



## PROJECT INFORMATION

# ESA VALUE ADDING ELEMENT MONITORING OF INTERTIDAL FLATS

Intertidal flats are ecologically and economically of very high importance. Monitoring methods are in place to assess the status of this ecosystem. However, these are limited by the difficulty to access the area and high costs of field campaigns. Therefore, utilisation of remote sensing techniques can provide additional valuable information about this highly dynamic system. Techniques for classification of remote sensing data of intertidal flats have been developed at Brockmann Consult during the past 8 years in national and international projects, namely the EU projects BIOPTIS (1998-2001) and HIMOM (2002-2004), the national projects OFEW (2005-2007) and DeMarine Environment (running since 2008). A standardised method has been developed in these projects dealing with the classification of the intertidal flat surfaces using remote sensing data. The close interaction with the users in all projects enables the development of products and services dedicated to serving the requirements of end users, especially in respect to the reporting duties for TMAP, WFD and Natura 2000.

### VAE – Monitoring of Intertidal Flats

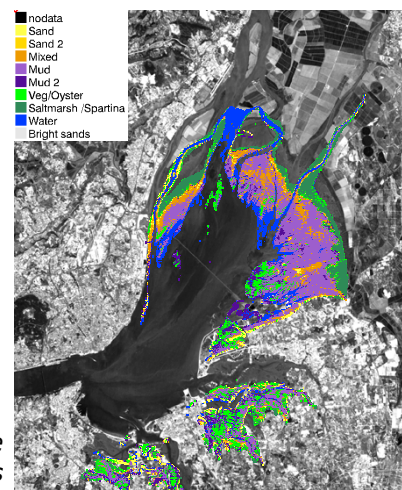
The Value Adding Element Programme of the European Space Agency focuses on the needs of the Earth Observation service industry to address new and evolving market opportunities. This programme gives us the opportunity to transfer the method developed in former projects to other test sites, raise its technical robustness to an operational status and enlarge the awareness for the potential of remote sensing for intertidal flats. Users will be involved closely in the product specification as well as in the validation and assessment of the quality of the products and services.

### The main subjects of the project are:

- Study the international market for monitoring of intertidal flats; collect requirements and identify market opportunities
- Develop the classification beyond the current state in order to adapt it to other regions. This will be tested at the example of the Portuguese Tagus Estuary. This step requires collection of in-situ data for calibration of the algorithms and for validation.
- Validate the classification maps and assess their quality by the users. This is the most critical step of the project and key to sustainable success.
- Present the service to additional stakeholders of international intertidal flats.



Left: Tagus Estuary; 11.07.2009  
Original data source: Landsat 5 TM,  
USGS © 2009



Right: Classification map of the  
intertidal flats of the Tagus  
Estuary 11.07.2009

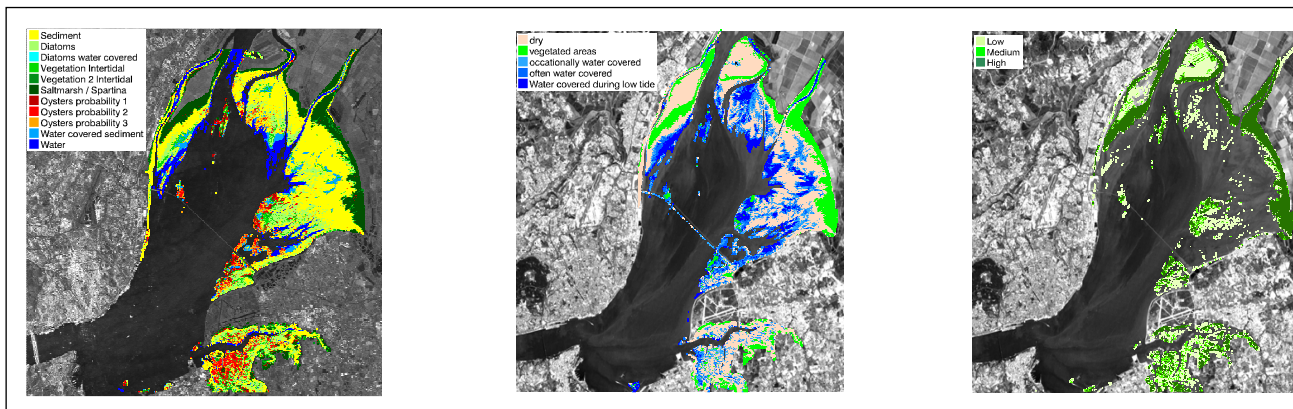
## VALUE ADDING OF REMOTE SENSING DATA FOR INTERTIDAL FLATS

Different remote sensing techniques are used for the characterisation of intertidal flats. On the one hand, optical remote sensing or Earth Observation data provide information about the spectral reflectance of the different surface types such as different sediment types (sand, mud), mussel or oyster beds, sea grass or macro algae. On the other hand, radar techniques are used to gain information about the surface roughness of the different areas. The surface roughness is caused e.g. by ripples of sandy areas or oysters building their beds on the tidal flats. Beside these two remote sensing techniques, we include the knowledge of a tidal flat area by defining probabilities for different surface types to occur on certain regions. The figure below gives an overview on the input parameters.

Each surface type has characteristic properties that can be detected by optical / radar remote sensing or by determined by the steadiness of their appearance. Thus, the combination of all three data sources enables a classification of the flats covering a large area.

However, not all parameters needed for an assessment of the status of intertidal flats can be obtained by this method. Therefore, the combination of detailed information gained from selected in-situ stations and the spatial information available from remote sensing data will give a most complete image of the whole system.

*Products derived from Earth Observation data*  
*a – Classification of oyster beds and vegetation*  
*b – Water coverage map*  
*c – Frequency of vegetation coverage*



## INVOLVEMENT OF USERS

### Market Analysis

In order to gain an overview on a wide range of user requirements, stakeholders of intertidal flats of different intertidal flat regions (e.g. Germany, Portuguese, The Netherlands, UK) as well as international organisations such as the Common Wadden Sea Secretariat or RAMSAR have been contacted. The following key questions have been addressed to the users:

- What is the current practice for monitoring intertidal flats in the respective country?
- What are the limitations of these practices?
- What role plays remote sensing in your current and future practices?
- What are the market opportunities for the proposed method in the respective country?

Afterwards, the requirements were compiled for a requirement study and a market analysis.

### Validation

A validation of the results was performed by comparison with in-situ data acquired during the project lifetime and by a verification of the classification by visiting selected locations boat. A validation report summarises the validation results and could be made available. The results will be presented to stakeholders in order to retrieve further feedback on the products and their quality.

### Service Assessment

During a trial service several satellite products have been classified and different information products could be received. Users now have to assess about the usefulness of the products for their future work and if and how it would be possible to include the products into their operational monitoring programmes.