Standardisation and harmonisation of *seabed habitat mapping* **Sediment and Terrain**

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Jorgen Leth[2], Zaid Al-Hamdani[2]
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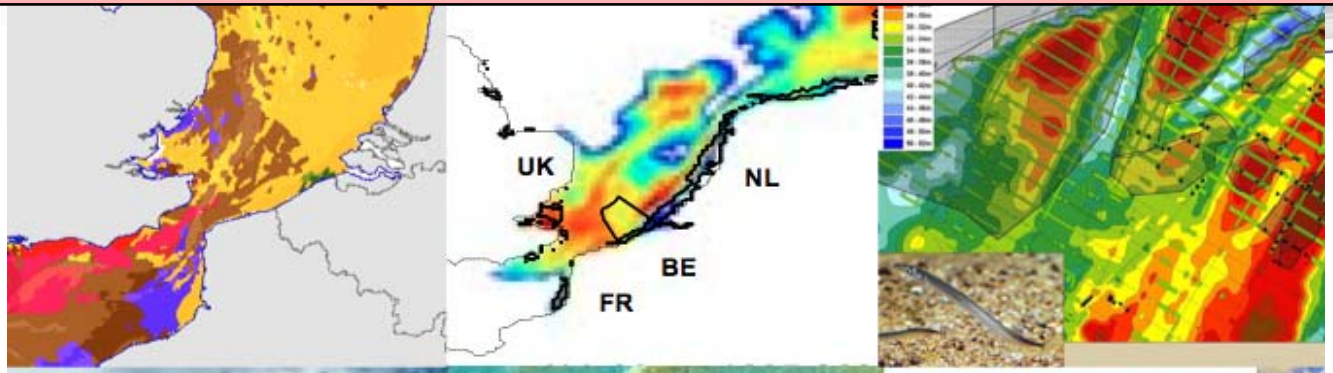
Need for Habitat mapping

Geo-Seas

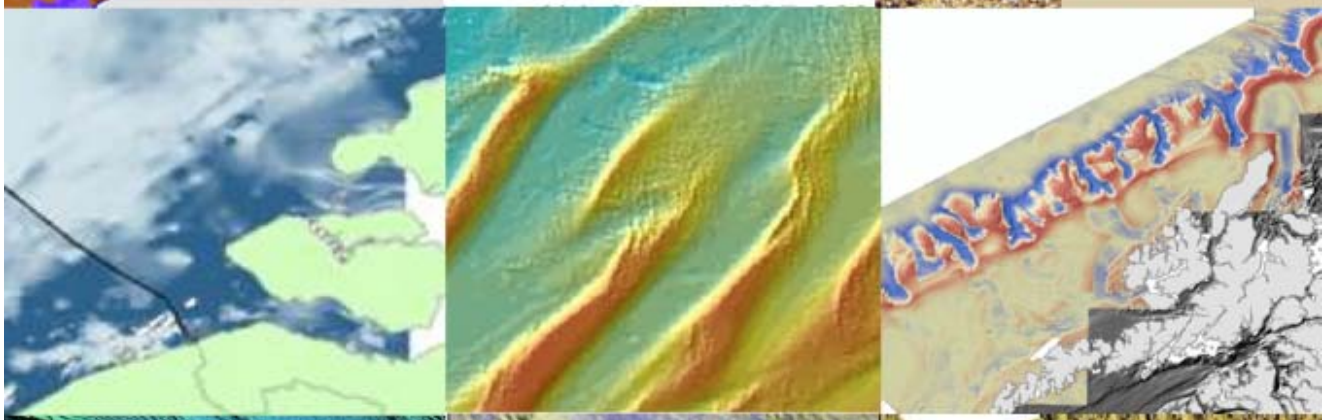
Different stakeholders have various needs and require varying scales and resolution of mapping products according to their application

- Regional assessments
- Fisheries management



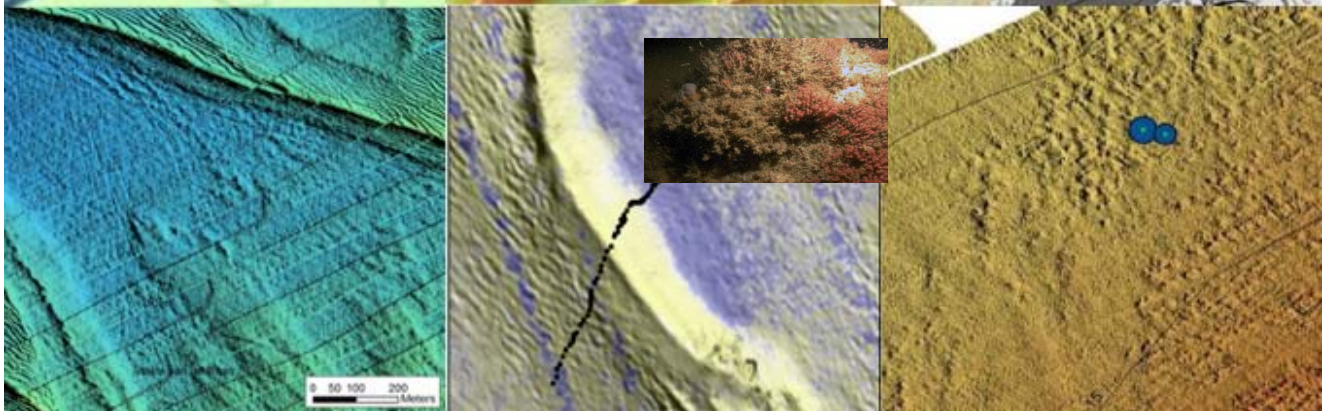
Broad-scale
Megahabitats
e.g. >=500m

- Spatial planning
- Resource assessments



Intermediate scales
Communities
e.g. >=50m

- MSFD
- MPA's
- Invasive species



Fine-scale
Species
e.g. >=5m

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EU context

- **Safeguarding** and **conserving** biodiversity (European Directives);
- Mapping the distributions of all representative species is not possible and requires **Surrogates**;
- **Assessments** are needed on the status of marine habitats, quantifying area and condition of habitats;
- Increasing need for process and system knowledge to make **monitoring programmes** cost- and time efficient.

MESH, 2007

From MARKET to CHEFS!

MARKET
Standardised data

RECIPES <-> CHEFS!
Standardised recipes ++ people to work with it!

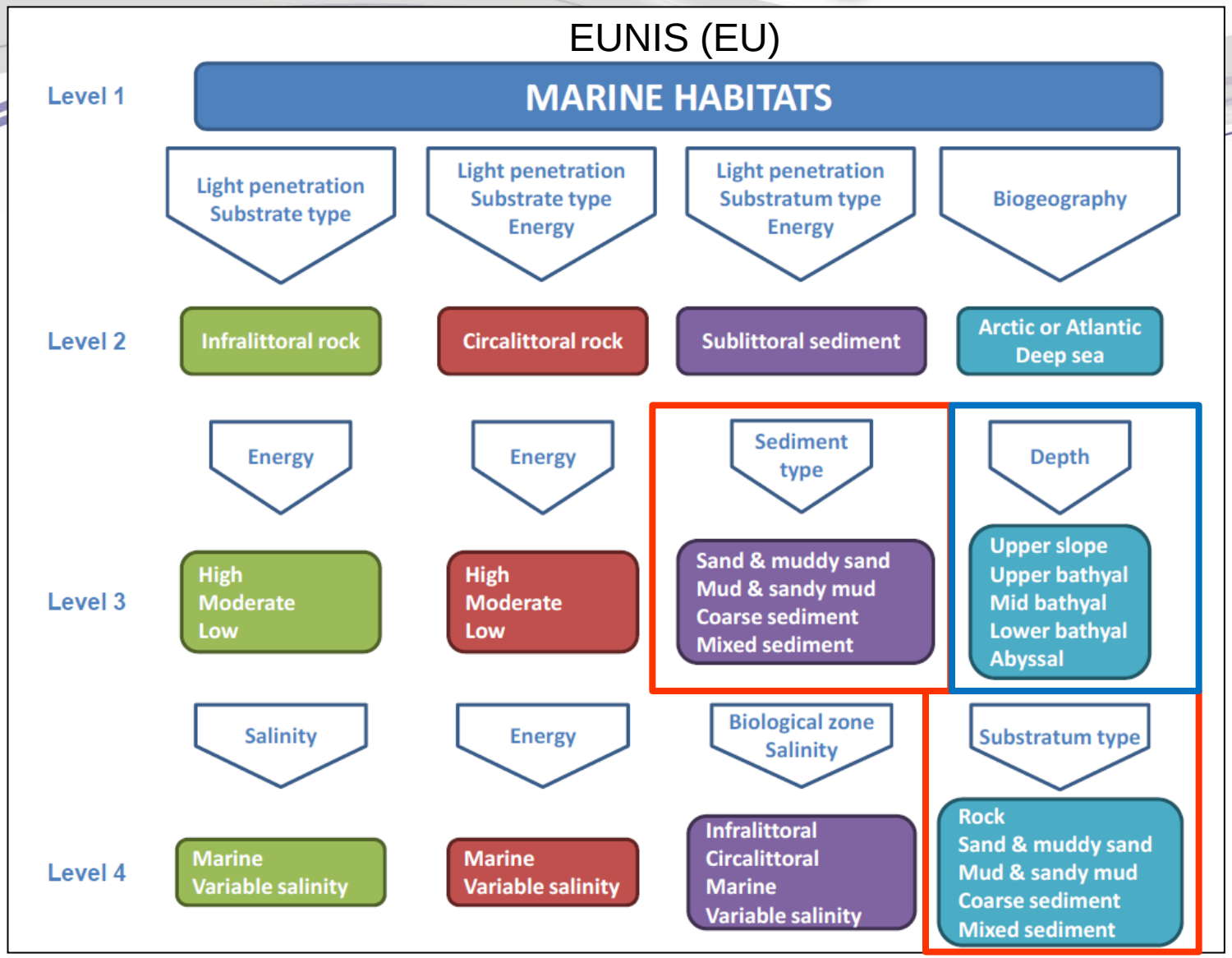
We need more chefs and cooks now!

Content

- Review sediment/geomorphic structures relevant for habitat mapping and extent to which they are mentioned in
  - *EU directives, OSPAR*
  - *Habitat classification systems*
- Review methods for sediment/terrain characterisation of ecologically relevant sediment/geomorphic structures
  - *Methods for quantitative sediment/terrain characteristation, including (semi) automated classification*
- **Case studies** using sediment/bathymetry data with different resolutions
  - *Broad-scale: Denmark, English Channel*
  - *Intermediate-scale: Irish Sea*
  - *Fine-scale: Irish Sea; southern North Sea*
- Discussion and recommendations

Classification schemes

Geo-Seas



Challenge EUNIS Level 5 and 6 ***down to species level***

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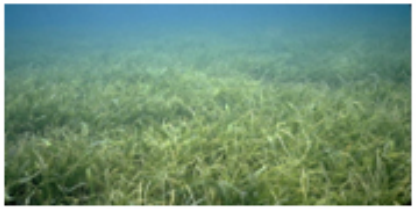
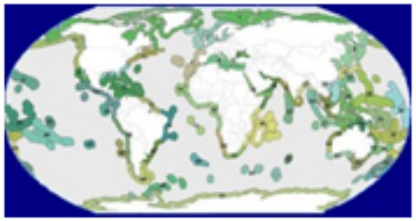
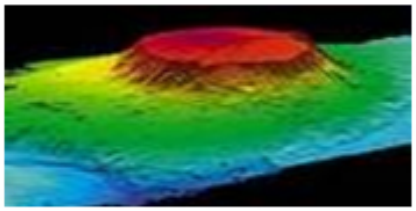
US Coastal and Marine Ecological Classification Standard CMECS (USA)

Water Column Component (WC)		Structure and characteristics of the water column
Benthic Biotic Component (BC)		Assemblages of benthic or suspended/floating organisms
Substrate Component (SC)		Character and composition of surface and near-surface substrates
Eco-regional Component (EC)		Biogeographic regions based on features influencing species distributions
Geoform Component (GC)		Geomorphic or structural character of coast or seafloor

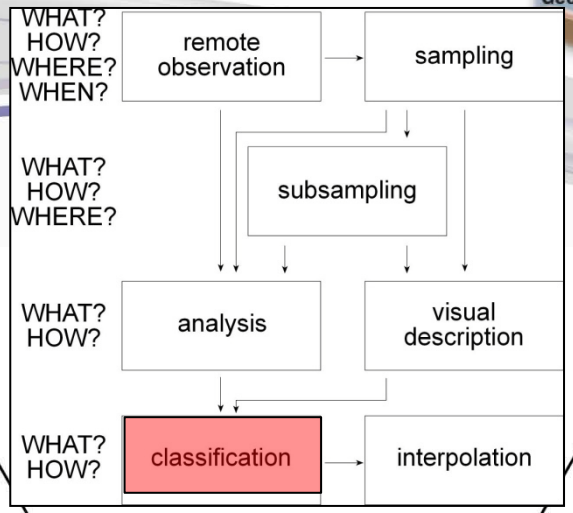
SEDIMENT

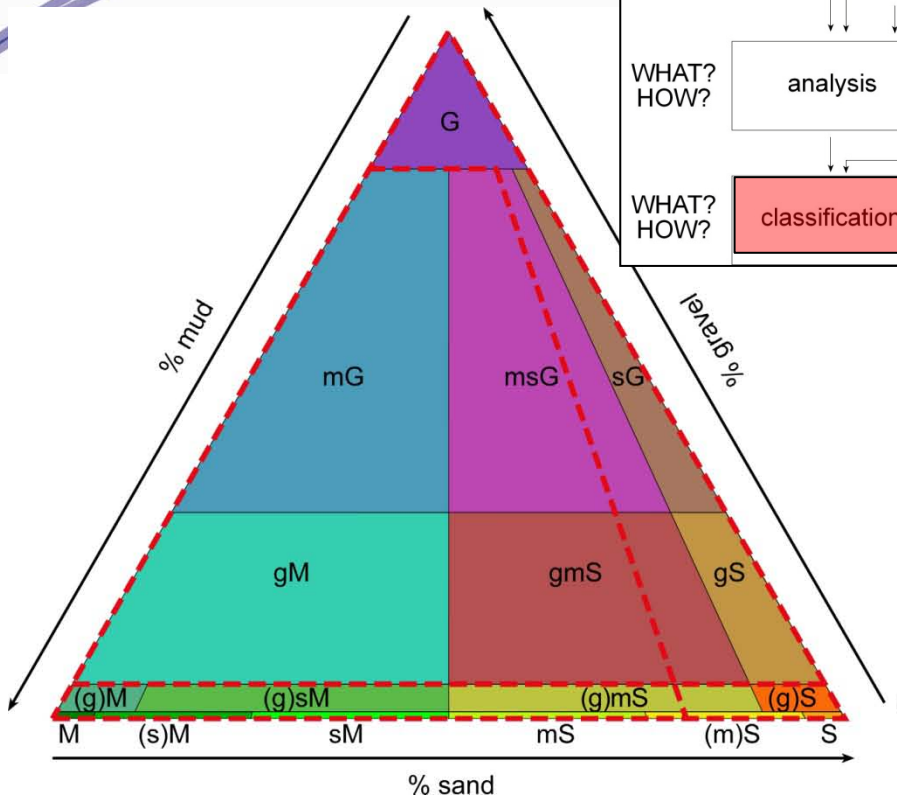
TERRAIN

http://www.csc.noaa.gov/benthic/cmecs/

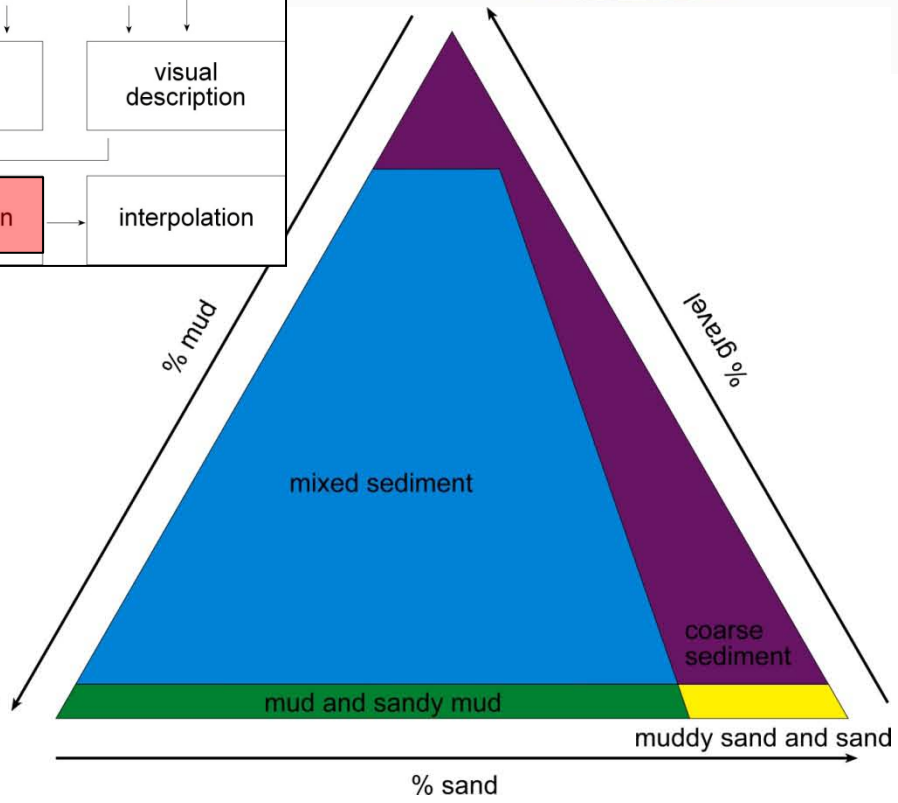
Sediment characterisation

Multi-faceted, stepwise approach



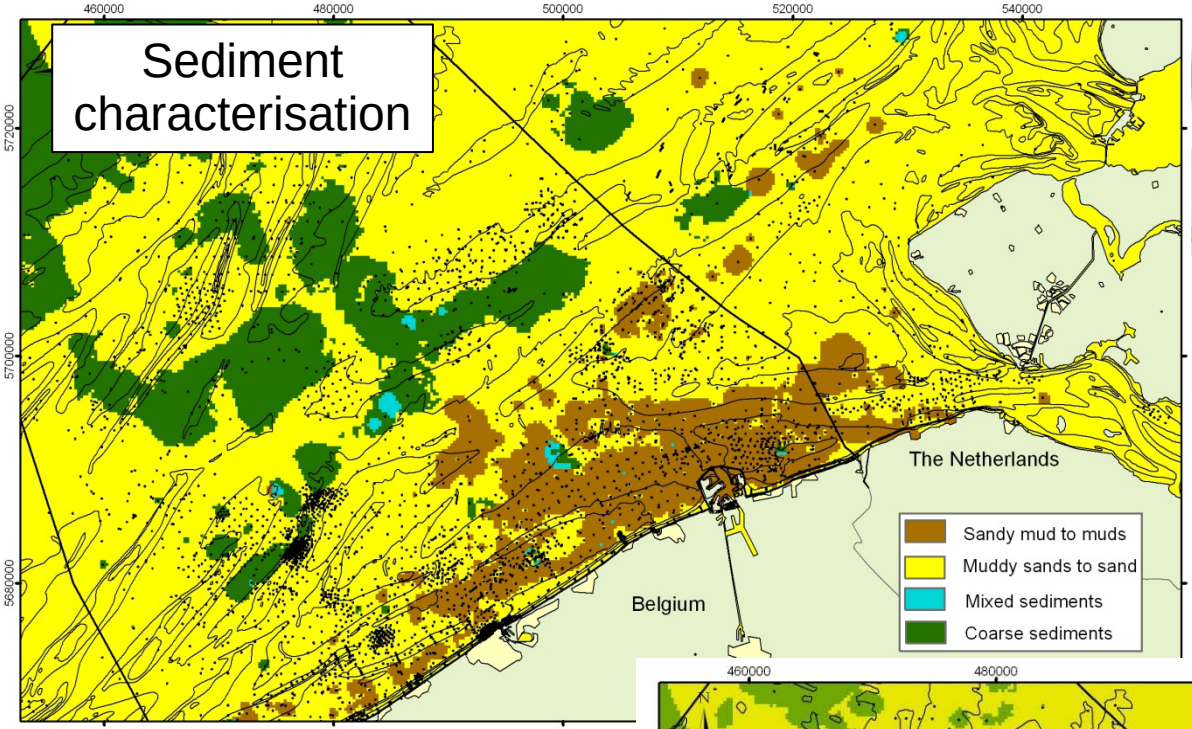


Folk classification



Modified Folk classification
>> EMODnet-Geology > EUSeaMAP

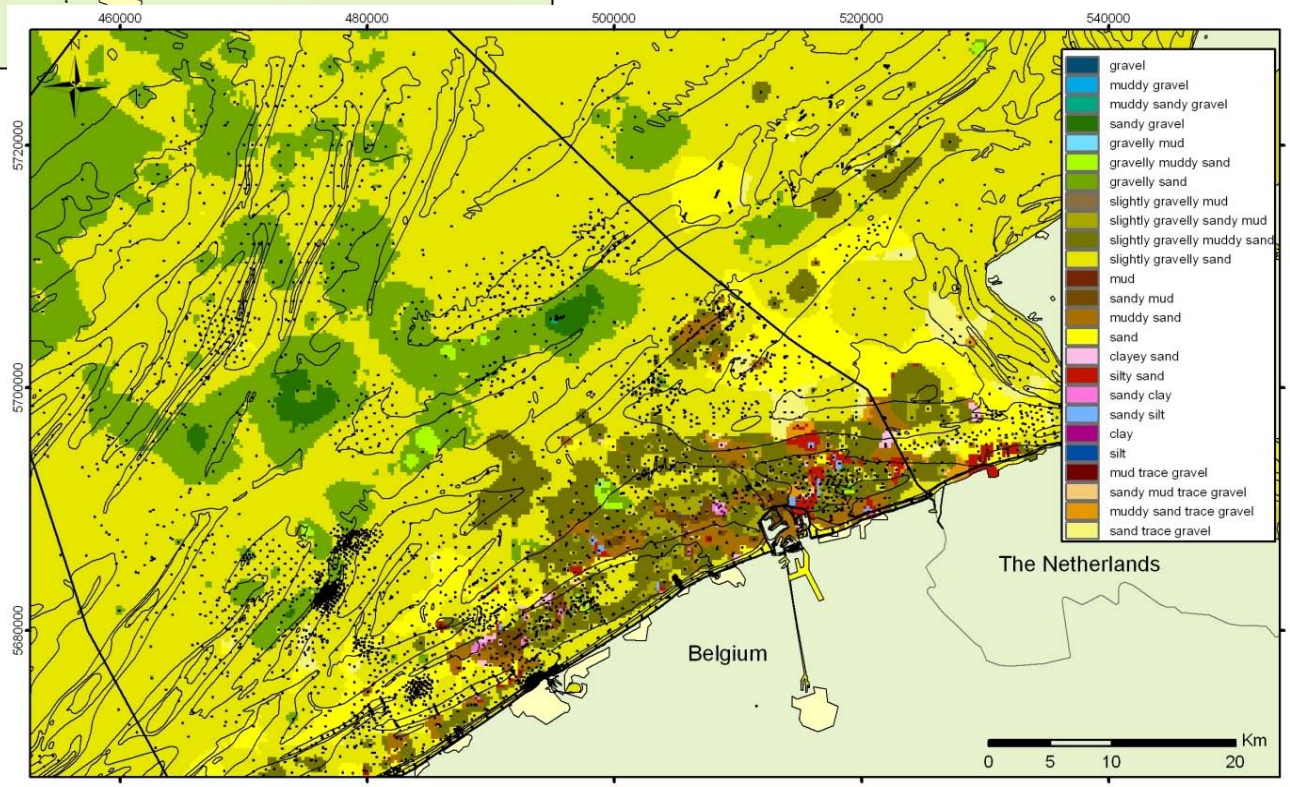
BUT PLEA FOR FULL DISTRIBUTION CURVE DATA



Geo-Seas

Modified Folk >
EMODnet Geology / EUSeaMap

SYSTEM KNOWLEDGE



Full Folk
more meaningful for
Assessments MSFD?

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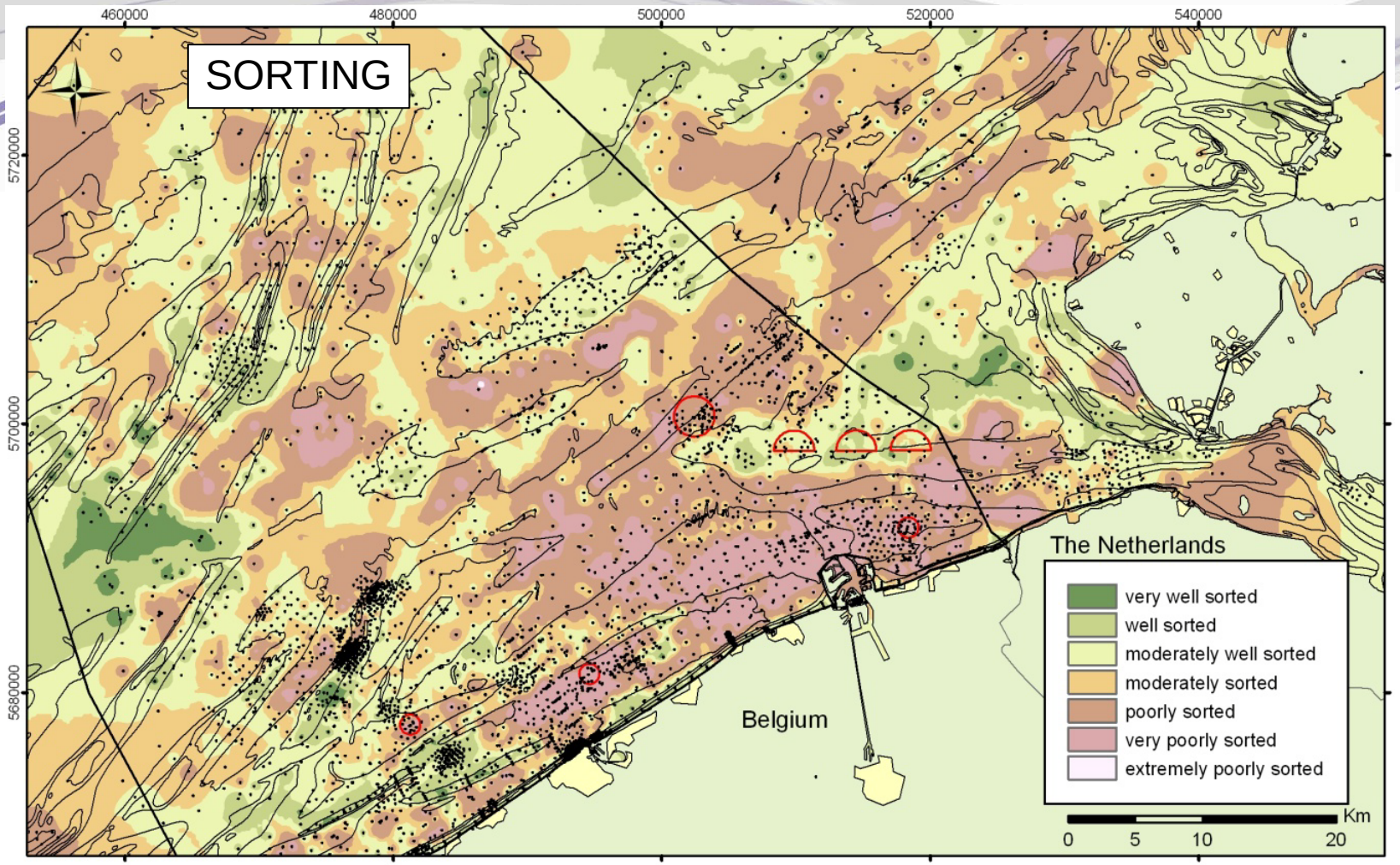
Van Lancker & van Heteren

Sediment characterisation

Geo-Seas



Flexible sediment parameter mapping enhancing habitat mapping

PROCESS KNOWLEDGE (e.g. changes in time)

Sediment characterisation

MULTI-SCALE CASE STUDIES

Geo-Seas

SCALE

- MULTIPLE GEOLOGICAL DATA SETS USED FOR INFERRING THE **DISTRIBUTION OF THE LESSER SANDEEL** (AMMODYTES MARINUS) IN THE NORTH SEA. **GEUS**, *Jorgen Leth*

- USING SEDIMENT DATA FROM THE GEO-SEAS DATABASE TO EXAMINE **THE EFFECTS OF SEDIMENT ON THE SPECIES** COMPOSITION IN BEAM TRAWL SAMPLES IN THE WESTERN ENGLISH CHANNEL.
  CEFAS, *Sven Kupschus, Roger Coggan and Claire Mason*

POSTER

- SEABED CHARACTERIZATION IN SHALLOW WATERS USING **MULTIBEAM BACKSCATTER** DATA. **GSI**, *Xavier Monteys et al.*

POSTER

- REVISITING THE SPATIAL DISTRIBUTION OF EUNIS LEVEL 3 NORTH SEA HABITATS IN VIEW OF EUROPE'S **MARINE STRATEGY FRAMEWORK DIRECTIVE**.
  MUMM & TNO, *Vera Van Lancker & Sytze van Heteren*

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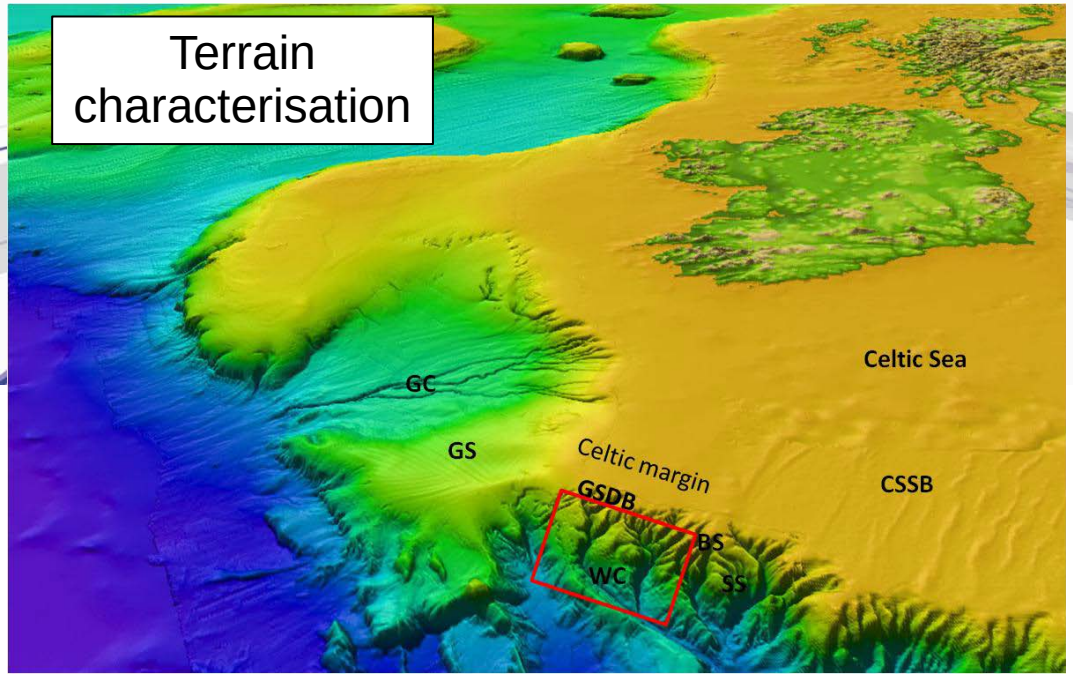
Conclusions ***Sediment***

- Sediment is the most often used **surrogate** for habitat mapping in a EU context;
- Sediment characterisation is a **stepwise, multi-faceted** activity (e.g. field, laboratory, derived from remote sensing);
- Digital data allows **flexible sediment parameter mapping** making use of the full potential of sediment databases;
- Acoustic data allow full-coverage mapping of seabed **heterogeneity**, and provide understanding of **scale** and **resolution** issues;
- For assessments of habitat extent, **confidence** is critical; **probability mapping** is recommended.

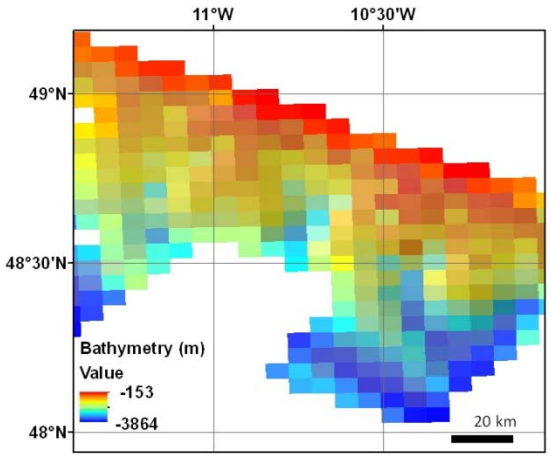
Terrain characterisation



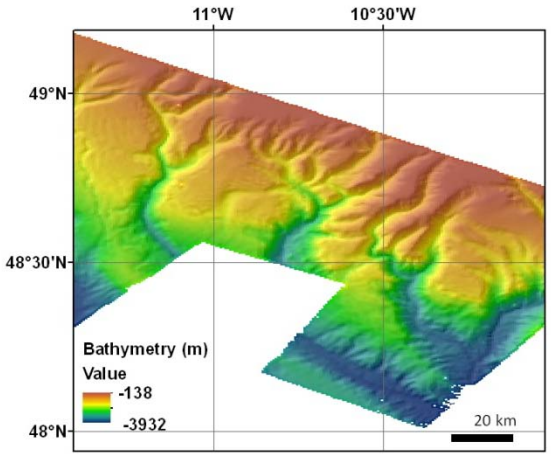
Geo-Seas

Seabed terrain characterisation at the Celtic Margin, Offshore Ireland

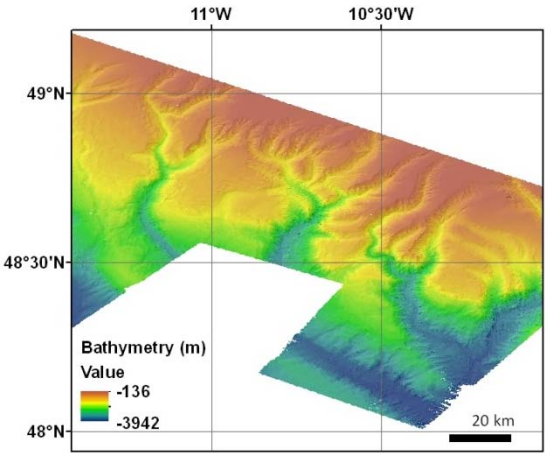
SYSTEM KNOWLEDGE



5km



500m



50m

Trade-off between mapping cost and level of detail

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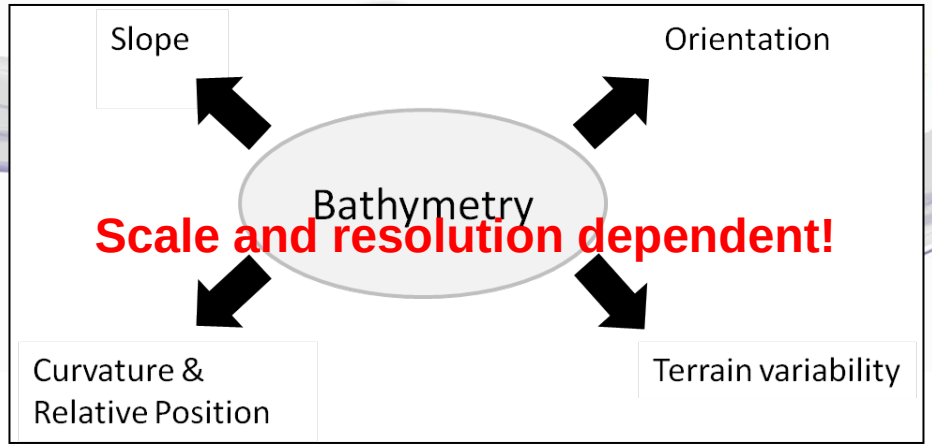
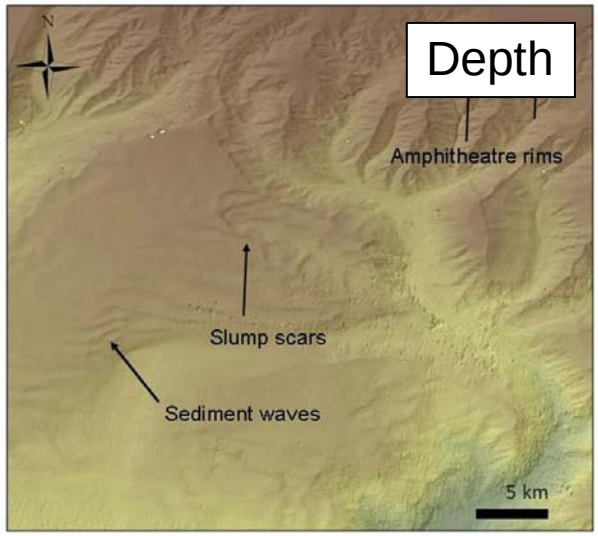
SEVENTH FRAMEWORK PROGRAMME

Terrain characterisation

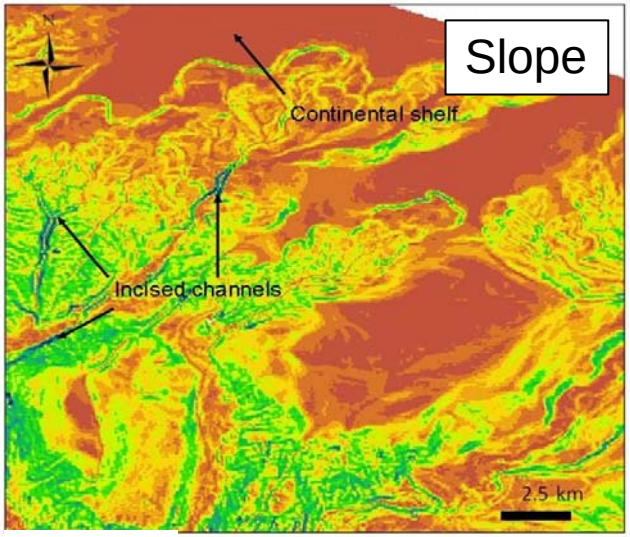
Derivates of DTMs enhancing habitat mapping



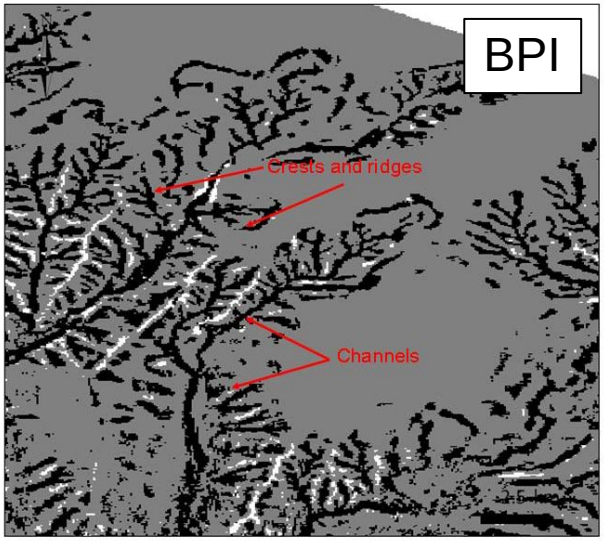
Finding and quantifying links with habitats



Bathymetry (m)
Value
-136
-3942



Slope (degrees)
0 - 3
3 - 7
7 - 11
11 - 15
15 - 20
20 - 24
24 - 30
30 - 37
37 - 48
48 - 80



Broad Scale BPI
-558 - 0
0 - 26
26 - 824

Benthic position index

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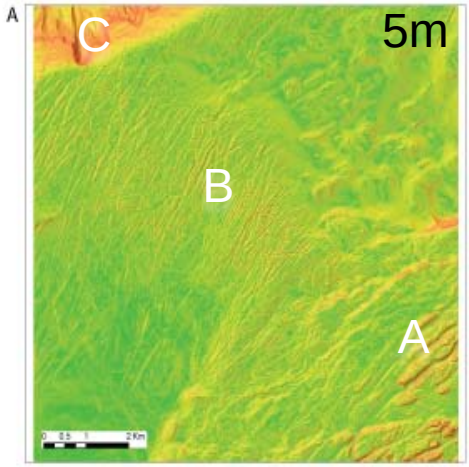
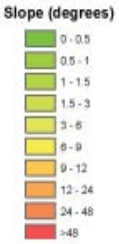
SEVENTH FRAMEWORK PROGRAMME

Terrain variables

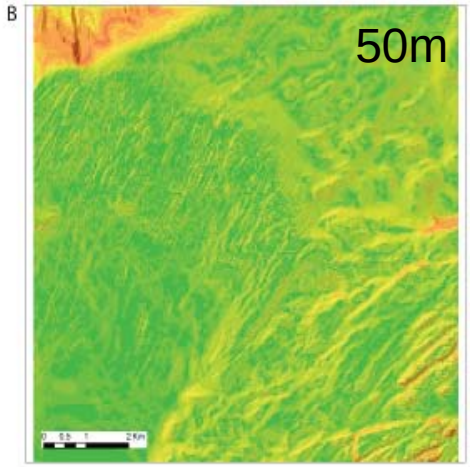
- scale, resolution and computation methods matter

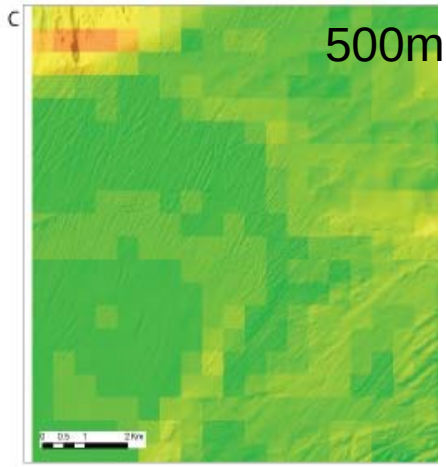


e.g. resolution

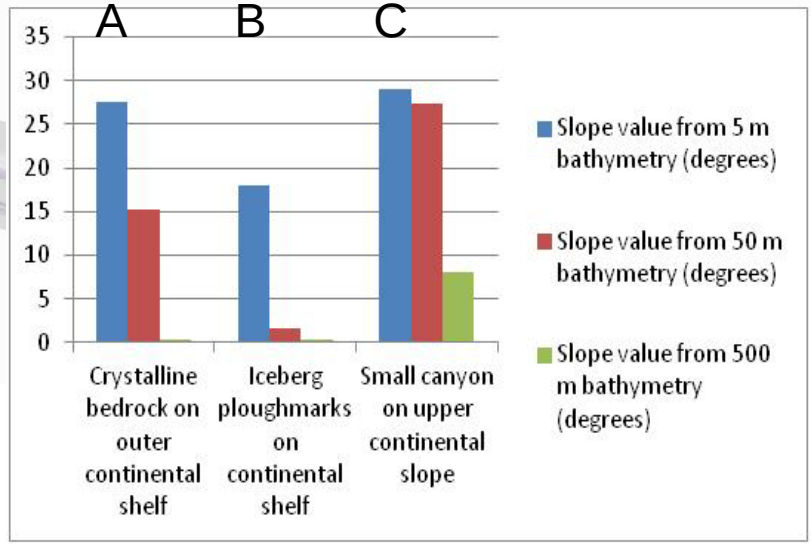


The same colour scale is used for slope values across each cell size

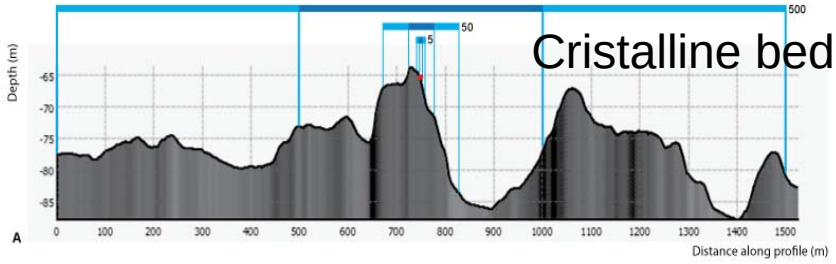




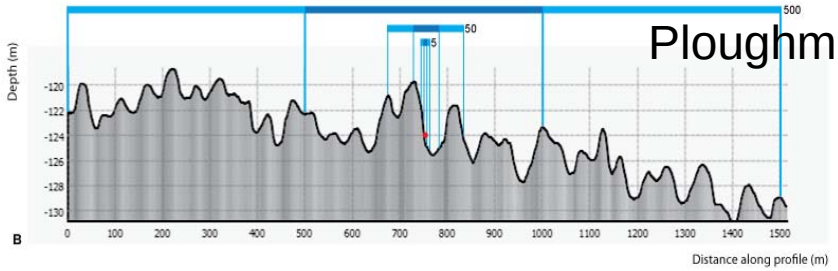
Examples of single-scale (3x3 analysis window) slope at three different cell sizes.



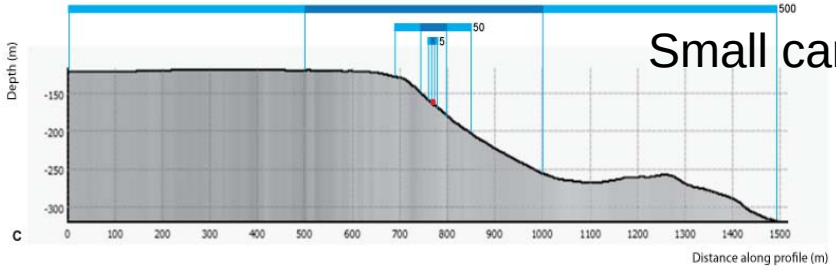
Importance of **length scales**



Cristalline bedrock A



Ploughmarks B



Small canyon C

Dolan e-infrastructure

Terrain characterisation

MULTI-SCALE CASE STUDIES

Geo-Seas

SCALE

- NE NORTH SEA AND THE SKAGERRAK AS WELL AS THE NORTHERN PART OF KATTEGAT COMPRISING DANISH, NORWEGIAN AND SWEDISH WATER. **GEUS**, *Jorgen Leth and Zaid Alhamdani*
- SUBMARINE CANYON SYSTEM AT THE CELTIC MARGIN, OFFSHORE IRELAND. **GSI,** *Janine Guinan*
- HABITAT AND SPECIES MAPPING, SANDBANK ENVIRONMENTS, BELGIAN PART OF THE NORTH SEA. **MUMM**, *Vera Van Lancker*

Conclusions ***Terrain***

- Many marine habitats listed in Directives are directly identifiable by **geomorpology**;
- For future development of classification systems (e.g. EUNIS) it is recommended to capture bathymetric and terrain variables in a **more detailed and standardised** way;
- Digital data allow (semi-)**automated classification** producing **derivate products** that can be tested for their relevance in habitat classification;
- **Multi-scale approaches** maximise the chance to develop ecologically meaningful data products.

Overall conclusions

- Plea for **interoperability** between data and data products (common infrastructure for accessing, sharing and exchanging harmonised data and data products);
- To best meet stakeholder requirements, **flexible querying and visualisation of data** are needed;
- **Flexibility** is also needed to conduct multiple analyses and select from these the ones that **best fit** their intended use.

We need more chefs and cooks !!

Deliverable: 2 Reports **AVAILABLE**

Geo-Seas

Sediment characterisation: Van Lancker & van Heteren (eds)
Terrain characterisation: Dolan and Thorsnes et al.

Geo-Seas

Pan-European infrastructure for management of marine and ocean geological and geophysical data

Home > Products

Data Products and Services

Geological and geophysical data comprise analytical data and data products which are derived from seabed sediment samples, boreholes, borehole samples, geophysical surveys (seismic, gravity, magnetic) of the seabed and sub-seabed, cone penetration tests, and sides can sonar surveys. The data, products and services being delivered by the Geo-Seas project can be used by a number of sectors including: environmental research and monitoring; academic research; government; national and regional agencies; dredging; marine hydrocarbons; beach nourishment; land reclamation; sustainable energy; civil engineering (pipelines, offshore construction, aggregates); communications (submarine cables); shipping; fisheries; and tourism.

As part of Geo-Seas a number of new data products and services are being developed with input from the user consultation that was conducted early in the project. This included an online user survey, conducted from mid December 2009 to June 2010 to learn more about user requirements, followed up by an in-depth user consultation conducted through one-to-one interviews, either in-person or by telephone, and small focus group meetings.

Geo-Seas develops the following new **data products and viewing services,** also in crossfertilisation with the on-going SeaDataNet II, One-Geology Europe, EMODNet Geology and EMODNet Hydrography projects:

- **Digital Terrain Model and 3D viewing software (available)**
- Digital Terrain Model and 2D viewing service (release October 2012)
- **Borehole Viewer software (available)**
- Low resolution seismic viewing service (available)
- High resolution seismic viewing service (release October 2012)
- **Standardization in seabed habitat mapping (available)**

Furthermore, OGC standards are adopted for the distribution and viewing services. These comprise Web Map Services (WMS) and Web Feature Services (WFS), supporting the quick viewing and visualization of data sets and data products.

News

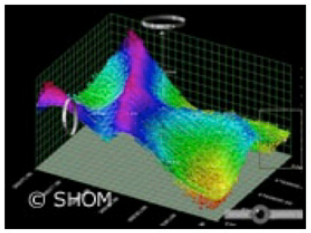
International Conference - 9-10 October 2012 - PROGRAMME and FINAL ANNOUNCEMENT now available

Geo-Seas International workshop - 9 & 10 October 2012

Geo-Seas at the 34th Session of the International Geological Congress

Project Review successful

More news »



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