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Assessing plankton and other particles in situ with the SOLOPC

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ABSTRACT: We combined a Sounding Oceanographic Lagrangian Observer float with a Laser Optical Plankton Counter (LOPC) and a fluorometer to make an autonomous biological profiler, the SOLOPC. The instrument senses plankton and other particles over a size range of 100 μm to 1 cm in profiles to 300 m in depth and sends data ashore via satellite. Objects sensed by the LOPC include aggregates and zooplankton, the larger of which can be distinguished from one another by their transparency. We hypothesized that the diel production of particles and their loss by sinking and grazing are reflected in the change of the particle distribution. We present data from four deployments of the SOLOPC off California. Particle volume was maximal at the base of the surface mixed layer and correlated with chlorophyll a fluorescence. In a 3-d deployment in 2005, particle volume was greatest in the early evening and smallest in the morning, and average particle size increased with depth. Eigenvector analysis of the particle volume distribution as a function of diameter for each of the deployments yielded size peaks characteristic of planktonic crustaceans. Ship-based measurements showed that the abundance of opaque particles of 1.1-1.7 mm equivalent spherical diameter was positively correlated with copepods of this size and simultaneously collected in nets. This relationship was used with SOLOPC data to estimate the distribution of large copepods, which were most abundant beneath the depth of maximal particle flux, estimated from particle size and published sinking rates. Our data are consistent with a model with diel production of particles and their loss by sinking and grazing.

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