DECONVOLVING PHYTOPLANKTON ABSORPTION FROM BULK MEASUREMENTS IN TURBID COASTAL WATERS

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Quantitative estimates of phytoplankton absorption are central to bio- optical productivity models and efforts to delineate specific classes of algae (e.g. red-tides). Estimating phytoplankton absorption from bulk in situ measurements is difficult given the absorption of Colored Dissolved Organic Matter (CDOM) and detritus which becomes especially significant in nearshore coastal waters. We have developed a iterative inversion method that deconvolves the bulk absorption, as measured with a Wetlabs ac-9, into the respective contributions of CDOM, detritus, chlorophyll c-, chlorophyll b-, and phycobilin-containing algae. Using data, collected as part of HyCODE program, at the Long term Ecosystem Observatory (LEO-15), we validated the approach with over 250 discrete filter pad phytoplankton absorption estimates. Quantitative agreement between estimated phytoplankton absorption was within 20% of the measured filter pad phytoplankton absorption. Spectral agreement was quantified using a similarity index and was very robust for phytoplankton populations at depth (0.97-0.92). Spectral agreement was less robust in surface waters (0.93-0.4) with disagreement being most significant in the wavelengths of maximum absorption. The phytoplankton input spectra in this inversion approach were based on laboratory phytoplankton cultures. Laboratory cultures are rarely grown at light intensities encountered by phytoplankton in surface waters; thus the spectral mismatch in the surface populations was consistent with the "dark-acclimated" laboratory spectra being more highly packaged then the absorption spectra for the surface populations. Using the ac-9 curve fitter and data collected at LEO- 15, the relationship between phytoplankton community dynamics and coastal upwelling will be discussed.