Optimization of continuous reflectance measurements in coastal waters

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The Baltic Sea is optically characterized by relatively clear waters rich in coloured dissolved organic matter (CDOM), seasonal phytoplankton blooms, and the influence of suspended sediments in near coastal areas and river plumes. Monitoring phytoplankton bloom development is of particular interest in terms of water quality and nutrient dynamics of this eutrophicated sea. Conventional monitoring is based on the analysis of phytoplankton by light microscopy, and automated transect monitoring of phytoplankton fluorescence from ships-of-opportunity e.g. within the Alg@line project.

We are currently investigating the potential for continuous reflectance measurements from ships of opportunity as a low cost, low-maintenance expansion of conventional water quality monitoring practises in the Baltic Sea, with special emphasis on the retrieval of phytoplankton biomass and related optical properties. Hyperspectral reflectance monitoring reveals the contribution of light absorbing and scattering substances to the upwelling light field, and provides a link between *in situ* measurements and basin scale (e.g., satellite imagery based) observations.

Avoiding low sun angles, sun glint, and removing the pollution of water leaving radiance by reflected skylight are prerequisite to succesful interpretation of *in situ* reflectance measurements. Data for fully overcast or fully clear skies and obtained under low wind pressure are then relatively easy to convert into a reflectance product. Data obtained under partly clouded skies, particularly in combination with non-flat seas, can normally not be used. Products of doubtful quality are, however, easily obtained even when following these restrictions. Using a large dataset of measurements obtained from the first auto-ranging shipborn reflectance sensor setup onboard R/V *Aranda*, we evaluate whether *in situ* water colour data can be improved using information contained in the transect data rather than strict point-by-point analysis. We also assess the added value of flowthrough instruments measuring absorption or fluorescence of optically active substances to restrict reflectance values in the blue and near-infrared parts of the spectrum.