

Abstract Submitted
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DeepPIV: Particle image velocimetry measurements using deep-sea, remotely operated vehicles¹ KAKANI KATIJA, ALANA SHERMAN, DALE GRAVES, DENIS KLIMOV, CHAD KECY, BRUCE ROBISON, Research and Development, Monterey Bay Aquarium Research Institute — The midwater region of the ocean (below the euphotic zone and above the benthos) is one of the largest ecosystems on our planet, yet remains one of the least explored. Little-known marine organisms that inhabit midwater have developed life strategies that contribute to their evolutionary success, and may inspire engineering solutions for societally relevant challenges. Although significant advances in underwater vehicle technologies have improved access to midwater, small-scale, in situ fluid mechanics measurement methods that seek to quantify the interactions that midwater organisms have with their physical environment are lacking. Here we present DeepPIV, an instrumentation package affixed to remotely operated vehicles that quantifies fluid motions from the surface of the ocean down to 4000 m depths. Utilizing ambient suspended particulate, fluid-structure interactions are evaluated on a range of marine organisms in midwater. Initial science targets include larvaceans, biological equivalents of flapping flexible foils, that create mucus houses to filter food. Little is known about the structure of these mucus houses and the function they play in selectively filtering particles, and these dynamics can serve as particle-mucus models for human health. Using DeepPIV, we reveal the complex structures and flows generated within larvacean mucus houses, and elucidate how these structures function.

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