

Airborne remote sensing activities over the North Sea

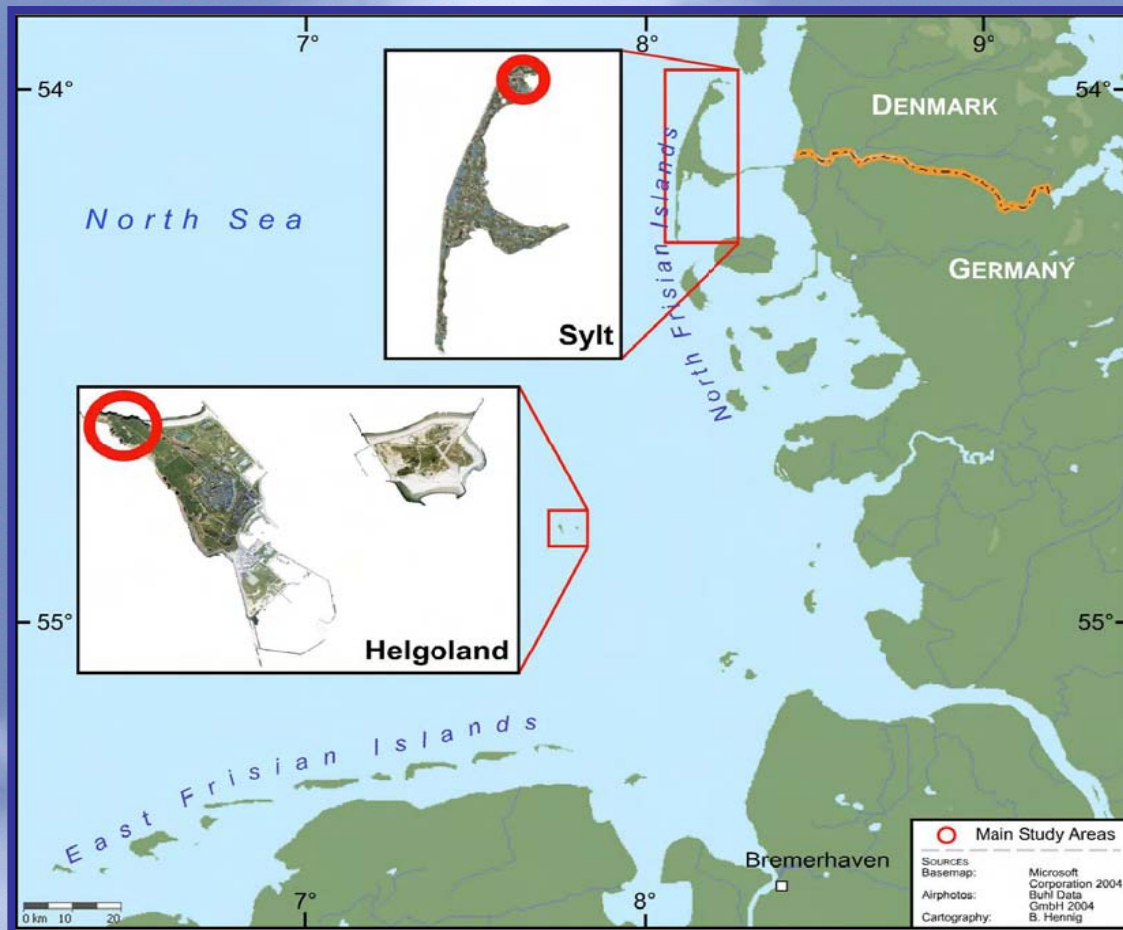
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The investigation areas over the North Sea



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

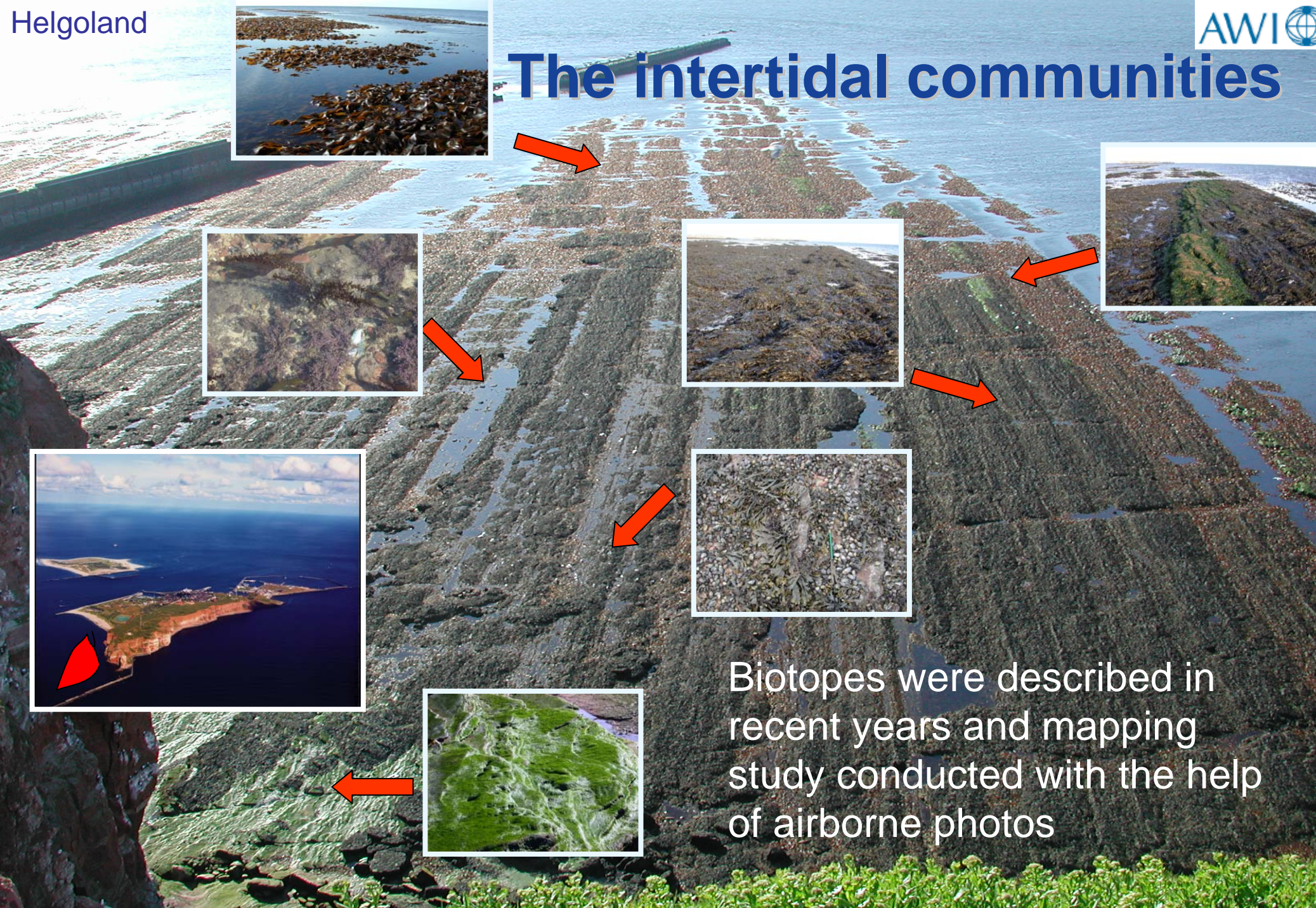
Methods:

- 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

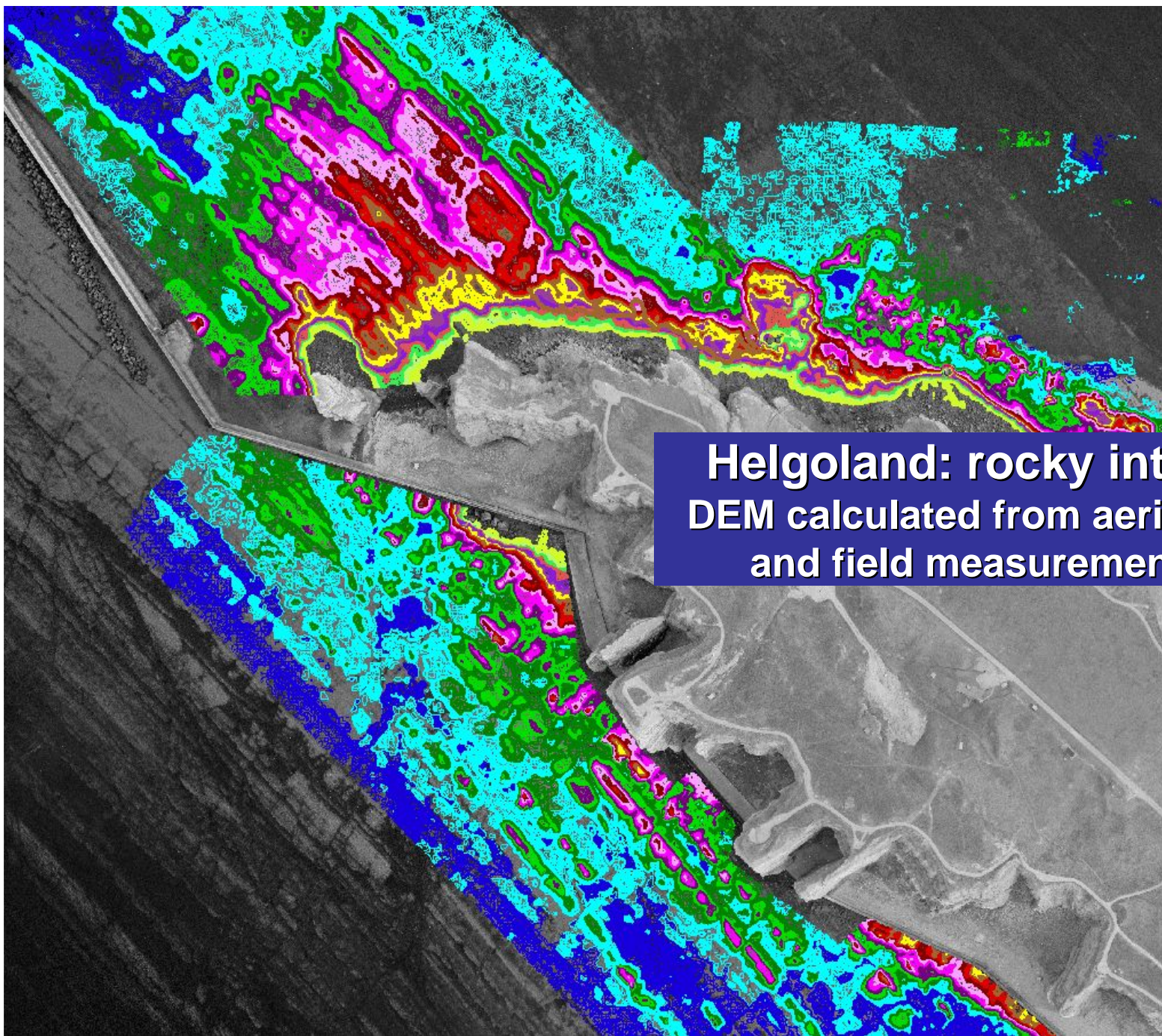


Background: Working area is relatively small, but partially not accessible by boat or on foot → Time series not achievable without remote sensing

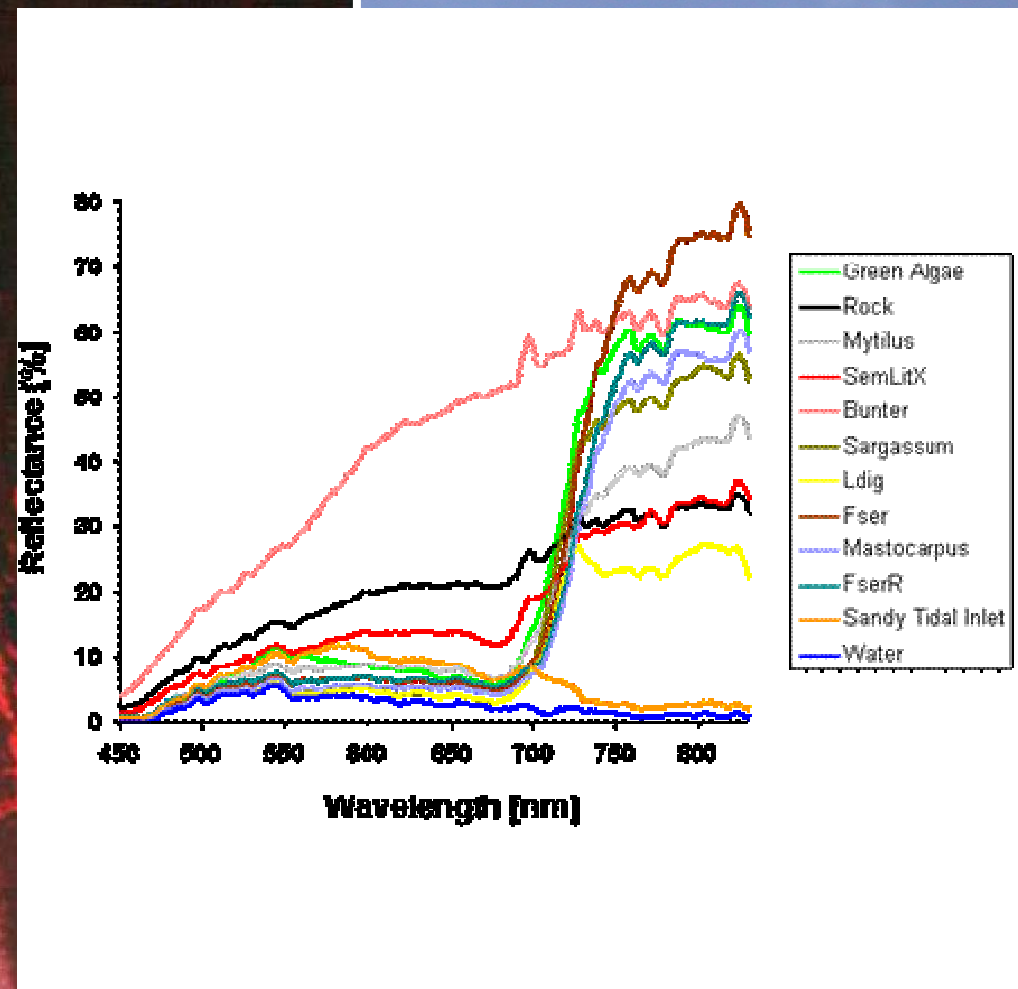
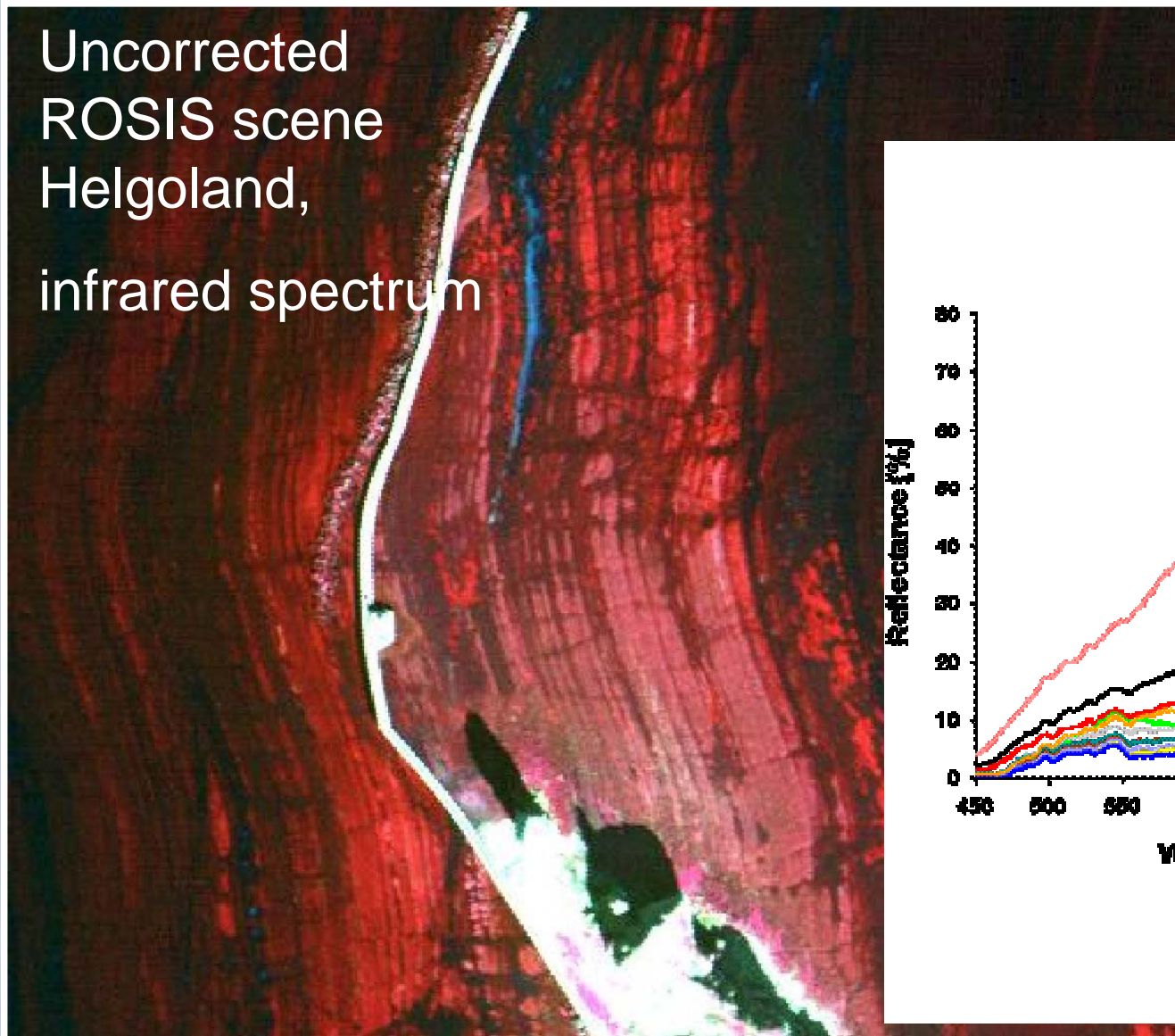
The intertidal communities



Biotopes were described in recent years and mapping study conducted with the help of airborne photos

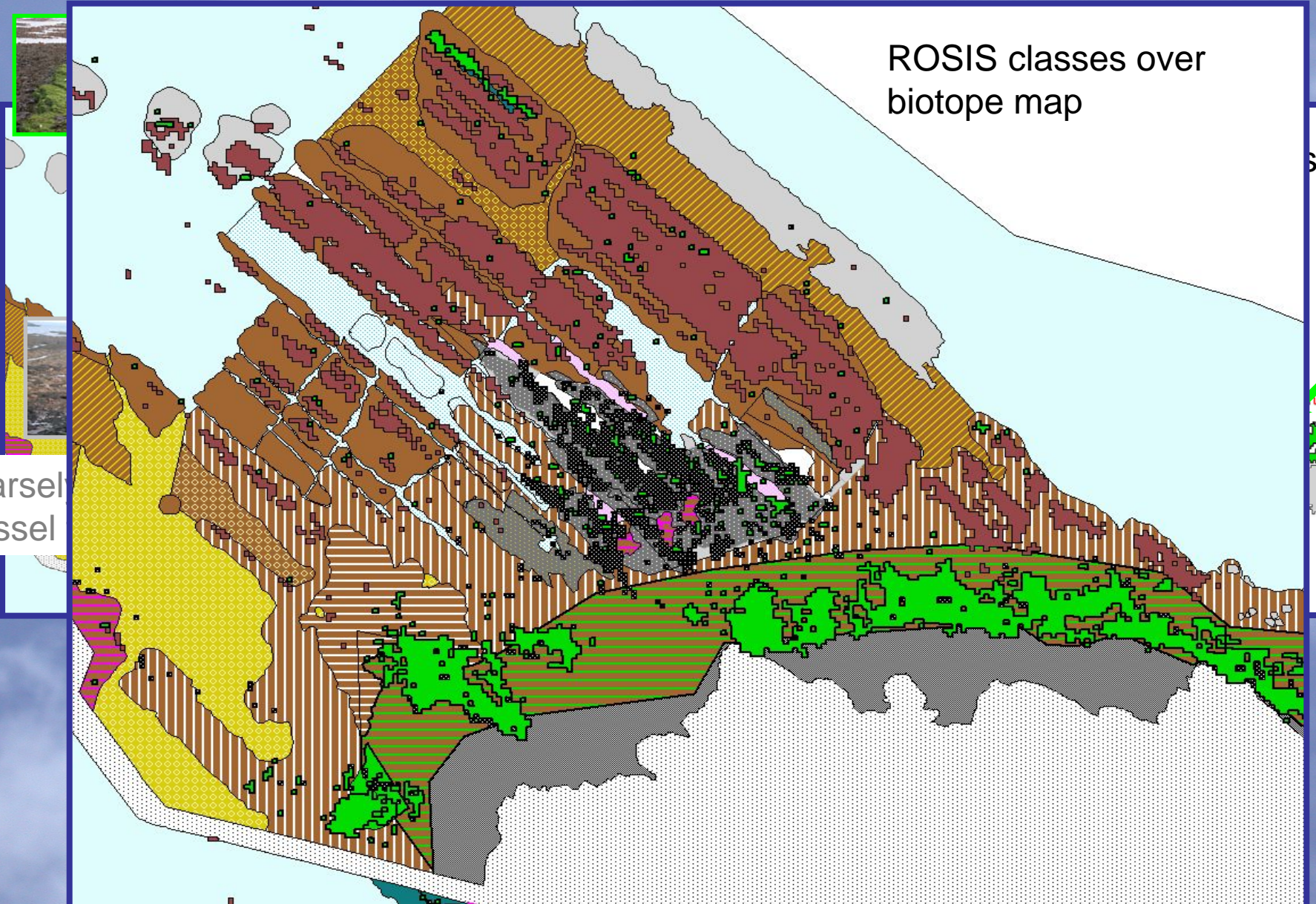


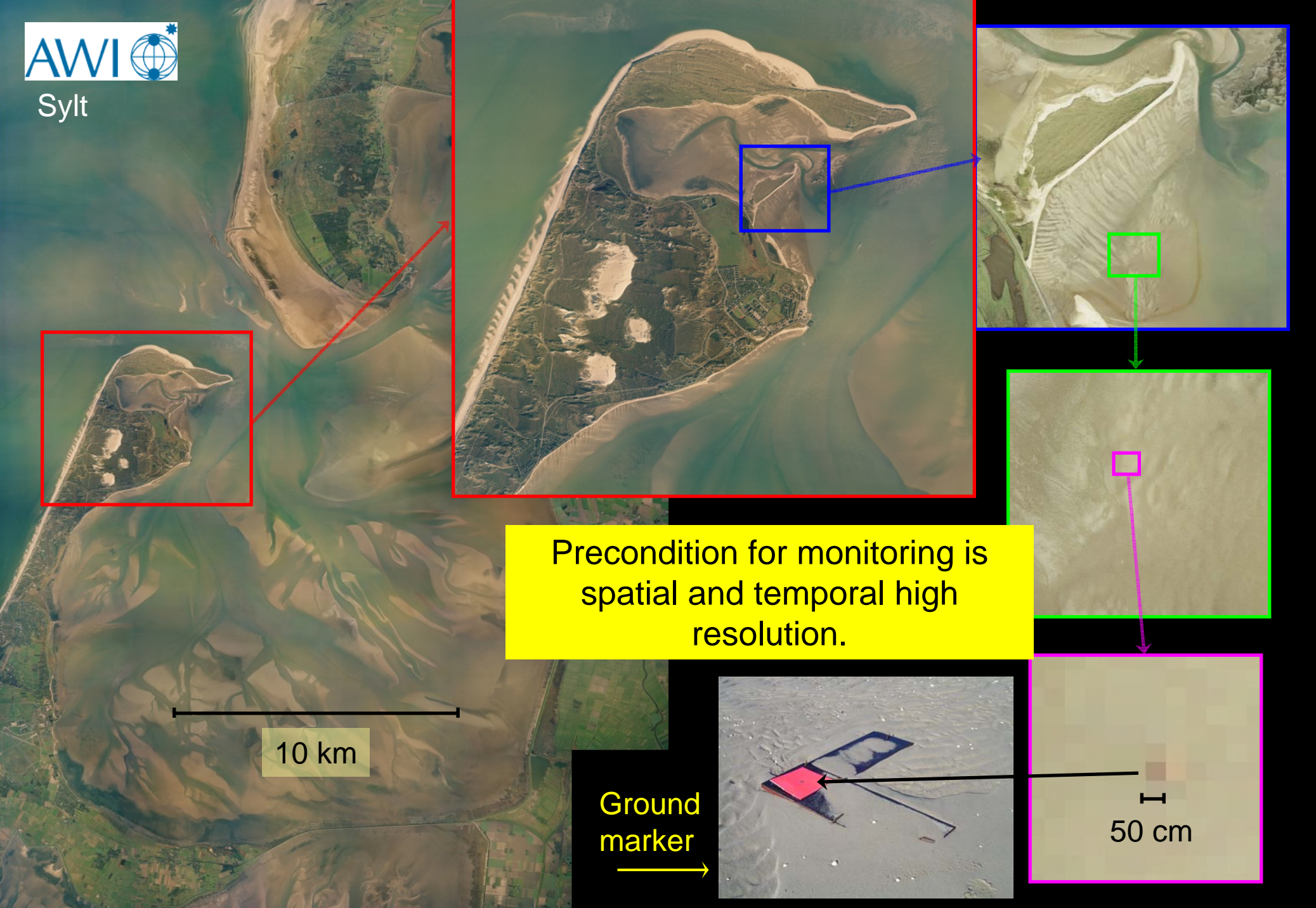
Uncorrected
ROSIS scene
Helgoland,
infrared spectrum



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





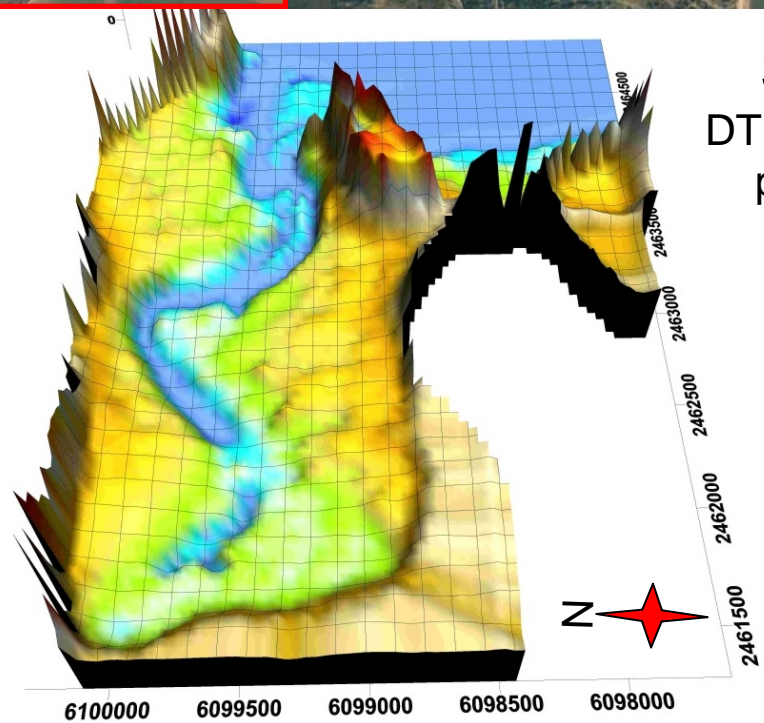
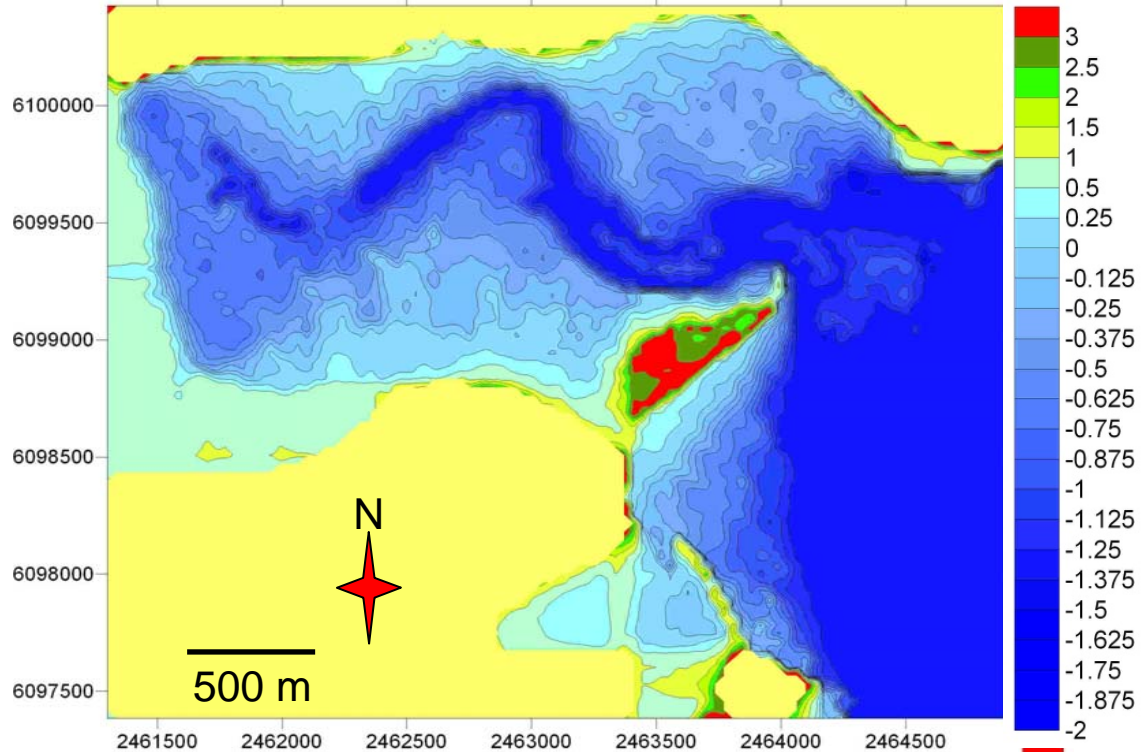
Precondition for monitoring is spatial and temporal high resolution.

10 km

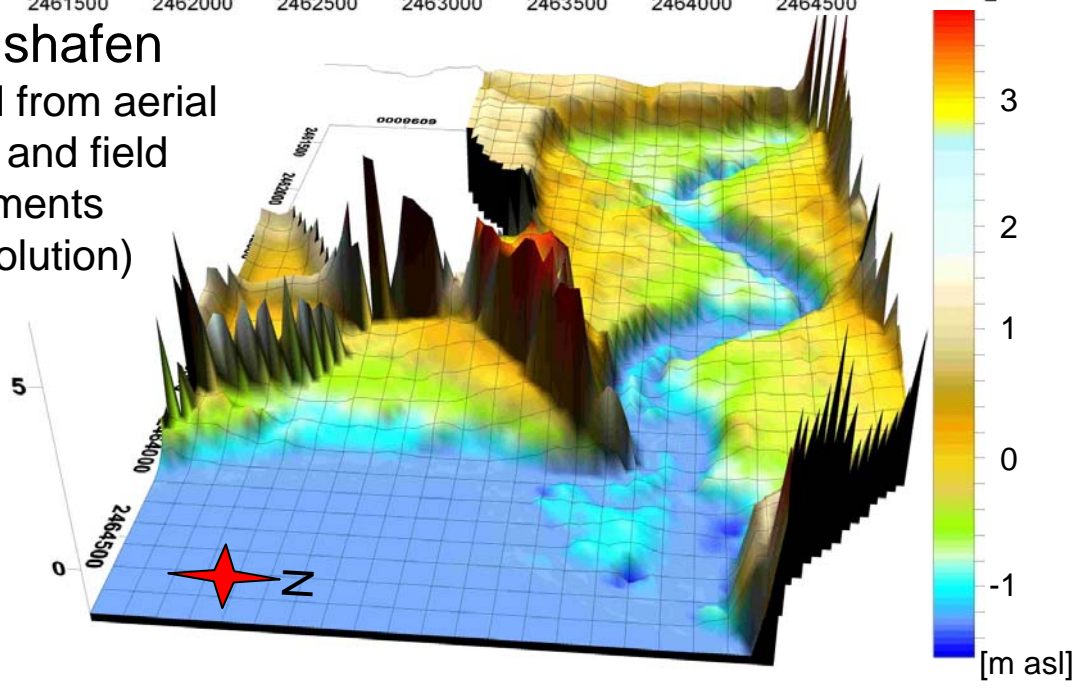
Ground marker
→



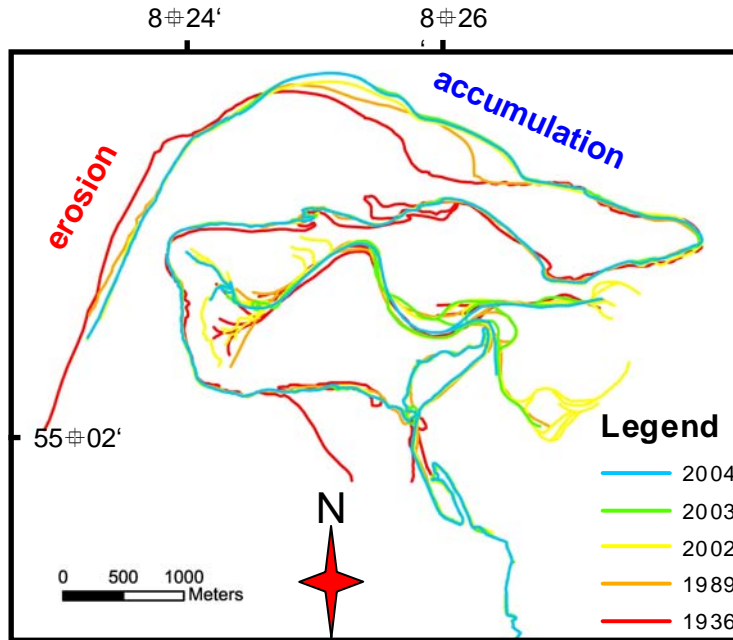
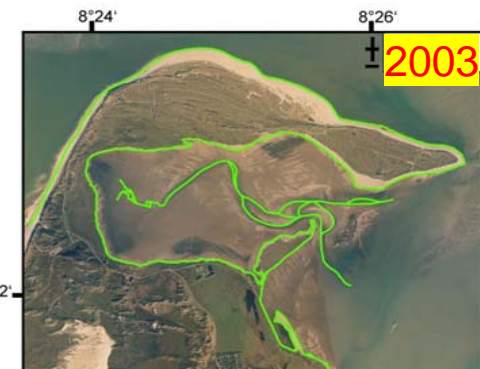
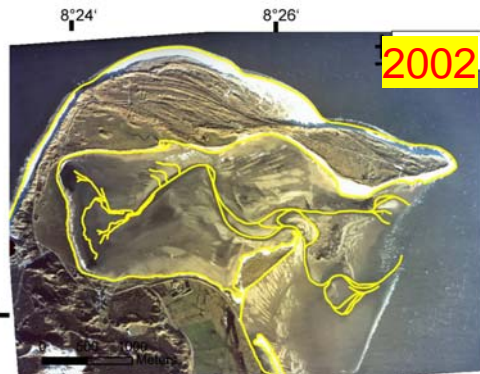
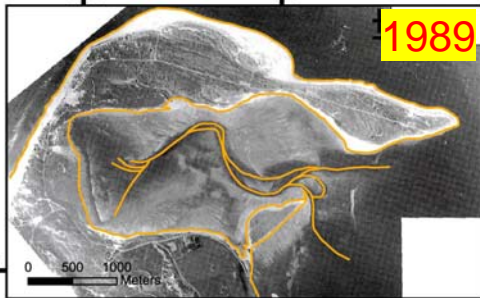
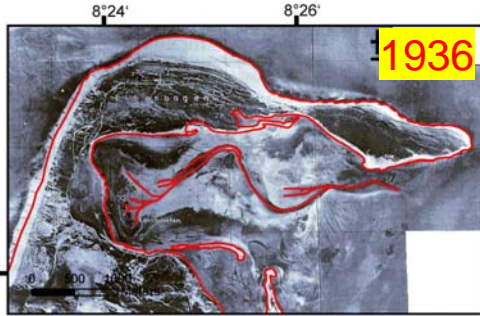
50 cm



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

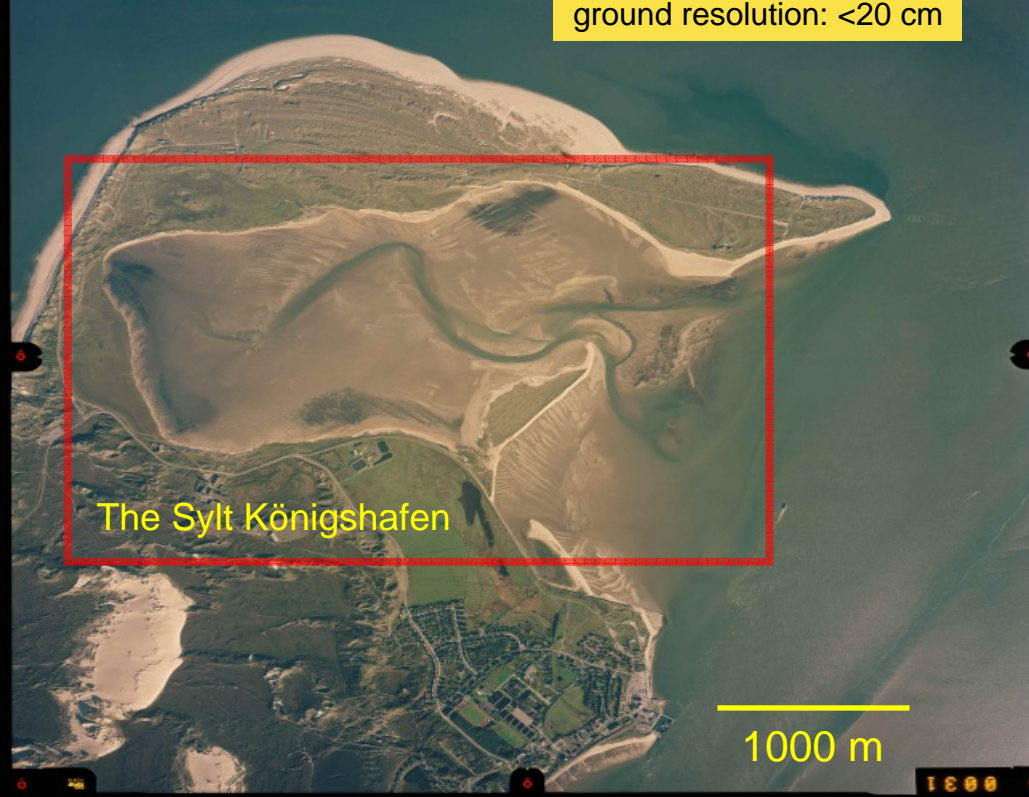
Tidal Channels

- no exceptional effects

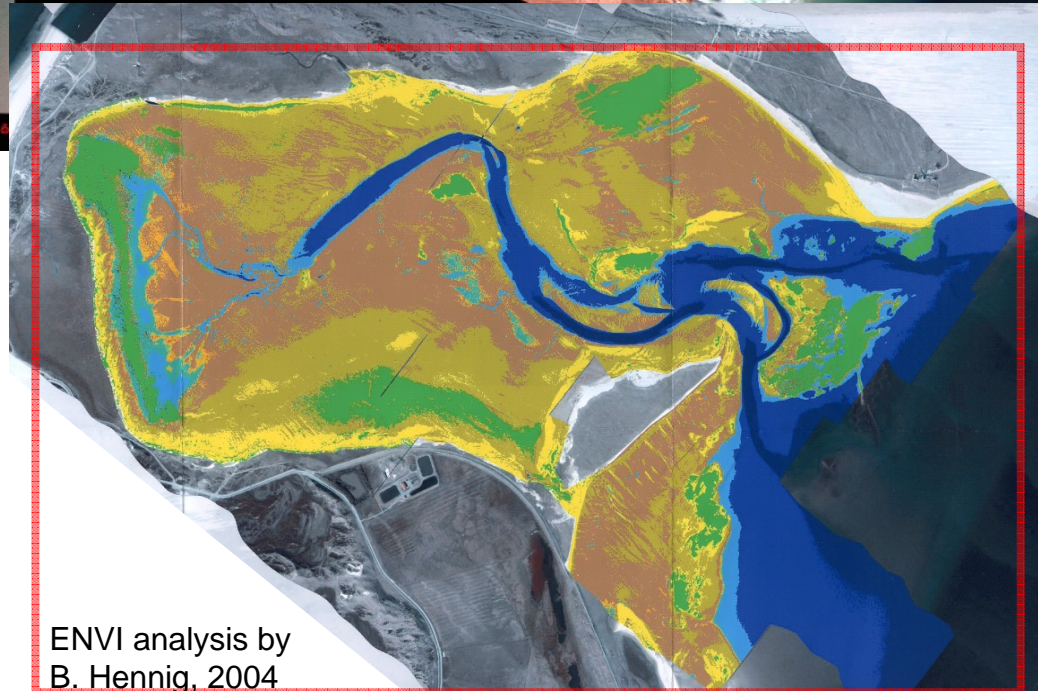
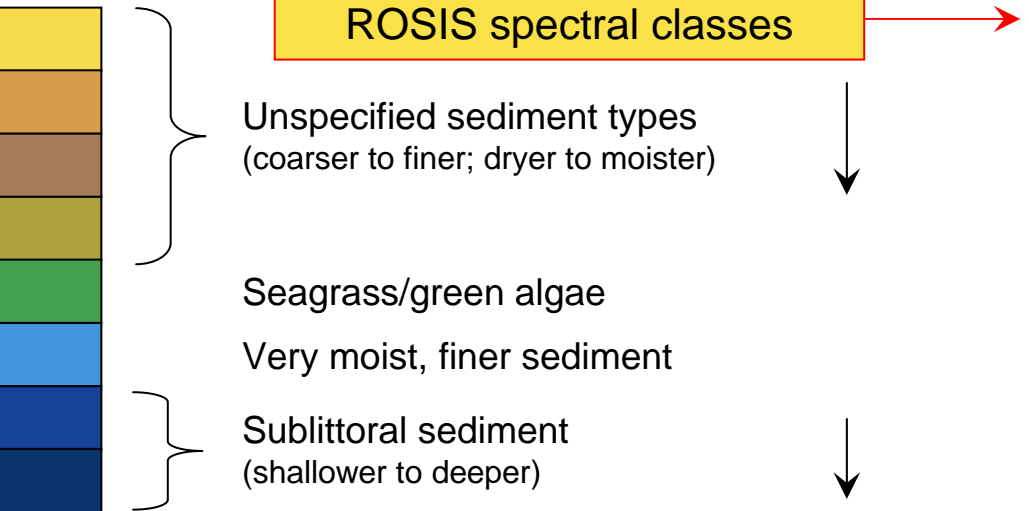
Human Impact

- 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

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