

OCEAN OPTICS XXIV

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<https://oceanopticsconference.org>

Friday, October 12

Plenary Session 5

10:00–10:40

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FURTHER STEPS TOWARDS A 4-DIMENSIONAL OCEAN COLOR FIELD FOR OCEAN BIOGEOCHEMISTRY AND CLIMATE STUDIES

Ocean color products are routinely used for the initialization, development and validation of regional to global scale ocean and climate models. In particular, novel satellite estimates of phytoplankton community composition and carbon cycle processes are commonly used to validate simulated marine ecosystem services related to global biogeochemical cycling and climate support. Yet, significant uncertainties remain with respect to the representation of biological and biogeochemical processes in climate models. Here, we discuss recent efforts to better constrain present and future marine ecosystem structure and biogeochemical function based on the analysis of satellite algorithms, mechanistic models, carbon biomass data and HPLC pigment concentrations, and presence-absence observations. We show that estimates of diatom biomass, NPP, silicate production and export differ substantially between observational data products, and that they are dependent on the ecological niche structure and seasonal dynamics of biomass-rich diatom species pertaining to multiple genera. We use species distribution models to extrapolate in situ observations of plankton biomass and diversity to the global scale, and ecological niche analysis to identify the physical and biogeochemical drivers of phyto- and zooplankton biogeography. We show that the habitat suitability patterns of thousands of phytoplankton species can be used to define marine ecoregions with distinct biogeochemical and physical properties, as well as biodiversity patterns, thus linking properties readily observable from space with biological in situ observations. We subsequently highlight challenges associated with the use of ocean color products in global climate applications, and discuss potential future avenues to improve and better integrate different data streams.

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