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The influence of suspended matter on a water column correction approach for case 2 coastal waters on remote sensing data

T. Geisler (1), O. Oppelt (1), T. Heege (2), and I. Bartsch (3)

(1) Geographic Institute, Christian Albrecht Universität Kiel, Germany (geisler@geographie.uni-kiel.de), (2) EOMAP GmbH, Gilching, Germany (Heege@eomap.de), (3) Alfred-Wegener Institute for Polar and Marine Research, Bremerhaven, Germany (Inka.Bartsch@awi.de)

Hyperspectral remote sensing technologies are predestined for analyses and monitoring tasks of coastal and shallow water regions. These technologies enable a simultaneous monitoring of an area which is efficient as well as time and cost saving compared to conventional mapping methods. The existing potential of airborne hyperspectral data to detect and monitor sublitoral vegetation has been proven in previous studies which were carried out mainly in clear and shallow coastal water bodies. To analyze the range of its application and the limitations of this technique we carried out a research study in the turbid water body along the rocky shores of the island Helgoland (Germany). The basis for the mapping of benthic vegetation and sediment is the characterization of the water body which strongly influences the down- and upwelling irradiance. To quantify the spectral response of the benthic areas, a water column correction is essential as the atmospheric correction.

To provide hyperspectral data, a flight campaign has been carried out in 2010 using an AISAeagle instrument (420 to 900 nm with a sampling rate of 2 nm). In situ measurements were taken simultaneously to validate the AISAeagle data. RAMSES data and water constituent's analysis (suspended matter, phytoplankton, yellow substances and optical depth) as well as terrestrial reference measurements were carried out to provide a basis for the application of the water column correction.

We present the procedure of the applied atmospheric correction as well as a water column unmixing using the modular inversion module (MIP) and classification approach. Special attention was laid to the water column correction: here, scattering and absorbing processes due to varying amounts of water constituents such as suspended sediments, salinity, nutrients, phytoplankton and yellow substance strongly influence the subsurface irradiation conditions. These components have to be quantified with their three dimensional distribution. Special focus had to be set on the concentrations of suspended sediments, because shallow waters in coastal regions contain high amounts of suspended sediments due to river inflow (i.e. river Elbe) and coastal erosion processes.