Tuesday, October 9
Oral Session 5
16:20–17:40

17:20–17:40

MAPPING IN SITU CHLOROPHYLL VARIABLE FLUORESCENCE USING AUTONOMOUS UNDERWATER GLIDERS

Accurate ecosystem models and assessment of the marine carbon budget require an understanding of the physiological responses of phytoplankton to physical forcing, such as nutrient and light availability. However, phytoplankton physiology and photosynthesis are poorly sampled using traditional shipboard techniques over the relevant spatial/temporal scales. Here, we report the integration of a Fluorescence Induction and Relaxation (FIRe) sensor in a Slocum glider (FIRe glider), allowing autonomous high-resolution and vertically-resolved measurements of physiological variables together with physical oceanographic data, and assess the potential insights this technology can bring to the phytoplankton physiology scientific community. A key advantage of this integration is the ability to make in situ variable fluorescence measurements under ambient light, providing a better understanding of the physical controls of primary production. Several targeted missions were conducted in the West Antarctic Peninsula using the FIRe glider that documented physiological responses (e.g. photosynthetic efficiency, Fv/Fm) to light stress using fluorescence kinetics. Diel cycles collected showed a clear daily cycle dependent on the magnitude of incident radiation. Different photoacclimation regimes were observed and evaluated under varying mixed layer depths conditions by modeling the light saturation parameter, Ek, using the light – photosynthetic efficiency relationship. Incorporating the FIRe system on a glider platform provides a novel approach for addressing topics of persistent/outstanding uncertainty due to the variable temporal and spatial scales at which they operate, such as the role of vertical mixing in phytoplankton dynamics and physiology.

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