

Optical properties and remote sensing of coccolithophores: recent advances and selected applications.

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Abstract

Coccolithophores are a group of phytoplankton that form an exoskeleton of calcium carbonate scales called coccoliths. Found throughout the world ocean, coccolithophores are major contributors to pelagic calcification and play a crucial role in the ocean carbon cycle. In the temperate and subpolar oceans, coccolithophores form intense and vast blooms, covering hundreds of thousands square kilometers, which are easily observed from optical satellite sensors. In this talk, I will first give a brief overview of optical properties of coccolithophores and ocean colour remote sensing algorithms to quantify their calcite mass concentration. Next, I will present some selected applications of marine optics and remote sensing in coccolithophore ecology, biogeochemistry, and climate science. For example, I will show that coccolithophore blooms are expanding poleward at a remarkably fast pace due to climate change using long-term satellite observations of coccolithophore blooms and the physical environment. I will also demonstrate that coccolithophore blooms promote deep carbon export using a combination of ocean colour remote sensing and optical measurements on autonomous profiling floats of the Biogeochemical-Argo network.