

Classification of Mussel Beds in Dutch Wadden Sea using high resolution WorldView-2 satellite data

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Introduction

The DELTA programme on protection of the Dutch coast has been recently established. Important natural features of the Wadden Sea are oyster/mussel beds reducing wave's energy.

WorldView-2 high resolution satellite images are able to provide specific details in 2.5 meters in multi-spectral and 60 sm in panchromatic bands.

The objective of the study

The inventory of the subtidal mussel/oyster beds is required, as mussel/oyster beds are important biogenic structures in Building with Nature. It is assumed that they can play an important role in retaining sediment and therefore in counteracting sediment erosion.

The remote sensing in this case can serve as indispensable tool, providing full coverage over Wadden Sea from the space, combined with cost-effectiveness of the data.

Results

Results: Mussel beds detection and classification

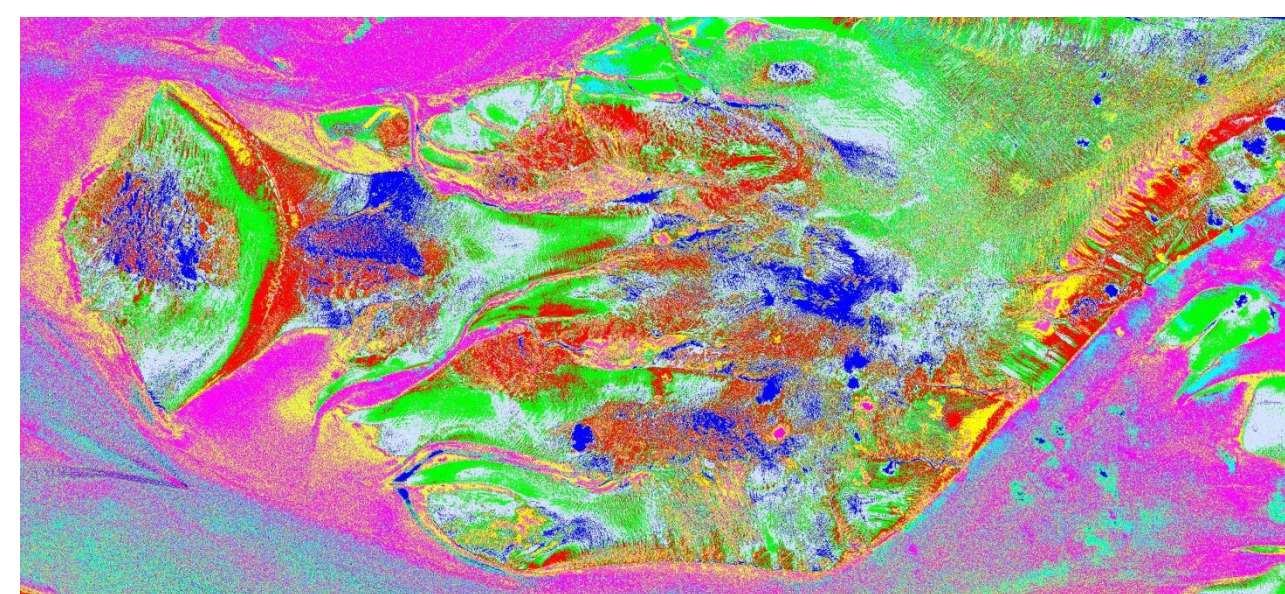


Figure 1- Supervised classification on mussel beds (blue color) Lauwersoog area. Image July 21, 2006.

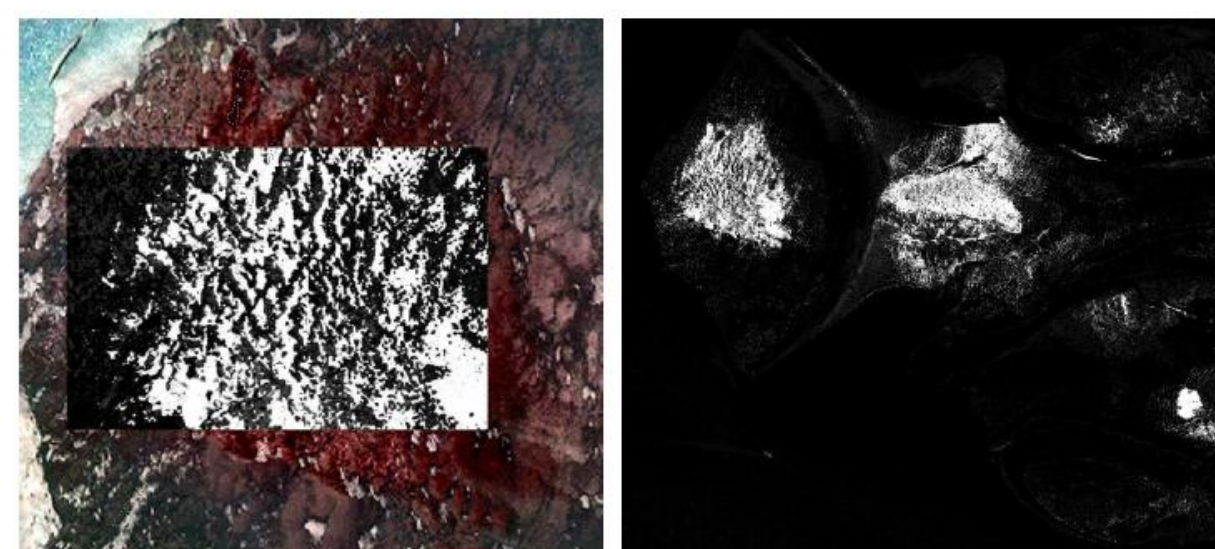


Figure 2- Object oriented classification of mussel beds, image July 21, 2006. Mussel bed around Schiermonnikoog.

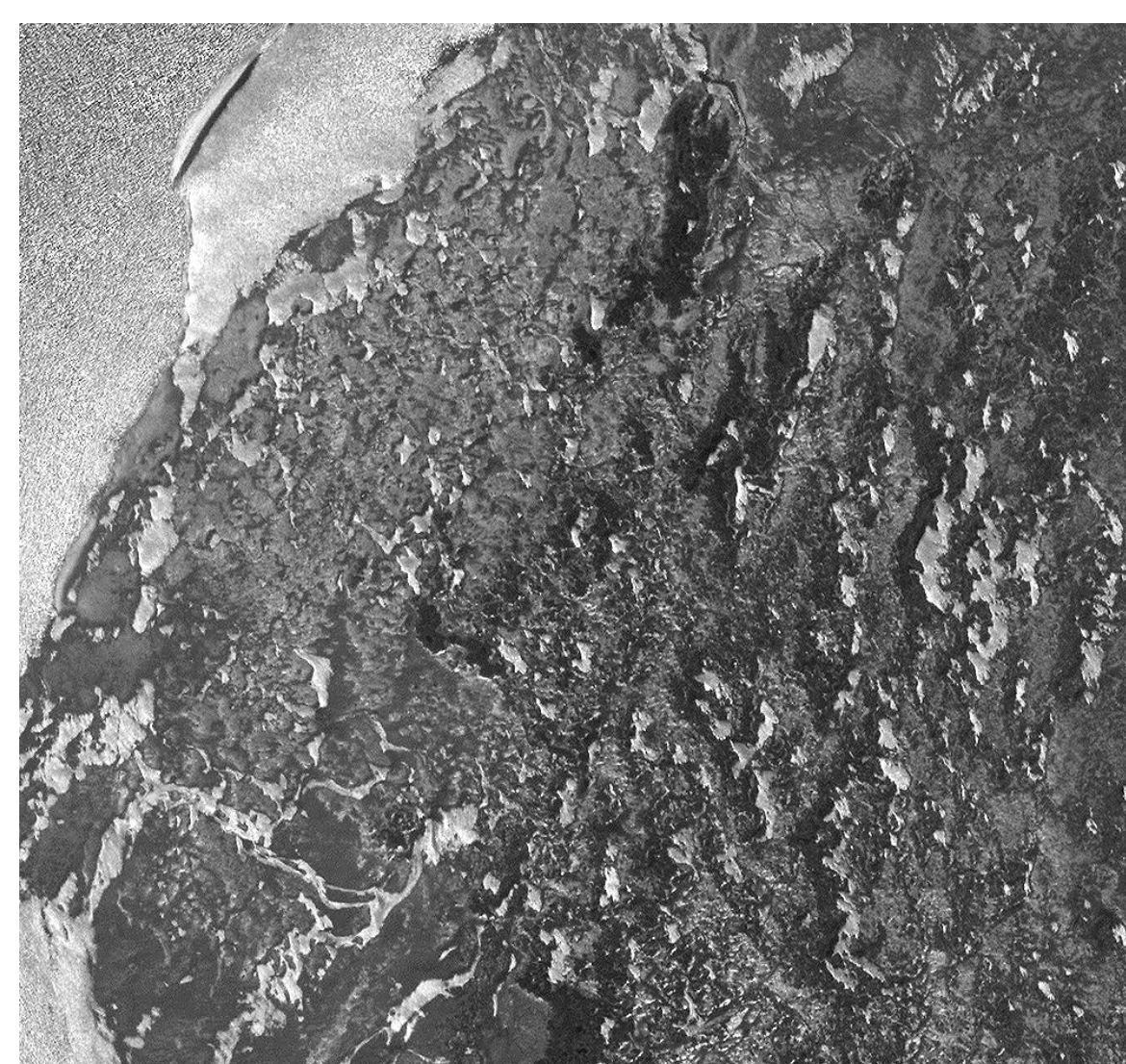


Figure 3- Mussel beds on panchromatic image in 60 sm, image July 21, 2006. Mussel bed around Schiermonnikoog.

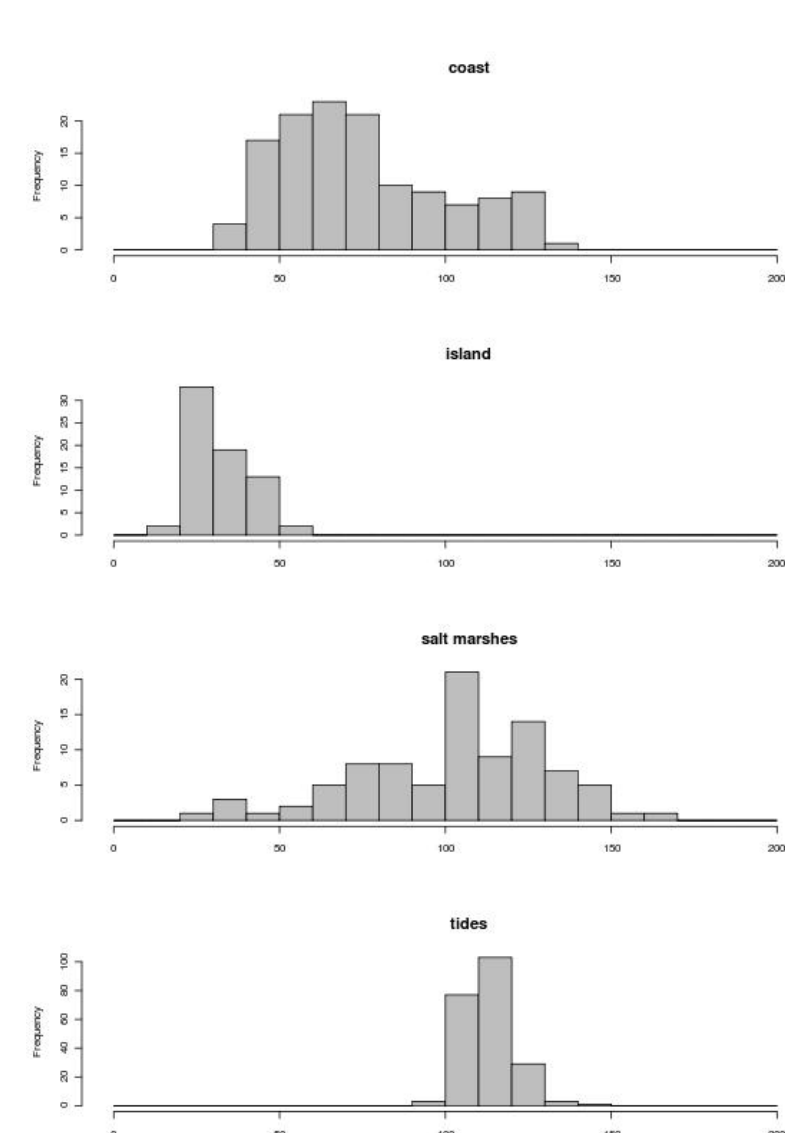


Figure 4 Statistical analysis. Overlapping reflectance of salt marshes, coastal land and dry tidal flats.

1. Detection of mussel beds are clear in images in low tide. The mussel beds are distinct from surrounding sediments, due to differences in surface structure and appearance.
2. Panchromatic information in 60 sm able to provide high precision of details in mussel beds.

Results: Sediments classification

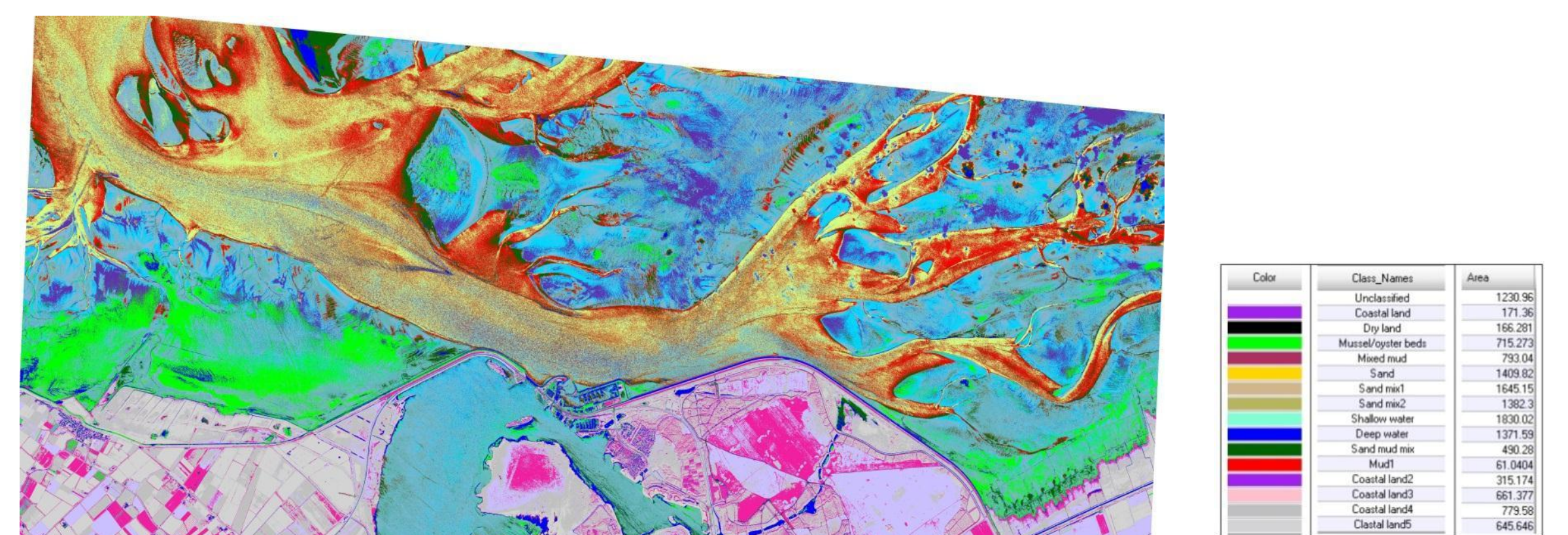


Figure 4 -Sediments classification on 4 bands. Mussels and areas covered by algae are appeared similar. Lauwersoog area. Image July 21, 2006.

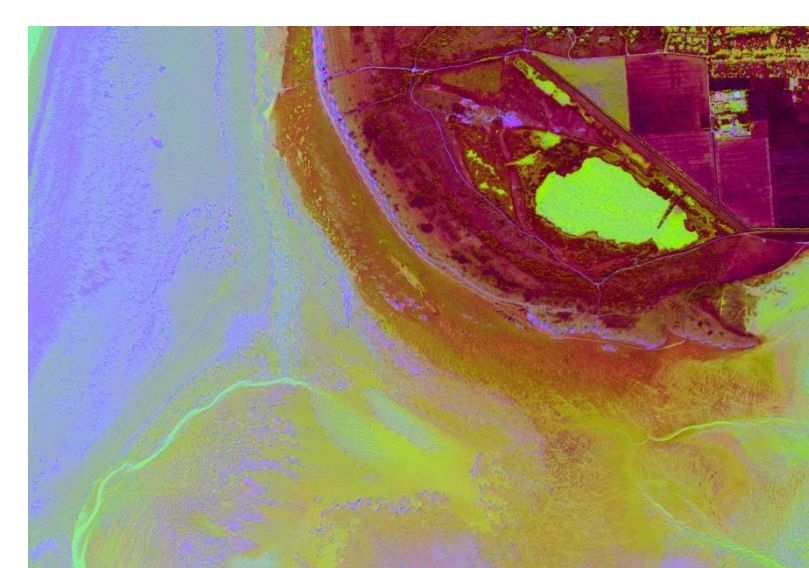


Figure 5 Differences in sediments type, Principal components PCA image, June 30, 2011. Schiermonnikoog.

Results: Coastal defence, changes on the coast

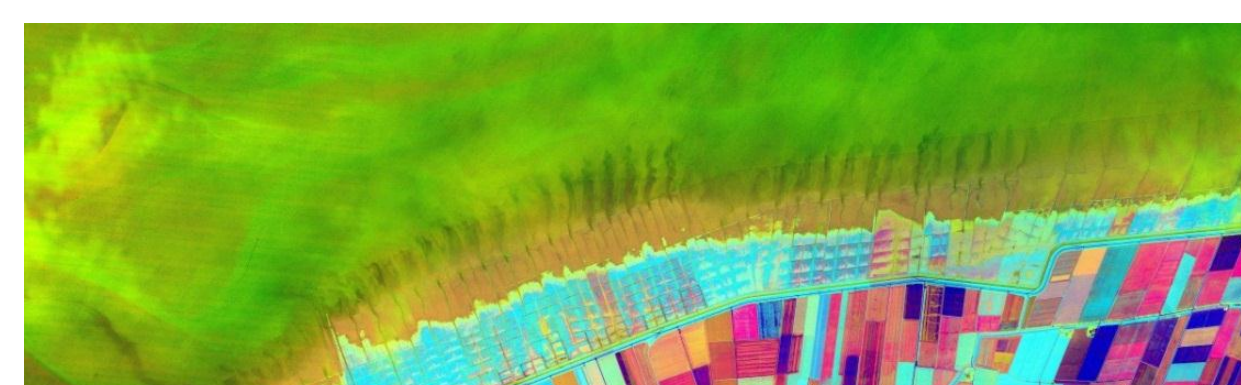


Figure 6 Image July 21, 2006. Lauwersoog area. Changes in soil type

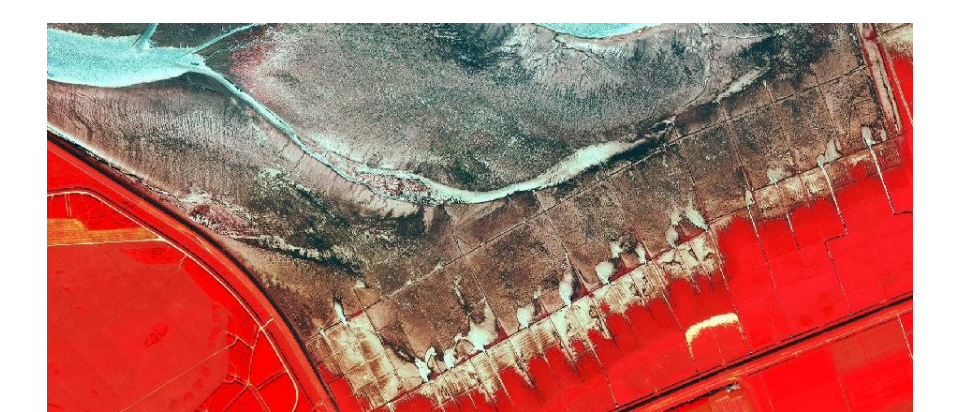


Figure 7 Image July 21, 2006. Coast of Lauwersoog area. Mud accumulation

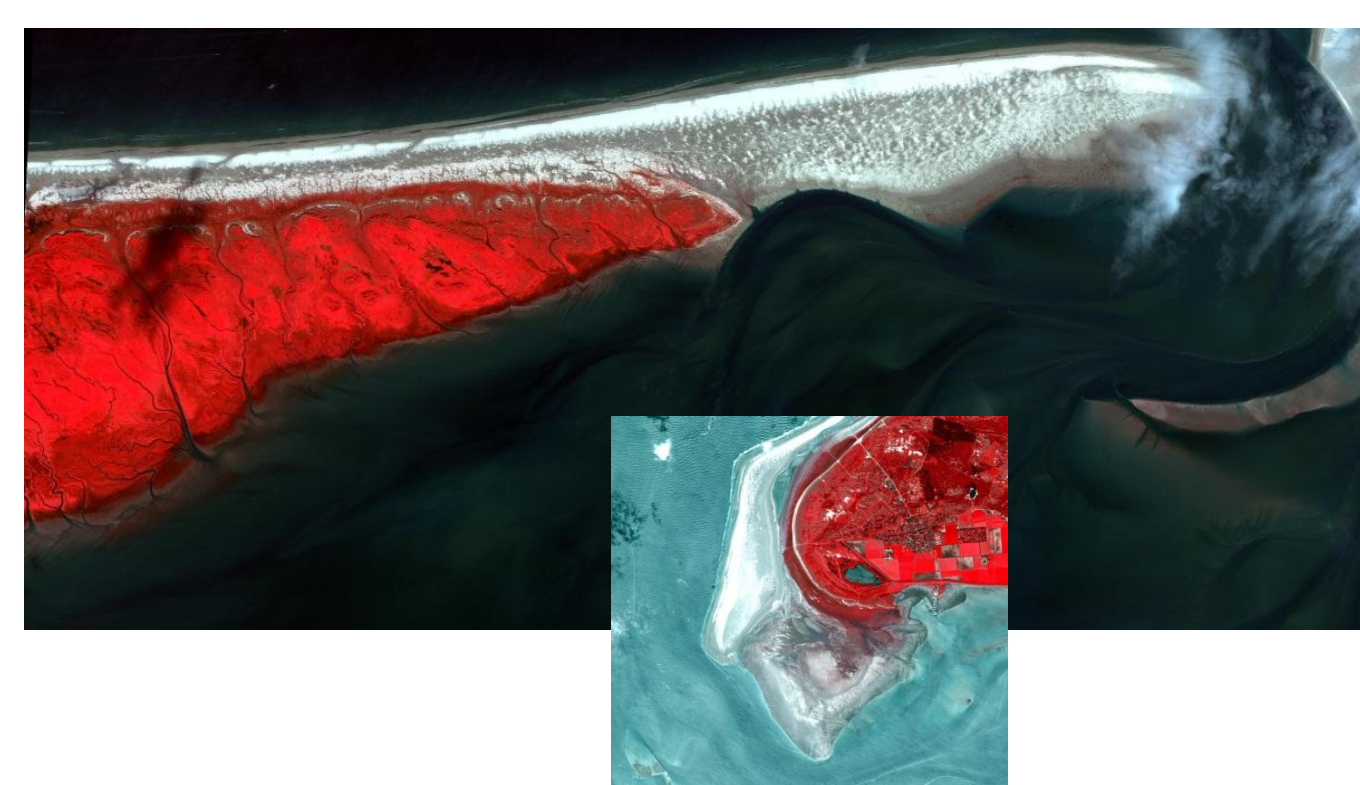


Figure 8 Image September 26, 2011 (top). June 30, 2011. Changes on coast, Schiermonnikoog.

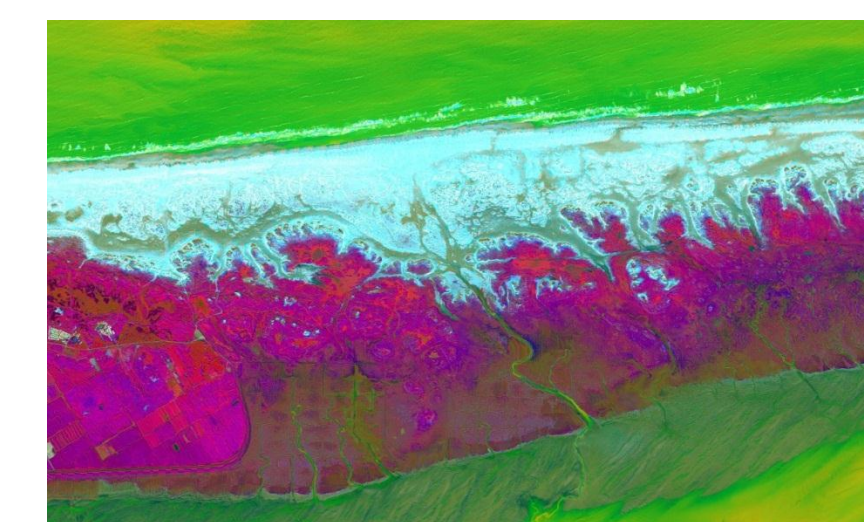


Figure 9- Image March 24, 2011. Intrusion of salt marshes, coast of Juist island, Germany.

Conclusion

1. The availability of low tide AND cloud free data is problematic for optical images.
2. The detection of mussel beds on low tide images using WorldView-2 images can provide high levels of detail and accuracy.
3. High resolution data is useful in mussel beds detection and change monitoring for coastal defence.