be directly visualized in 3D space by embedding phosphorescent particles in animals free-swimming in seeded environments. Particle tracking velocimetry (PTV) can then be used to calculate bell kinematics, such as pulse frequency, bell deformation, swim trajectories, and propulsive efficiency. By simultaneously tracking POI within the bell and collecting PIV data, we can further study the jellyfishs natural locomotive control mechanisms in conjunction with flow measurements.

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