

IMAGING SPECTROSCOPY AND INTEGRATED COASTAL ZONE MANAGEMENT, A PROMISING MARRIAGE

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This abstract provides a brief overview of the coastal and marine applications under development in Vito. Since four years Vito uses airborne hyperspectral remote sensing, occasionally combined with complementary techniques, to study coastal systems in the broad sense of the word. The journey started in 2000 when the Flemish administration of Waterways and Seaways wanted to upgrade its beach monitoring techniques. A cost-efficient monitoring strategy that allowed the regular follow-up of the sandy beaches along the Belgian coast, which are known to be highly prone to erosion, was needed. Airborne hyperspectral imagery (CASI) allowed us to make maps of the different sand types occurring along the coastline. Because of this the beach nourishment zones could be mapped accurately and the erosion and spread-out of the nourished sand volumes became visible. Airborne laser altimetry was used to make DTM's of the beach and regular observations resulted in erosion/sedimentation maps. The combination of sand class maps and erosion maps proved to be very suited to follow up the processes responsible for beach morphodynamics.

In the Westerschelde Estuary HYMAP has been deployed to characterize the main intertidal sediment habitat types. In a novel approach, it is attempted to visualize the spatial coverage of each material-of-interest, but also to quantify how each parameter changes in time during the course of a low tide. Synoptic ground-truth measurements are used together with spectral analysis techniques in order to produce maps of the main materials of interest. These are pigment content, sediment grain size and water content.

Closely in line with these two projects a vegetation map of the dunes is being made starting from AISA-EAGLE data. Here the aim is twofold; biologists ask for a detailed vegetation map with as many vegetation classes as possible (if possible individual species, if not, plant associations). The higher mentioned administration on the other hand is asking for a map which indicates the degree of fixation of the dunes. Hence, the vegetation is grouped into classes that represent a certain fixation level. This is important information with respect to seawall protection.

A second biological project focuses on coral reef communities in Indonesia. The aim of this project is not only to map the coral reef environment but also to identify the reefs that are most threatened. In order to study the spectral discrimination of reef substrates we intend to follow a physical-based approach based on a combination of field measurements to build a comprehensive library of spectral signatures of the benthic substrates and model simulations to see how the water column and the atmosphere influence the benthic spectral signature.

This brings us to the question of atmospheric correction above water bodies. Atmospheric correction is essential for adequate extraction of water quality information from remotely sensed data. The effect of scattering and absorption by the atmosphere can be substantial. Due to the high absorption and transmission of water bodies the reflected radiation level is low compared to land. To extract this small signal from a much greater base of other radiance a very accurate atmospheric correction algorithm is required. Therefore a specific atmospheric correction, WATCOR, has been developed to account for the marine atmospheric conditions as well as the air-water interface.

With the help of WATCOR CASI data acquired from the Belgian coastal waters are corrected. Subsequently, water quality maps showing the ranges of chlorophyll and suspended matter content in the Southern North Sea are made by inversion of a bio-optical model using a set of Specific Inherent Optical Properties (SIOP's) measured in-situ.