

Airborne remote sensing activities over the North Sea

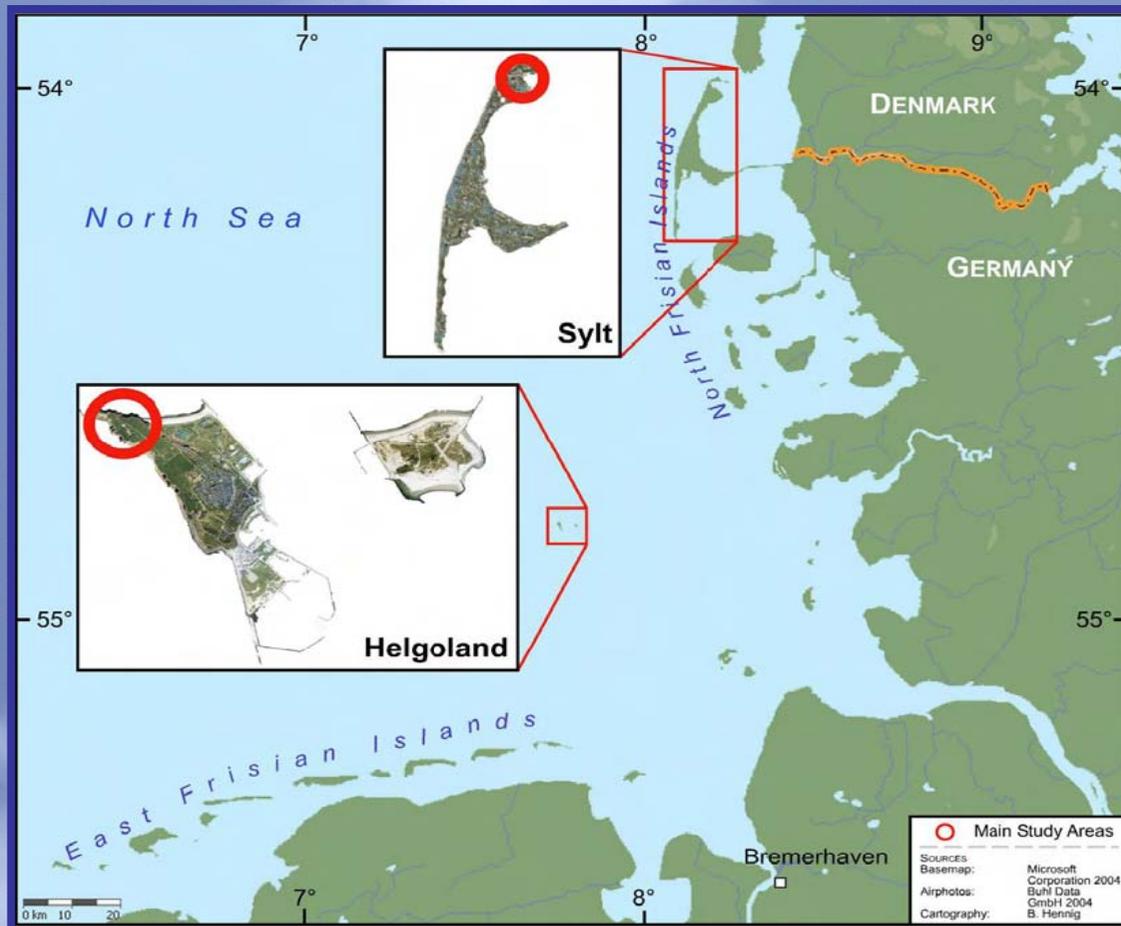
Inka Bartsch¹ and H. Christian Hass²

Alfred Wegener Institute for Polar and Marine Research

¹Am Handelshafen 12, 27570 Bremerhaven, Germany

²Wadden Sea Research Station, Hafenstr. 43, 25992 List/Sylt,
Germany

The investigation areas over the North Sea



July 2002:

- first ROSIS test flight at Helgoland

Sept. 2003:

- 2nd ROSIS flight Helgoland and Sylt
- spatially high resolution stereo pictures

Goals and Methods



Goals:

- Long-term monitoring of spatio-temporal dynamics of macroalgal dominated communities and tidal basins
- Recognition and evaluation of change at level of major biotopes and for processes that affect the Wadden Sea

Application:

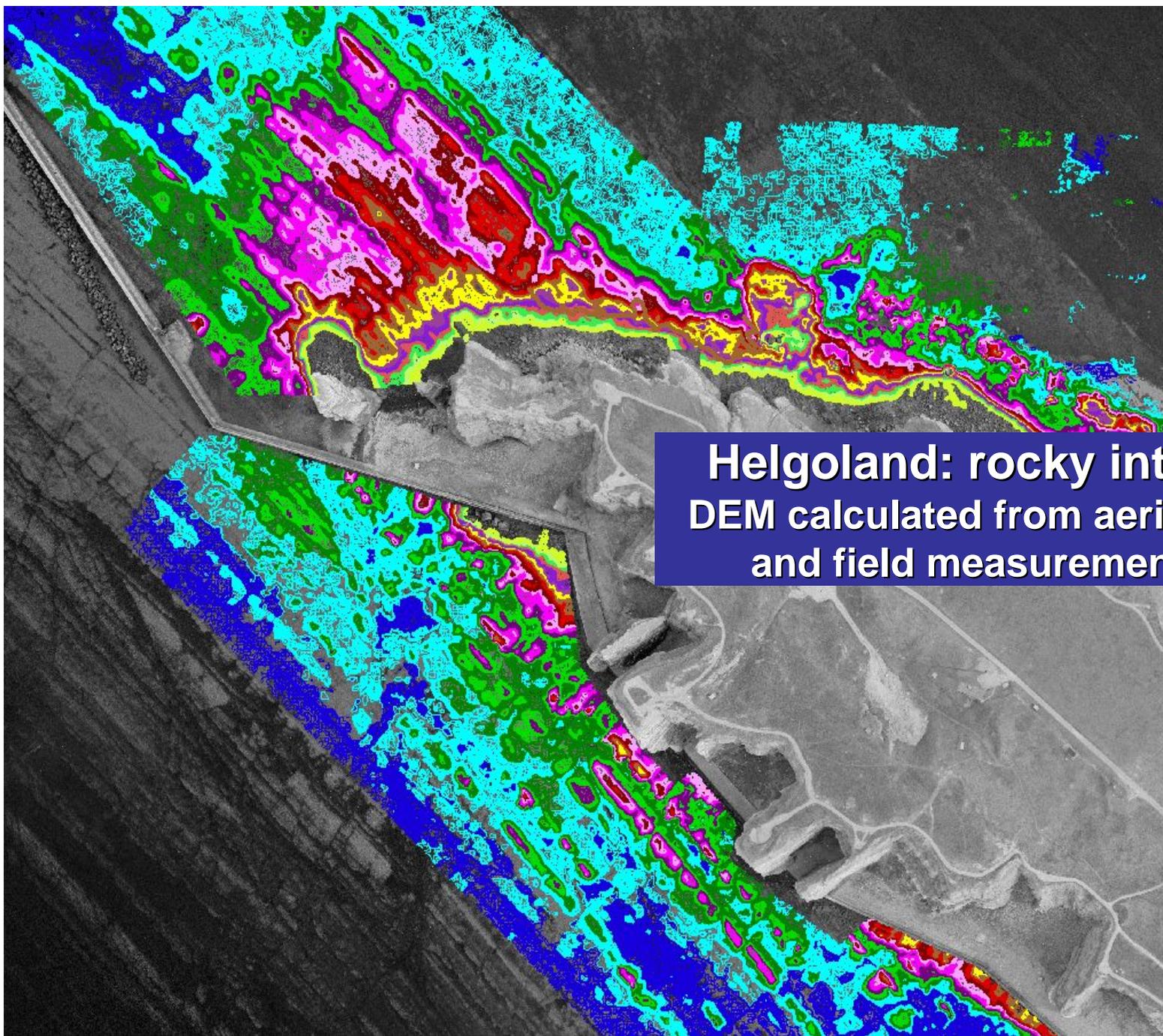
- e.g. EU-water frame work directive, North Sea Status Report



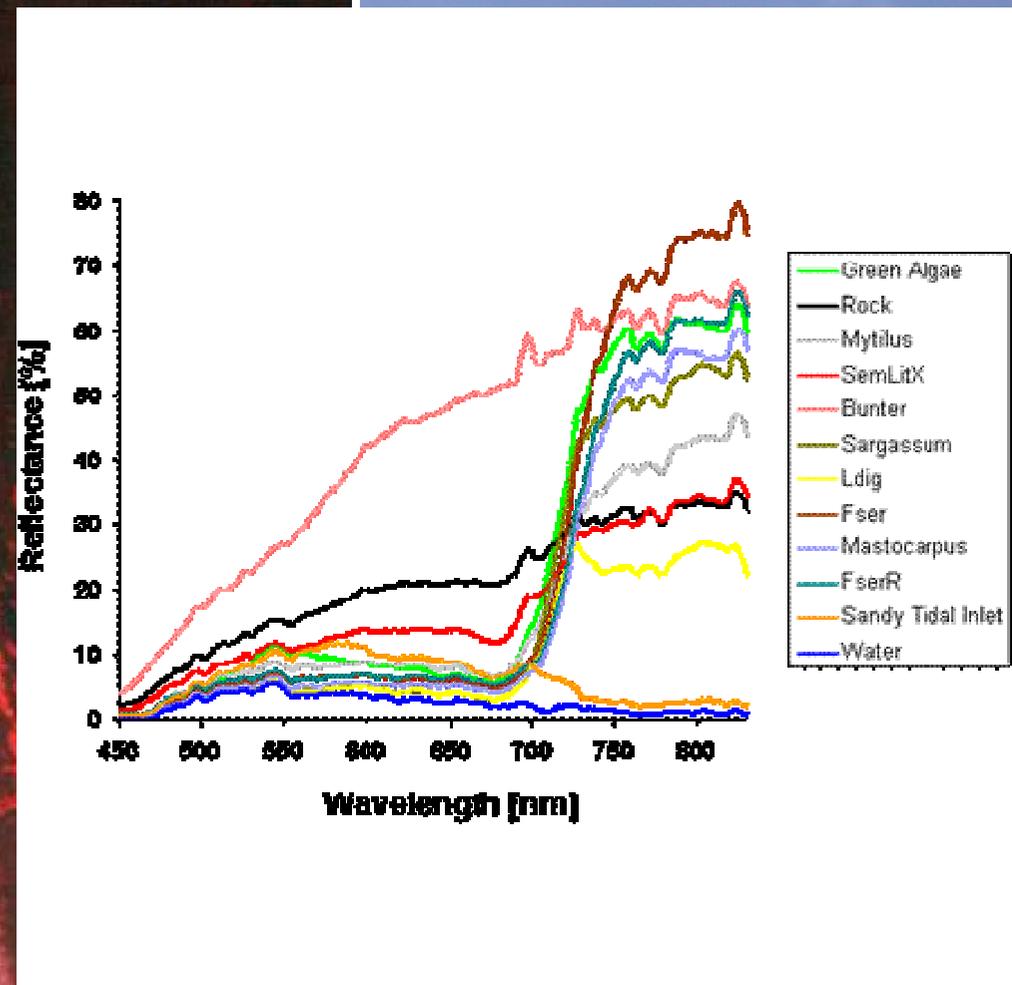
Methods:

- Mapping of biotopes, habitats, morphodynamics and sediments in target areas
- GIS techniques
- High-resolution aerial photograph mosaics
- Hyperspectral airborne images and their classification
- Ground-truthing in the field

Background: Working area is relatively small, but partially not accessible by boat or on foot → Time series not achievable without remote sensing



Uncorrected
ROSIS scene
Helgoland,
infrared spectrum

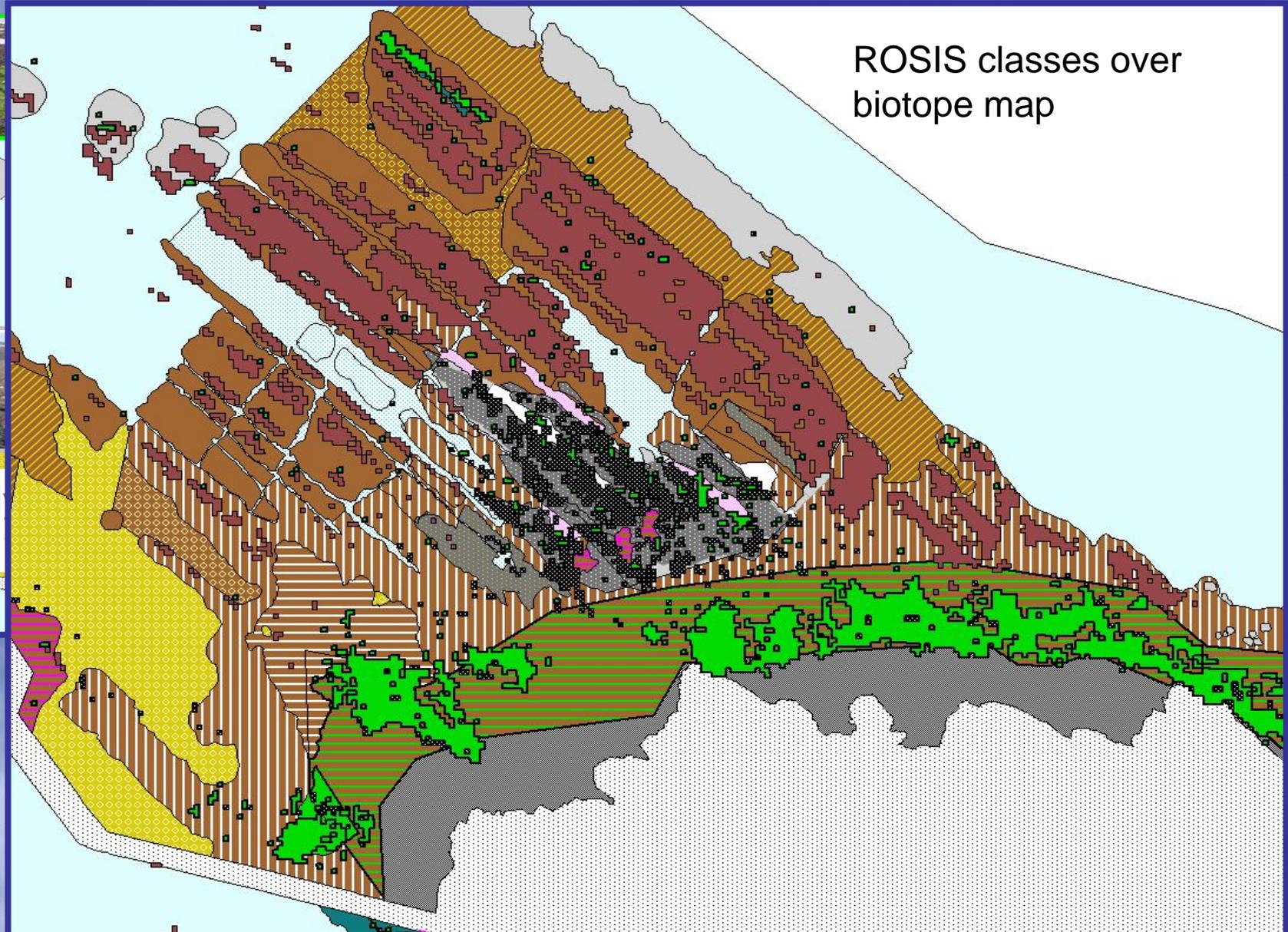


ROSIS: Reflective Optics System Imaging Spectrometer
Pixel resolution: 84x84 cm, hyperspectral: > 100 channels, band widths 4 nm, 430-860 nm

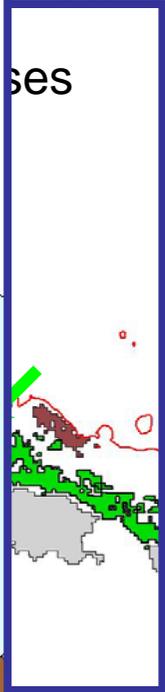
Biotope classification with ROSIS, Helgoland

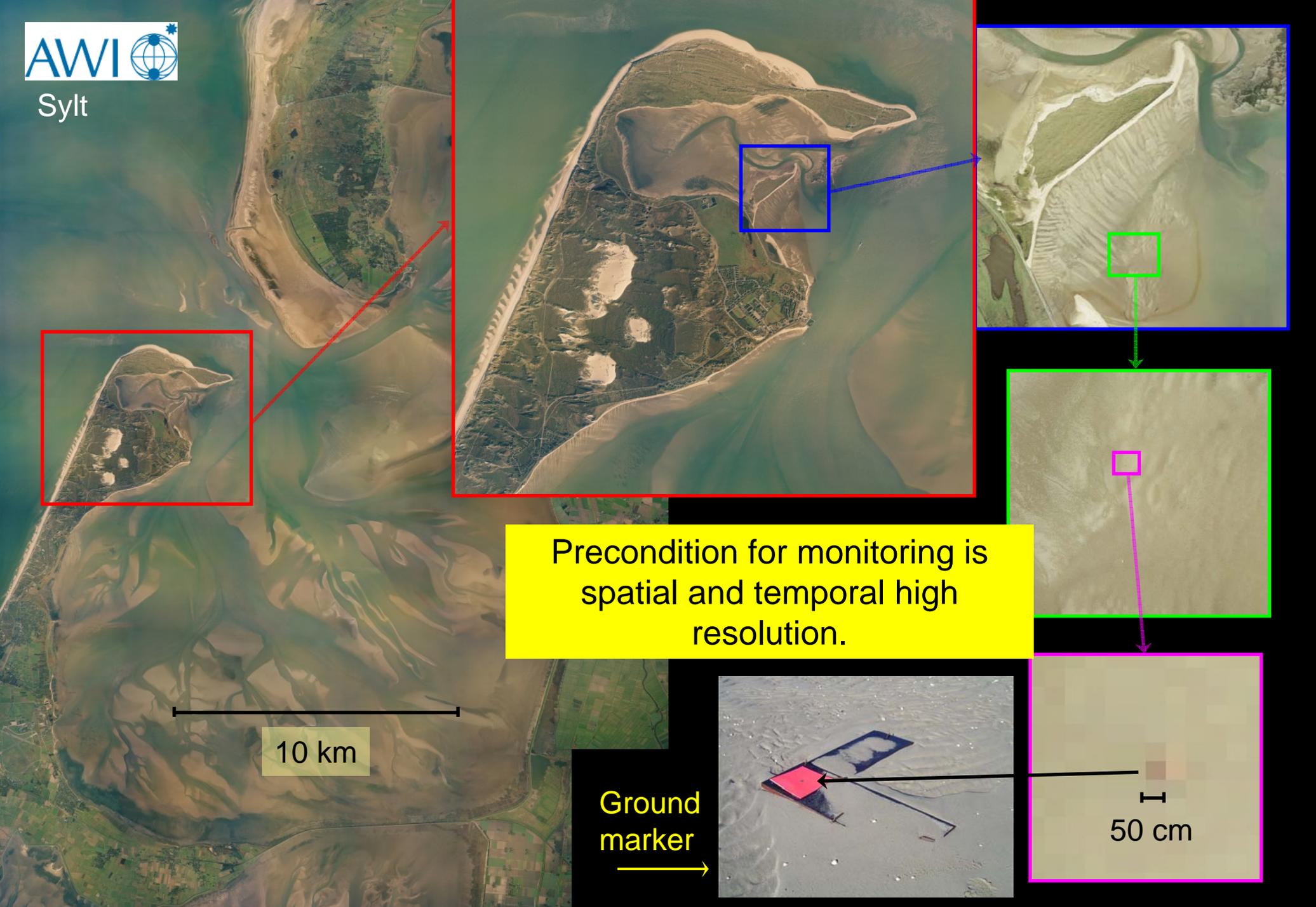


Sparsel
mussel



ROSIS classes over
biotope map



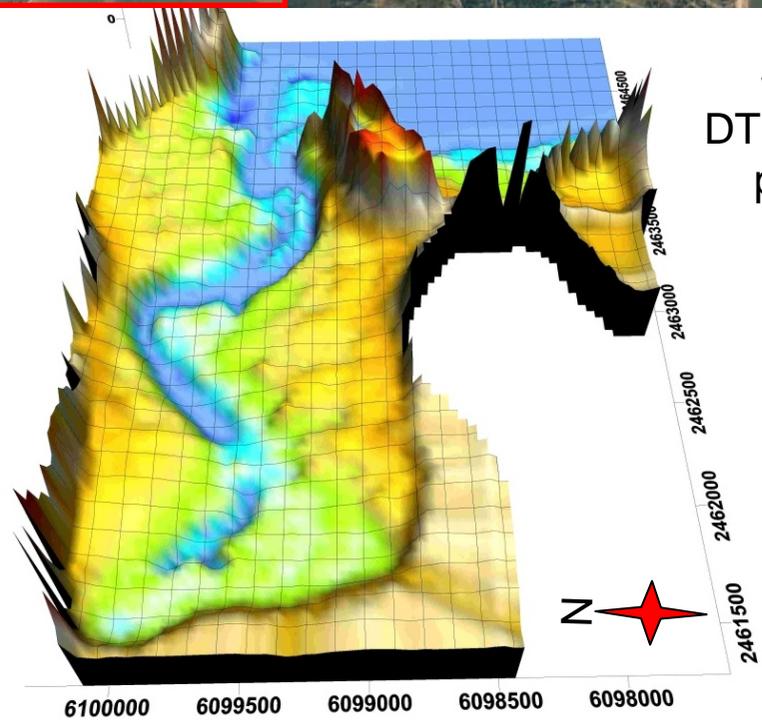
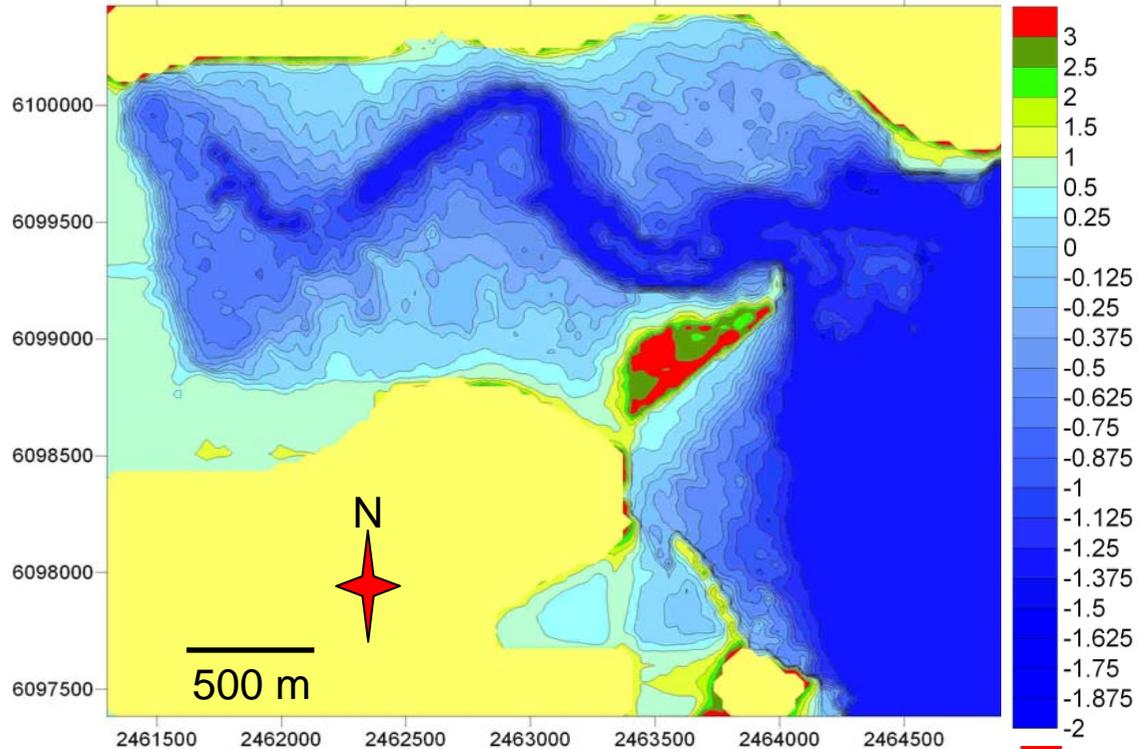


Precondition for monitoring is spatial and temporal high resolution.

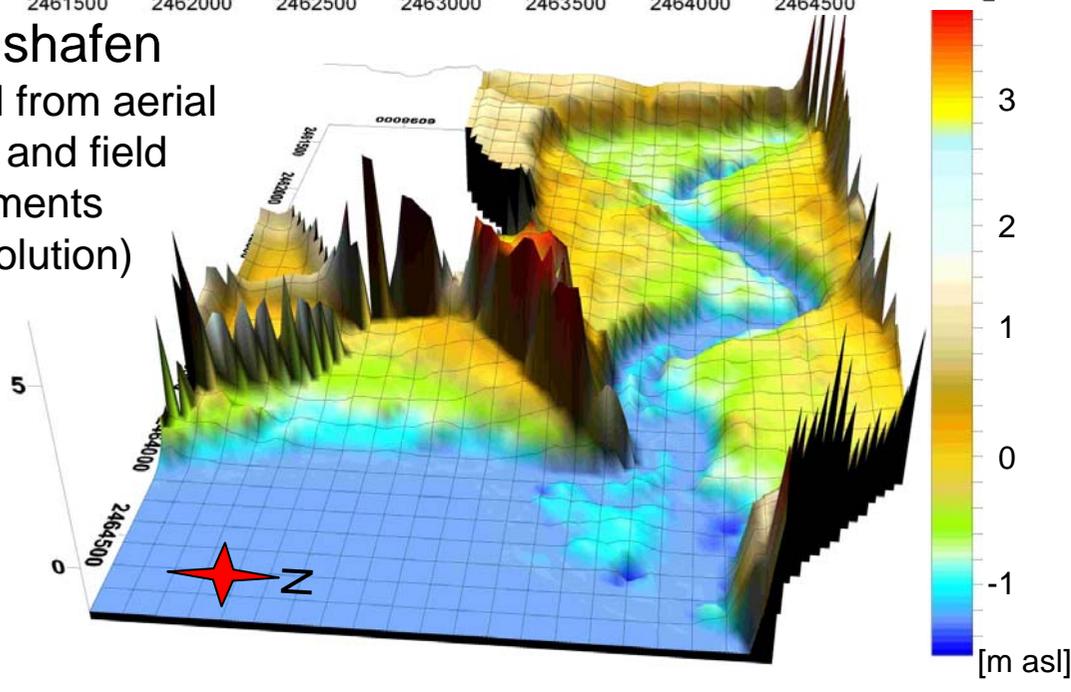
10 km

Ground marker
→

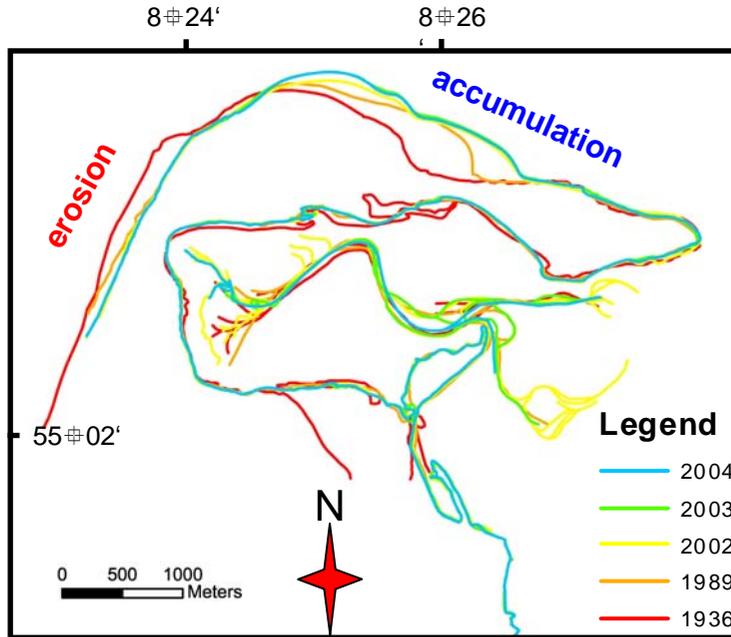
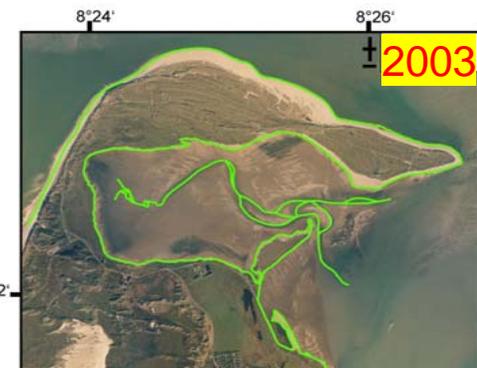
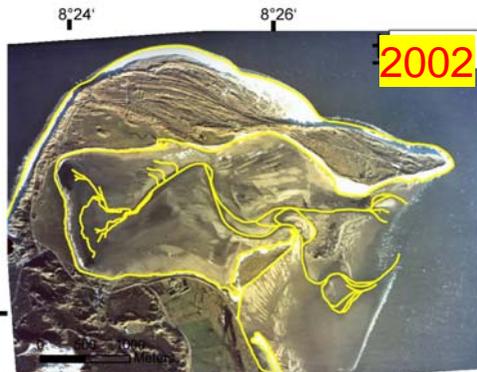
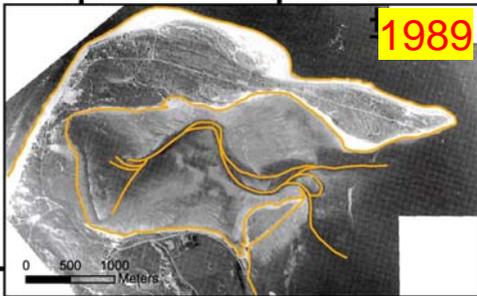
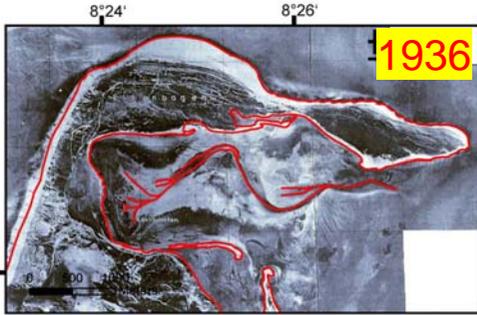
50 cm



Sylt Königshafen
DTM calculated from aerial
photographs and field
measurements
(50 cm resolution)



North Sylt: morphodynamics



Coastline

West coast: **erosion**

- 1936 - 1986: 2.5 m/y (=124.2 m)
- 1986 - 2004: 1.3 m/y (=23.6 m)

North coast: **accumulation**

- 1936 - 1986: 2.4 m/y (=119.7 m)
- 1986 - 2004: 6.9 m/y (=123.3 m); (more accumulation due to beach nourishments)

Königshafen: **balanced**

- Little effect, however balance slightly negative

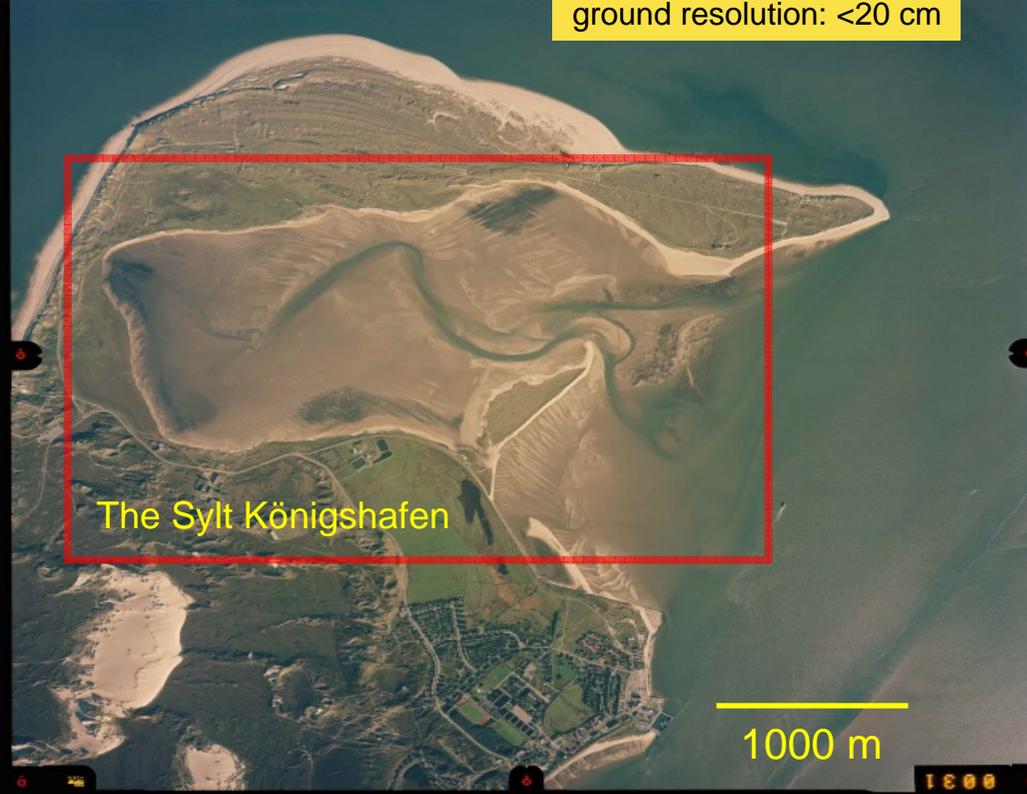
Tidal Channels

- no exceptional effects

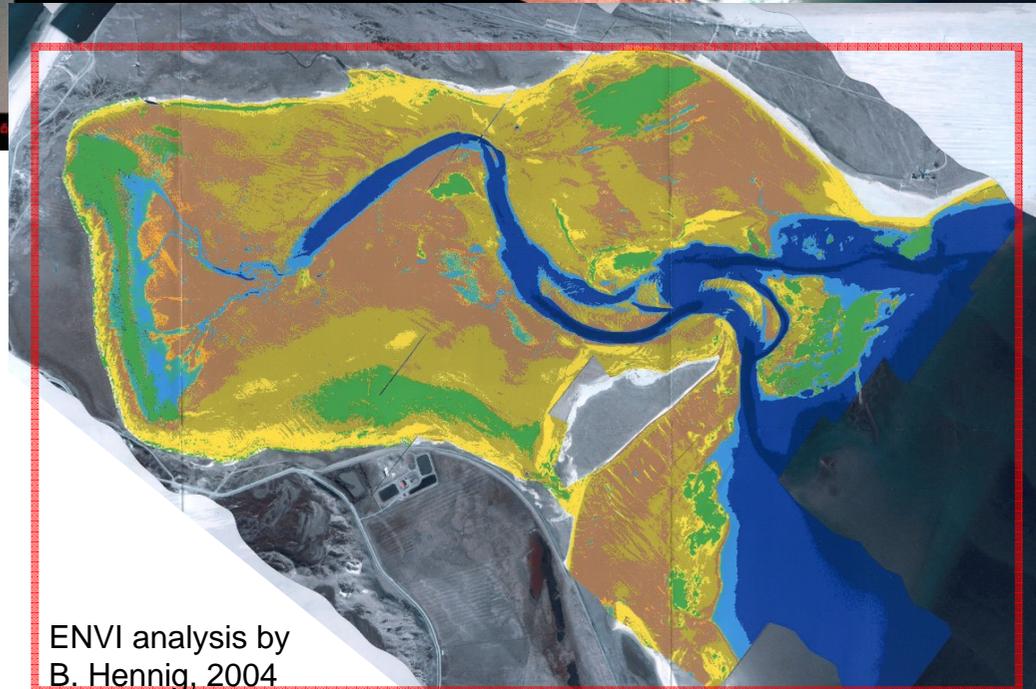
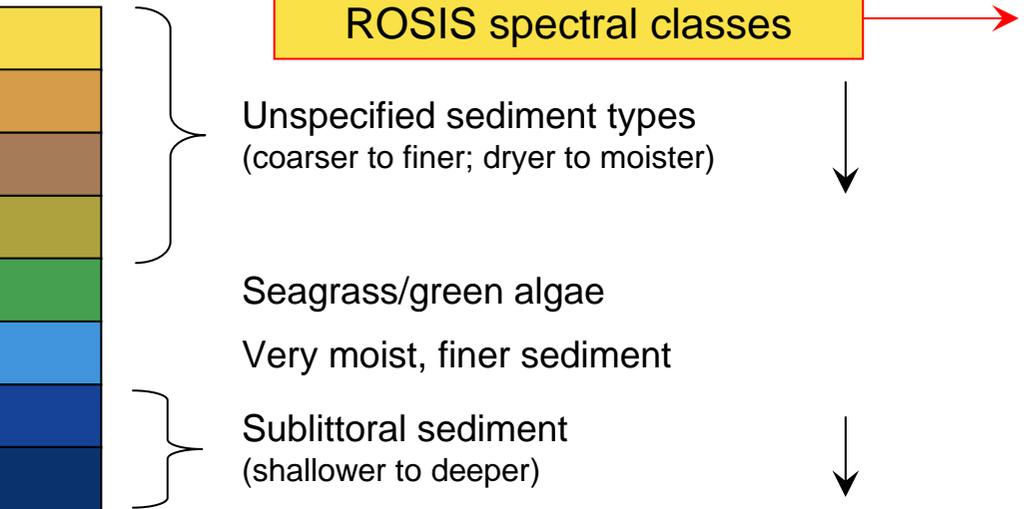
Human Impact

- the artificial island Uthörn built in the early 1940s
- a dyke built in 1937 changed the coastline considerably but had only little effect on the adjacent tidal basin

Color negative
ground resolution: <20 cm



Reflective Optics System Imaging Spectrometer
hyperspectral, ground resolution: 84 cm, 84 optical channels



Outlook

- **Hypersepctral classification has to be improved by a combination of field, laboratory and sensor spectrometry**
- **Combination of different sensors desireable in order to improve spatial and spectral high resolution**
- **Only several flights per year covering all seasons will give a holistic picture of the dynamics of coastal morphology and the spatial development of major biotopes →looking forward to the UAV**

Thanks are also due to

T. Dolch, AWI Sylt

B. Hennig, University Cologne

S. Thiemann, DLR Oberpfaffenhofen

J. Weber, LVA Schleswig Holstein

Th. Kersten, HAW- Hamburg

