Investigation of the optical backscattering to scattering ratio of marine particles in relation to their biogeochemical composition in the eastern English Channel and southern North Sea

Loisel, Hubert, Xavier Mériaux, Jean-François Berthon, Antoine Poteau

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ABSTRACT: The variability of the backscattering to scattering ratio of marine particles, $b_{bp} : b_p$, is examined from in situ measurements performed during the spring and early summer of 2004 in the eastern English Channel and southern North Sea. This area is characterized by a quasi-permanent background of mineral matter from direct inputs, or resuspension effects, and by relatively intense spring phytoplankton blooms (mainly diatoms and the prymnesiophyte *Phaeocystis globosa*). The $b_{bp} : b_p$ surface values range between 0.0024 and 0.0417, with a mean value of 0.0138 $\pm$ 0.0083. In order to interpret such a great variability, simultaneous water samples were collected for the biogeochemical characterization of the bulk suspended particle population. We show that the $b_{bp} : b_p$ variability is related to the composition of the particulate assemblage expressed by Chl *a*, the POC:SPM and POC: Chl *a* ratios, where Chl *a*, POC, and SPM are the concentrations of chlorophyll *a*, particulate organic carbon, and suspended particulate matter, respectively. Low $b_{bp} : b_p$ values are observed for a particle population dominated by low refractive index material such as phytoplankton, whereas high $b_{bp} : b_p$ values are generally observed in presence of relatively high concentration of inorganic particles. The amount of organic material (both living and nonliving, including phytoplankton) relative to phytoplankton has a strong (and sometimes the greatest) effect on the backscattering-to-scattering ratio. Assuming that phytoplankton and detritus have similar refractive index, this pattern is interpreted as resulting from changes in the particle size distribution as well as by aggregation of mineral and nonliving organic detrital material.