Resolving zooplankton and marine snow from a new autonomous Zooglider

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Abstract (Poster)

Zooplankton - both multicellular and unicellular - play critical roles in ocean food webs and ocean biogeochemical cycling. Conventional sampling methods invariably distort or damage these organisms and remove them from their 4-dimensional ocean context. Standard net and pump sampling also fail to resolve the fine-scale vertical distributions of zooplankton and marine snow where grazing, predator-prey, and other interactions are likely intensified. While submersible imaging devices for zooplankton have proliferated in recent years, all are deployed from shipboard profilers, towed instruments, or fixed platforms or piers. We have developed a novel Zooglider, a fully autonomous vehicle that includes an imaging Zoocam, a dual-frequency (200/1000 kHz) Zonar, pumped CTD, and Chl-a fluorescence sensor. Zooglider images at 2 Hz, providing 5 cm vertical resolution from 400 m to the sea surface. Zooglider images zooplankton and marine snow particles in situ with minimal hydrodynamic or visual disturbance to the surrounding environment, and incorporates two approaches to mitigate biofouling. Near real-time measurements of optical characteristics of optically-resolved particles and acoustic backscatter are telemetered ashore, permitting Zooglider to be used for adaptive sampling in relation to features detected in the ocean water column. Upon recovery, Deep Learning methods are used to classify zooplankton and marine snow particles. We will present results from recent deployments of Zooglider in the California Current Ecosystem LTER site.