Monday, October 8
Oral Session 1
10:50–12:30

11:50–12:10

CONTRIBUTION OF PHYTOPLANKTON TO THE INHERENT OPTICAL PROPERTIES OF CASE I WATERS

A growing body of literature suggests that in the open ocean the contribution of phytoplankton (particularly in the large size fraction) to the particulate backscattering (bbp) and attenuation (cp) signals is larger than previously thought. If true, this contribution would partially explain the significant underestimate in backscattering of case I water observed by most optical models: the so-called "backscattering enigma". However, the quantification of the phytoplankton signal remains a challenge given the scarcity of concurrent measurements of optical properties and microscopy. Here, the contribution of phytoplankton to cp is assessed using the theoretical efficiency factors of particulate attenuation (Qc). Several approaches are taken to estimate the efficiency factor of bbp(Qbb) and by extension the contribution of phytoplankton to bbp. The cross-sectional area of the larger size fraction of phytoplankton (7-150um) is estimated with quantitative microscopy while the cross-sectional area of smaller cells (0.8-20um) is estimated with flow cytometry. The sizes, shapes, and species composition of phytoplankton are used to explain the variance observed in Qbb and Qc. More than 5.5 million images were collected from a continuous flow-through system at the surface of the North Atlantic Ocean during the autumn, winter, spring, and summer. Measurements encompassed a wide range of physical-chemical conditions and biogeochemical provinces, with surface chlorophyll concentrations varying from 0.04 to 4.6ug/L. More than half of the observations fall within the theoretical range of the absorption efficiency factor. The larger size fraction of phytoplankton accounts for 12 to 18% of cp and 4 to 15% of bbp.

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