Grøn Trepart: Hvordan satellitdata skaber overblik.

Torsten Bondo | DHI A/S

Hydrologidag

DHI and our Earth Observation effort

1964
60 years of experience and know-how

2000
Earth Observation knowledge hub
Spin off Univ. of Copenhagen and DHI

1,100
employees
80% with an MSc or PhD degree

Foundation owned, Profit-for-purpose with a mission to create global impact.

Headquartered in Denmark
Offices in 26 countries

Industry-trusted physical and digital test facilities

MIKE Powered by DHI
Advanced technology and water modelling software

Research and Technology Organisation accreditation
UNEP-DHI centre

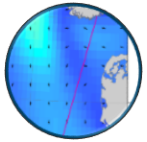
www.dhigroup.com

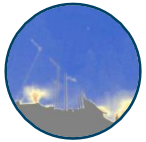
EO data

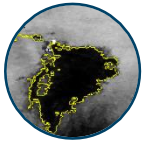
Data og vækst

From Space to Solutions: 25 Years of EO Excellence

- Real-World Applications of Satellite Data Across Sectors and Scales…

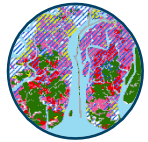

MetOcean data

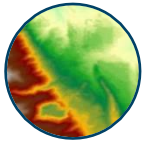

Sea Surface Temperature


Oil Spill


Marine Habitat Maps

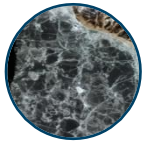

Satellite Images

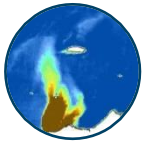

Coastal Vegetation


Digital Elevation

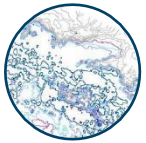

Urban Mapping

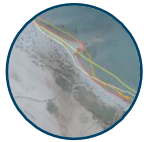

Vegetation Health

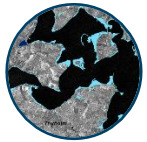

Sea Ice and Icebergs


Dredge Plumes


Water Quality


Bathymetry


Coastal Dynamics


Flooding

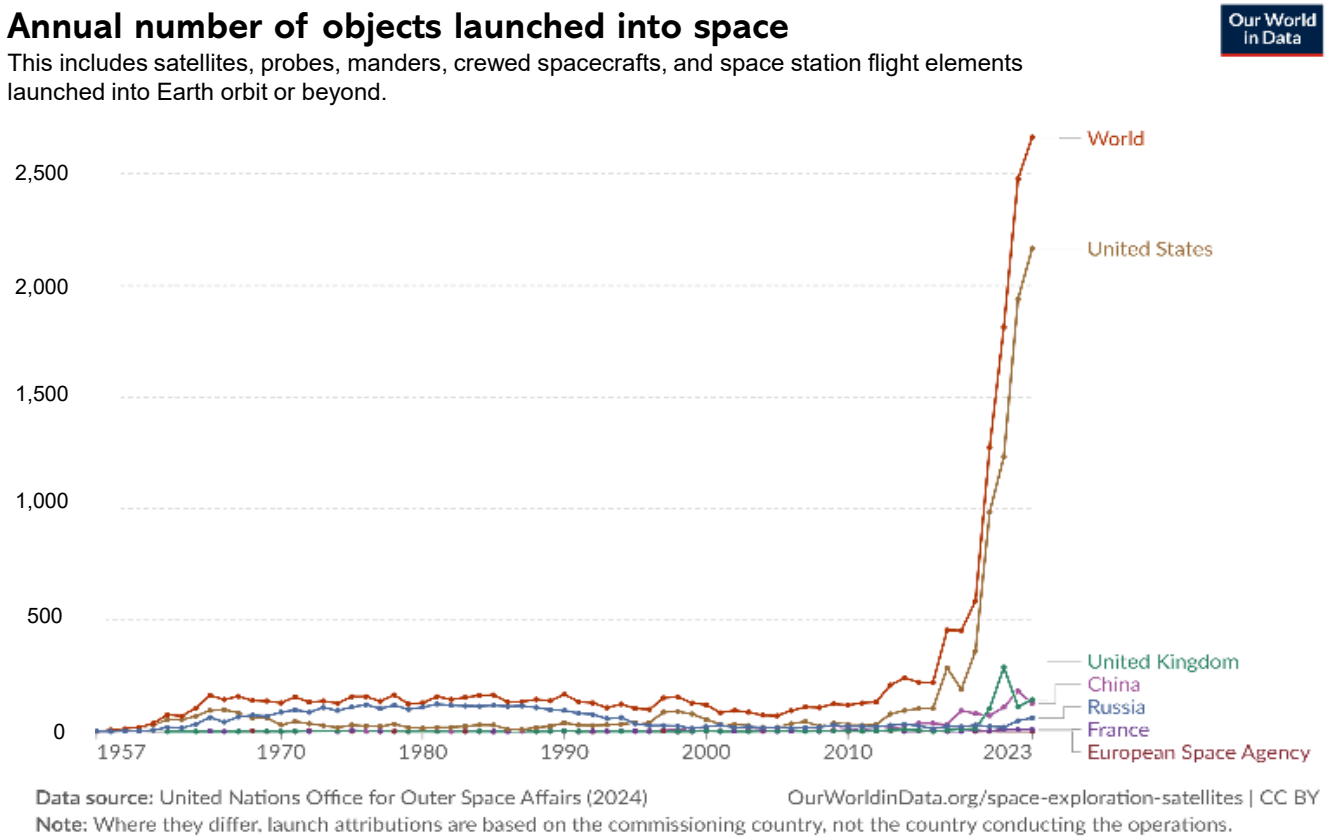

ET and drought


Freshwater Monitoring


Land Cover - Land Use

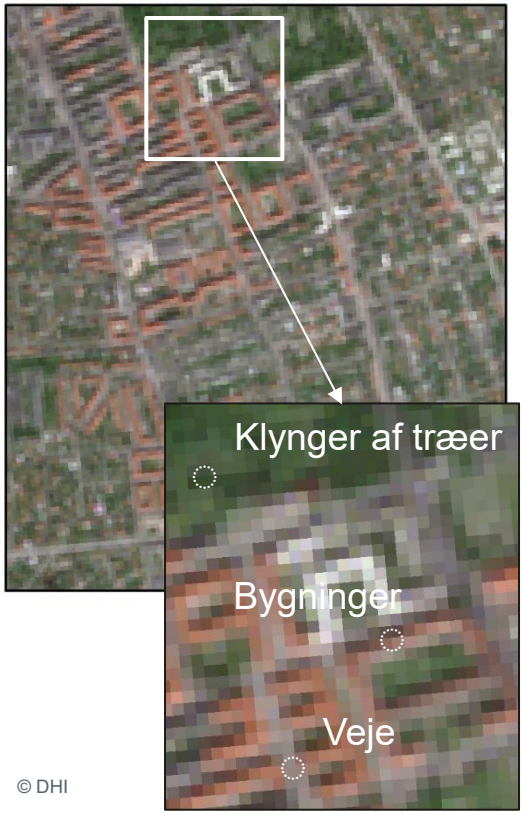
Offshore | Coastal | Land

Increase in number of satellites offers new possibilities

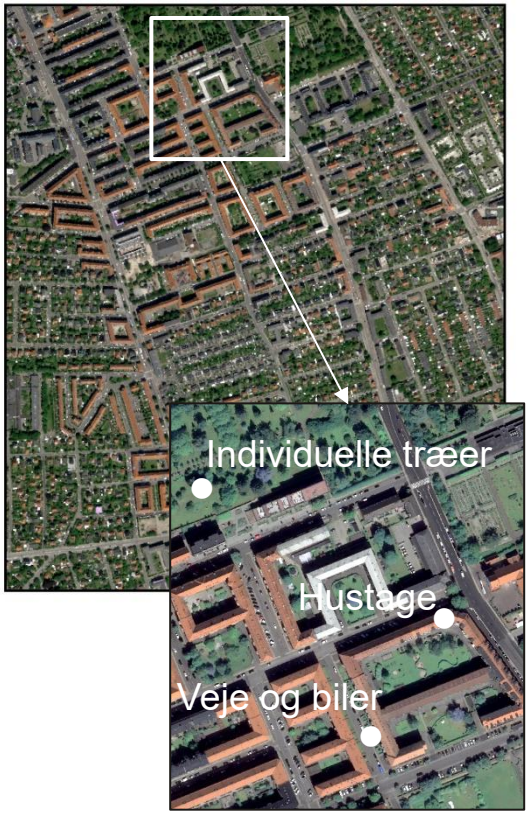


Hvad kan vi se I et satellitbillede?

Sentinel 2 – 10 m



Pléiades Neo – 30 cm



Orthofoto – 10 cm

Other techniques also exist

Open access satellite (>10m)

- Open access
- Weekly to yearly variations
- +9 years data archive
- Predictable tracks

Orthophoto (12.5 cm)

- 1-2 images /year
- National coverage (DK), mainly land.

UAV/ AUV (< 10cm)

- High mobilization costs
- Local scale coverage
- Low reproducability
- Permissions often needed

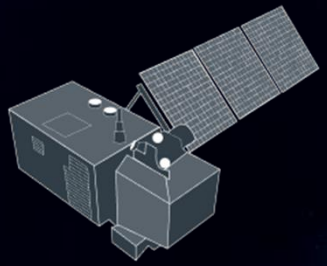
VHR (0.15 – 5m)

- Seasonal and yearly variations
- Commercial data

VHR: Very High Resolution, UAV: Unmanned Aerial Vehicle, AUV: Autonomous Underwater Vehicle

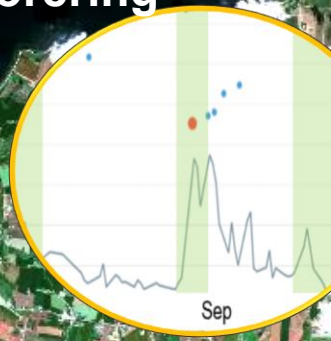
Grøn trepart

EO værktøjer og muligheder

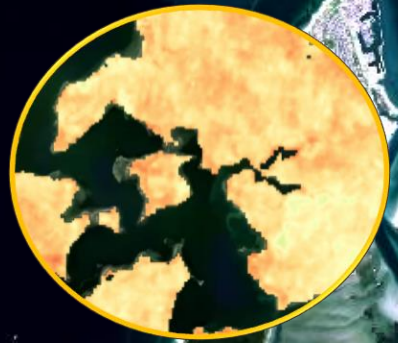


4. Vådområder

5.Monitorering



1. Jordfugtighed og fordampning



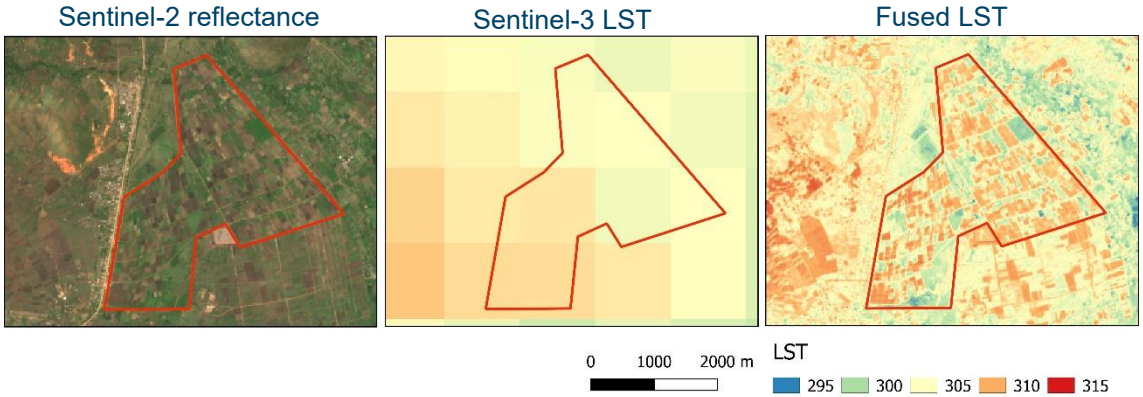
2. Vegetations-analyser

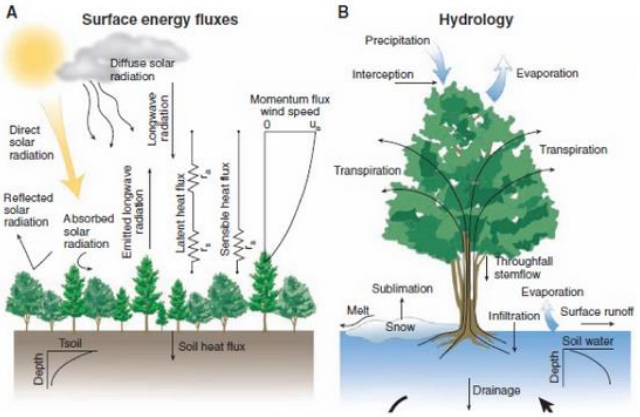
3. Økosystems tjenester

Jordfugt

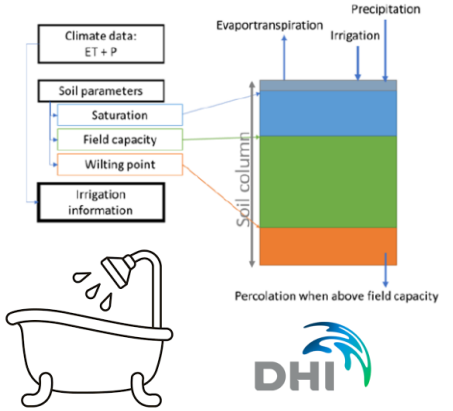
Fusion af Sentinel 2&3

– input til evapotranspiration og jordfugtighed



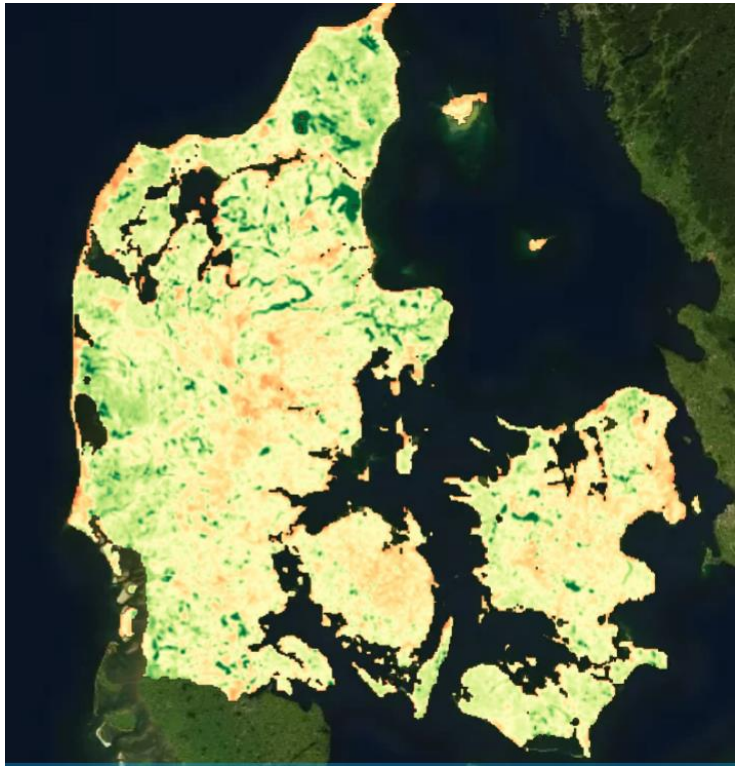


- EO + fysisk baseret vandbalance model => ET & SM
- NRT aktuel fordampning
- Absolut jordfugtighed i rodzonen i åbent land
- Baseret på globale datasæt & tilpasset via DK datasæt



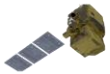
National scale soil moisture mapping

- Monthly, 100 m maps of RZSM for whole of Denmark
- The soil moisture maps are included as part of the decision-making tools for implementing the Agency for Green Transition and Aquatic Environment, Klima-Lavbund scheme
- Accessible at Soilmoisture.io



Vegetationsanalyser

EO-based monitoring for agricultural support schemes


Sentinel-1
Radar


Sentinel-2
Optical

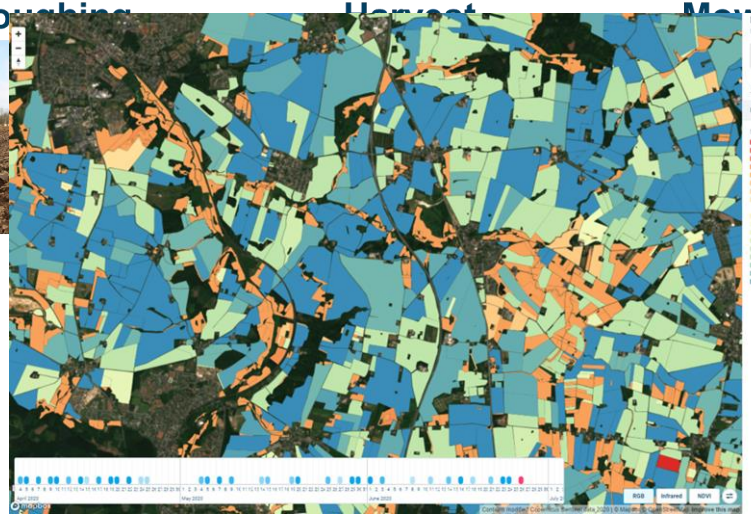

Landsat 8-9
Optical

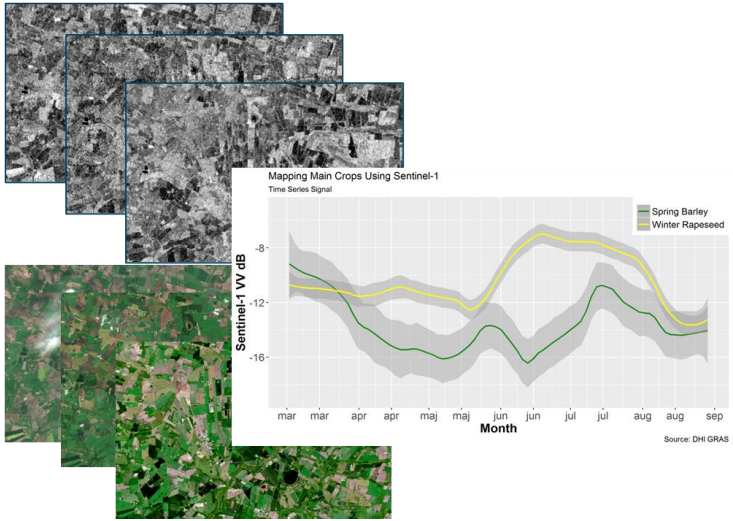
Crop classification

Plo

Harvest

Mowing

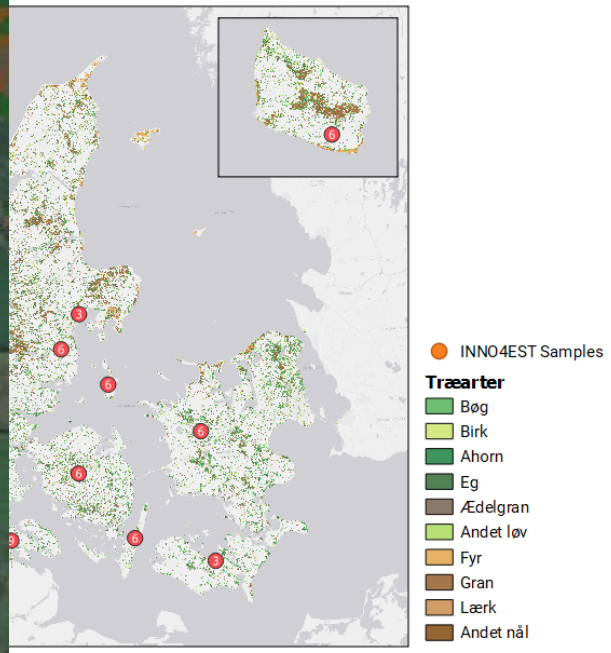




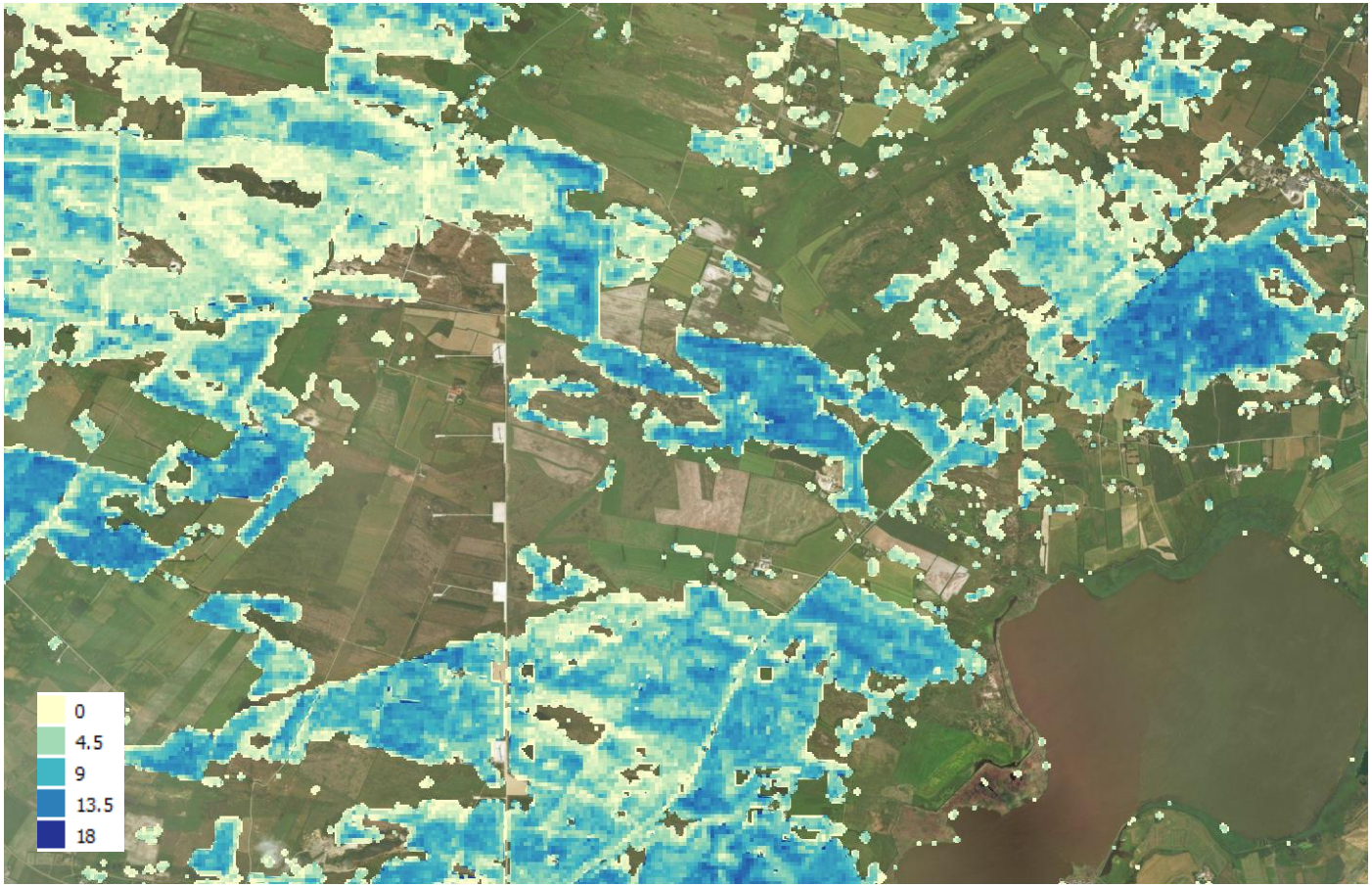
Input imagery

Automated crop classification


EG
RGR
RGR
EG
EG
RGR


INNO4EST Samples
Træarter
Bøg
Birk
Ahorn
Eg
Ædelgran
Andet løv
Fyr
Gran
Lærk
Andet nål

Vegetation height using ML and Sentinel-2 / ICESat-2 data



Pixel resolution: 10-20 m

Økosystemstjenester

Green Tripartite	Ecosystem services
Carbon dynamics	Forest extent, height and biomass → Carbon
Biodiversity	Forest habitats and species, forest age, “”vand i skov”
Nutrient retention	Forest density, health and stress (e.g., fractional cover, leaf area index, soil moisture, Evapotranspiration)
Recreation	Spatial configuration of forest habitats and species, “access”

Vådområder

GLOBAL WETLAND WATCH

A new system for globally mapping and monitoring changes to wetland ecosystems

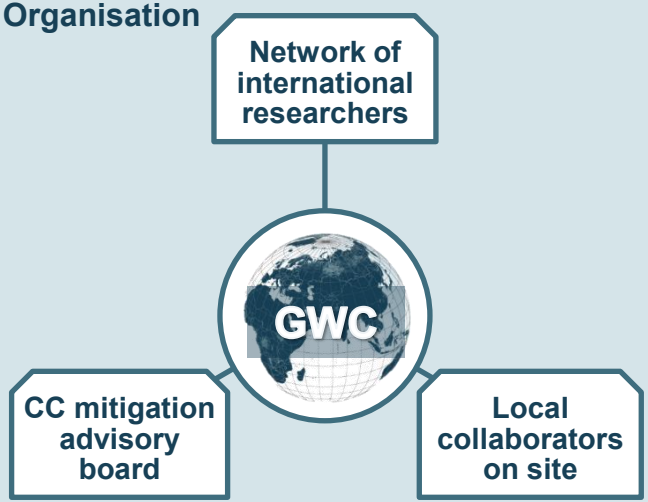
Global Wetland Center

- Granted by Novo Nordisk Foundation
- 8 mEUR over six years, to be shared with Copenhagen University and GEUS
- A success story based on patience, determination, collaboration and competencies

The Mission:

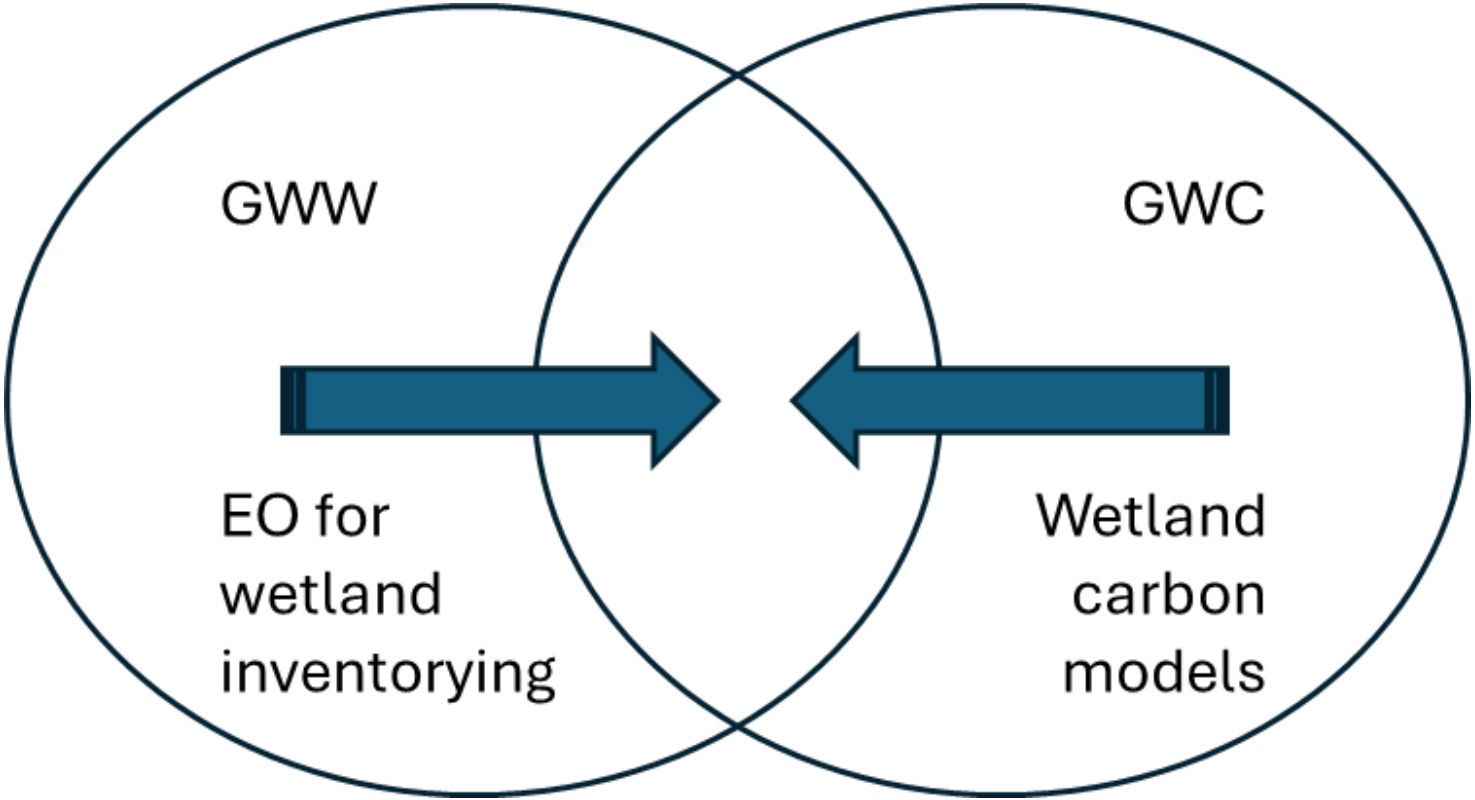
'*To be leading in designing novel approaches for mapping and modelling wetlands' greenhouse gas budgets that can guide wetland management as contribution to the global agenda towards climate neutrality*.'

Organisation



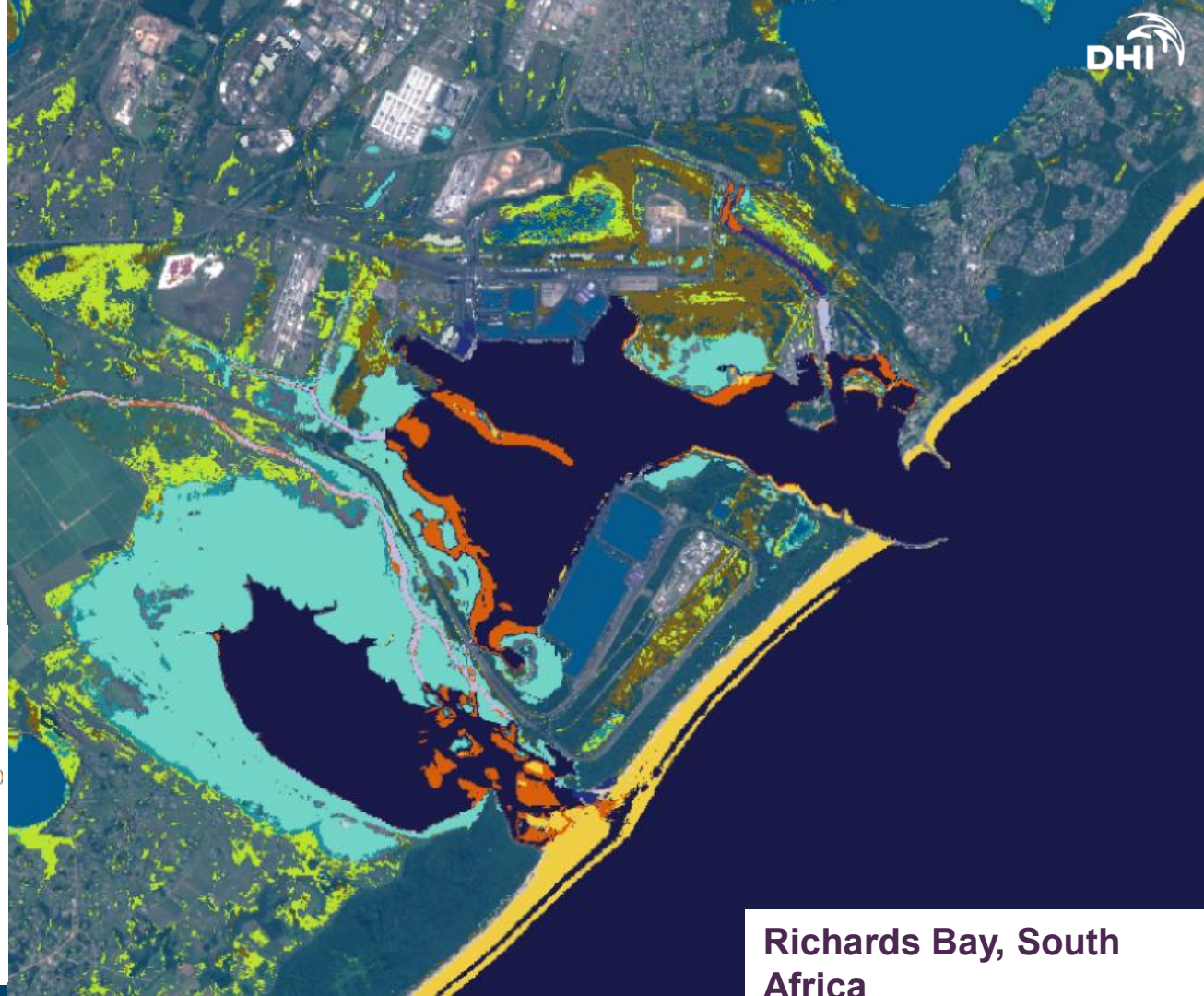
Collaboration strategy

- Physical center in Copenhagen
- 1 day per week at the center (e.g. seminars)
- Integration of center's activities in teaching



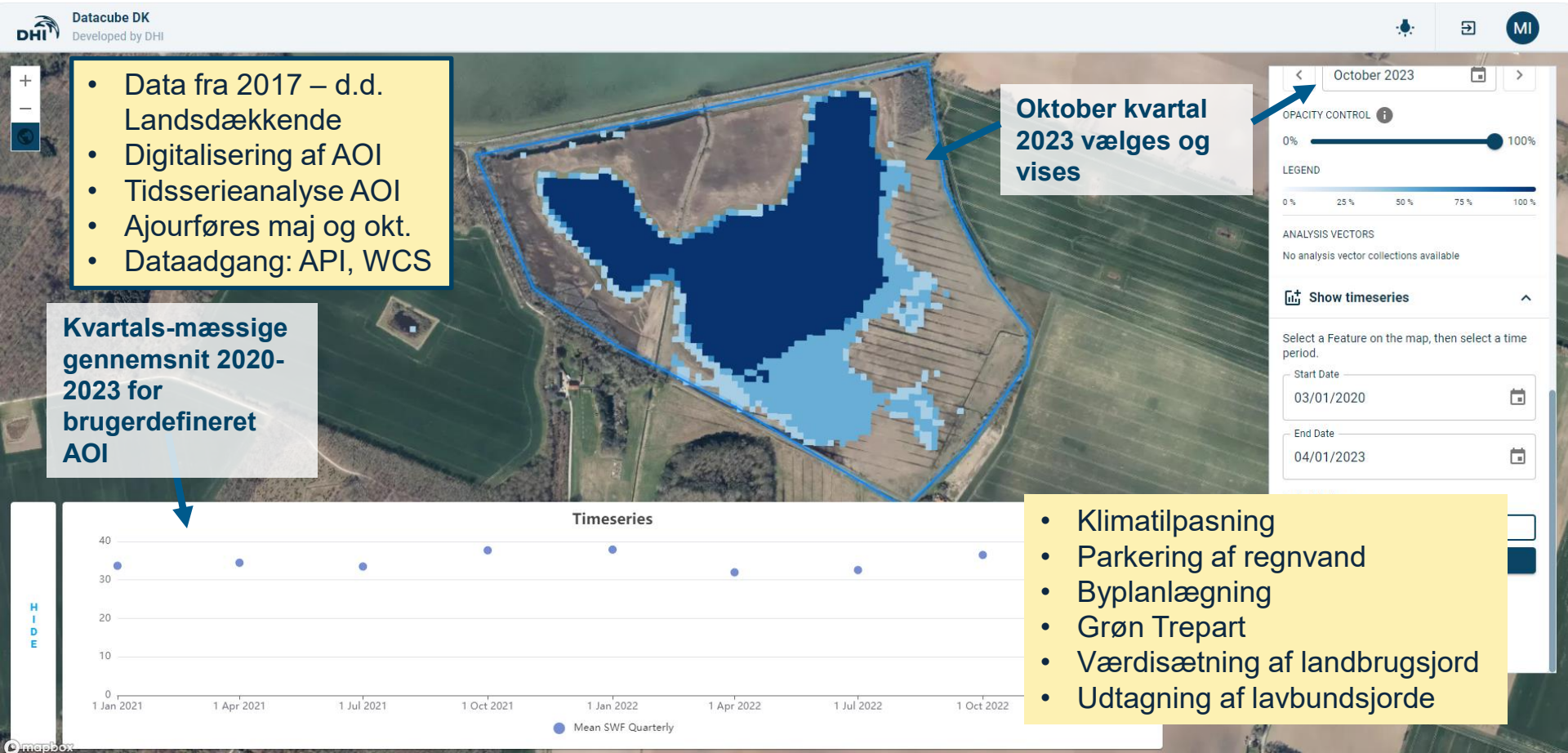
Wetland typology

Preliminary results



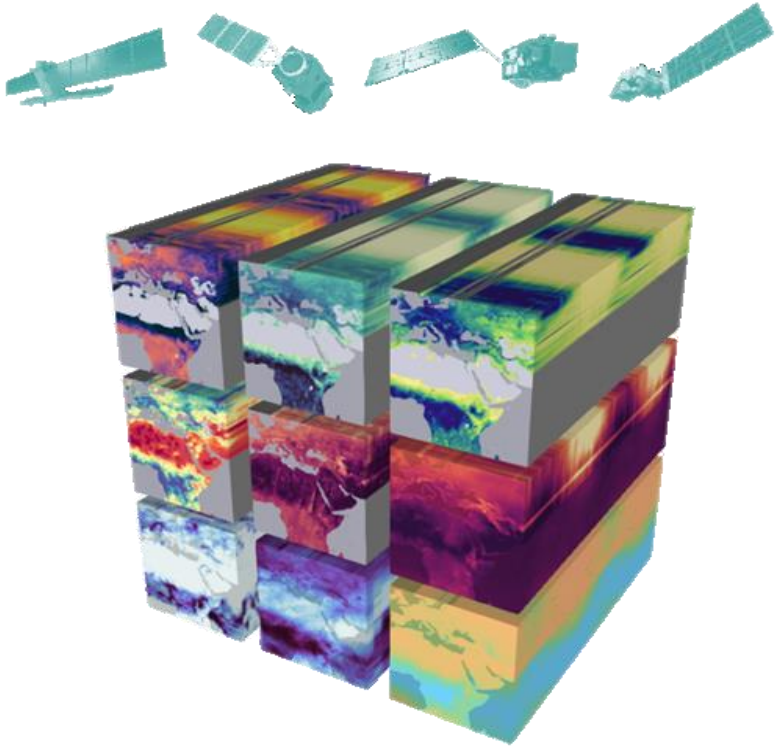
Richards Bay, South Africa

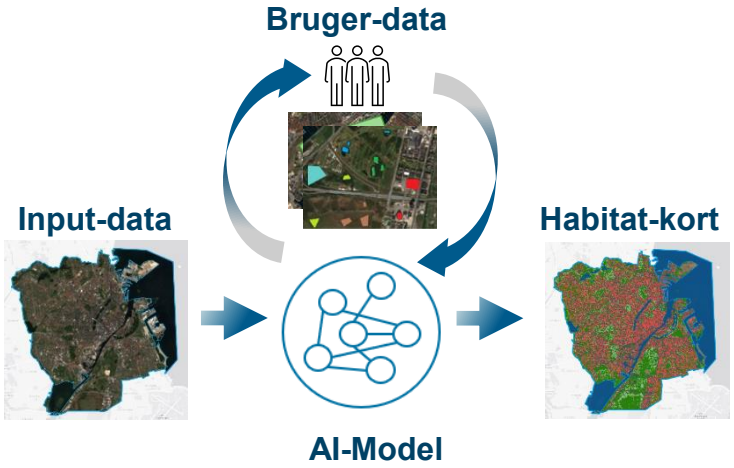
Datacube/SWF - Dokumentation af lokale mønstre i tid og rum



Monitorering

Data-cube
Analyseklare satelllitdata





Thank you!

For more information:

https://www.eo.dhigroup.com/

tbon@dhigroup.com