OCEAN OPTICS XXIV

Valamar Lacroma Dubrovnik Hotel | Dubrovnik, Croatia | October 7–12, 2018

https://oceanopticsconference.org

Wednesday, October 10
Oral Session 7
11:10–12:30

11:10–11:30

LINKING FRRF DERIVED PHOTO-PHYSIOLOGY WITH CARBON-BASED PRIMARY PRODUCTIVITY

Active chlorophyll a fluorescence approaches, including fast repetition rate fluorometry (FRRF), have the potential to provide estimates of phytoplankton primary productivity at unprecedented spatial and temporal resolution. FRRF-derived productivity rates are based on estimates of charge separation in photosystem II (ETR_{RCII}, mol e^- mol $RCII^{-1}$ s^{-1}), which must be converted into ecologically more relevant units of carbon fixation (mol C mol $chla^{-1}$ s^{-1}). Understanding sources of variability in the coupling of ETR_{RCII} and carbon fixation provides important physiological insight into phytoplankton photosynthesis, and is critical for the application of FRRF as a primary productivity measurement tool.

We present data from a series of field experiments during which we simultaneously measured phytoplankton carbon fixation and ETR_{RCII}, both as a function of incident light (PvsE curves). Our results show significant variability of the derived conversion factor between the two rates. Highest values of the conversion factor were observed under conditions of excess excitation pressure at the level of photosystem II, caused by high light and/or low iron availability. These results will be discussed in the context of metabolic plasticity, which evolved in phytoplankton to simultaneously maximize growth and provide photo-protection under fluctuating light and limiting nutrient availabilities. Because the derived conversion factor is associated with conditions of excess light, it correlates with the expression of non-photochemical quenching (NPQ) in the pigment antenna, also derived from FRRF measurements. Our results demonstrate a significant correlation between NPQ and the conversion factor, and the potential of this relationship to improve FRRF-based estimates of phytoplankton carbon fixation rates is discussed.

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