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Thursday, October 11
Poster Session 4
10:30–12:00

Poster 180

SINKING CARBON ASSOCIATED WITH COCCOLITHOPHORE BLOOMS IN THE SUBPOLAR OCEANS FROM BIOGEOCHEMICAL-ARGO PROFILING FLOATS

Coccolithophores, calcifying phytoplankton, form extensive annual blooms in the Subpolar Oceans, producing large quantities of calcite in the surface ocean. They are thought to enhance the sinking of organic carbon to the deep ocean by increasing the density of organic particles, or by protecting the more labile organic carbon from degradation while sinking. Here, we investigated this so-called ballast hypothesis using optical measurements on Biogeochemical-Argo profiling floats in conjunction with remotely sensed calcite concentration from ocean color satellites. Based on a match-up analysis, we first developed an algorithm to identify coccolithophore blooms in the surface ocean and estimate their calcite concentration from floats using measurements of chlorophyll-a fluorescence and particulate backscattering and beam attenuation coefficients. Next, we examined (i) carbon fluxes at depth using existing optical sediment trap methods, (ii) their transfer efficiency, (iii) the sinking speed of particles, and (iv) changes in their bulk refractive index (obtained from the particle backscattering ratio) during sinking. Our results show that Biogeochemical-Argo floats successfully identified coccolithophore blooms and allowed a reliable estimation of associated calcite concentration. The floats captured well the seasonal signal of carbon export and transfer associated with coccolithophore blooms in the Subpolar Oceans. Further, our observations of increased refractive index of particles with increasing depth and over time provide support for the hypothesis that calcite protects organic carbon from degradation while sinking, thereby enhancing long-term storage of carbon in the deep ocean.

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