European Digital Twin Ocean

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Deltares
12-12-'23

Make ocean knowledge accessible

- Prepare next generation of marine models

- Integrate in existing infrastructure

- Demonstrate capabilities
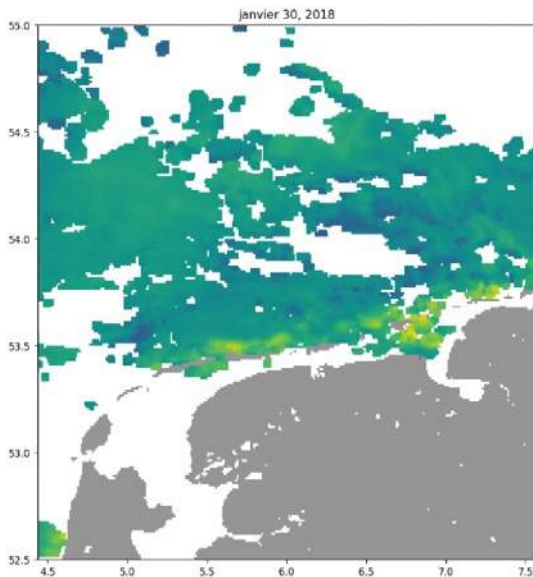
- Stakeholders become knowledge partners
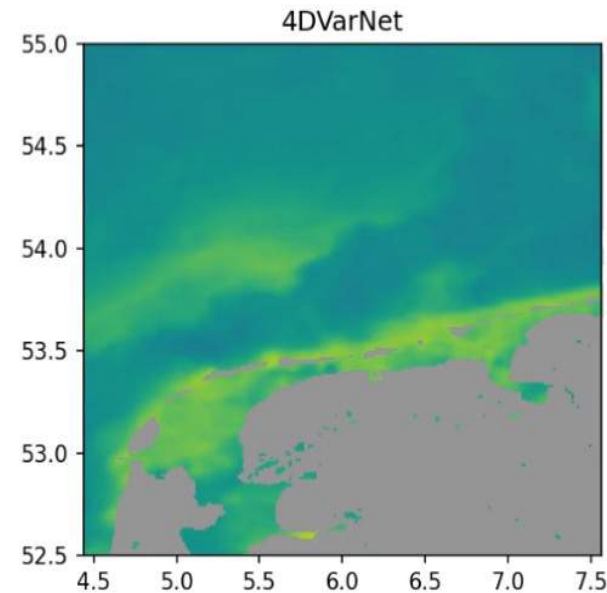
Prepare next generation of marine models

Hybrid modelling, using EO-data and AI

- Use earth observation and AI in numerical models

- **Speed up** simulation time

- Achieving better **interactivity**

- 4DVarNet for **SPM in Wadden Sea**

janvier 30, 2018

Snapshot of suspended sediment concentration using remote sensing (L3 product)

4DVarNet

Snapshot of suspended sediment concentration reconstructed with 4DVarNet (RMSE 0.126)

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Integrate in existing infrastructure

- Connect to HPC

- Connect to marine- & climate data

- Make components interoperable

Demonstrate capabilities
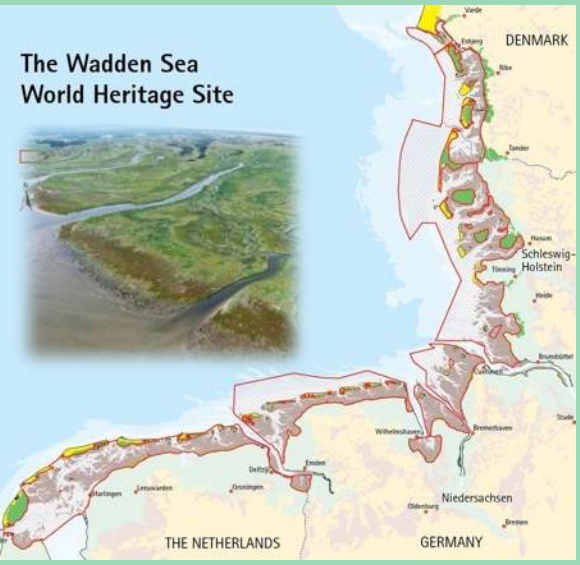
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Demonstrate capabilities: Focus Applications

1. Marine Protected Areas & biodiversity
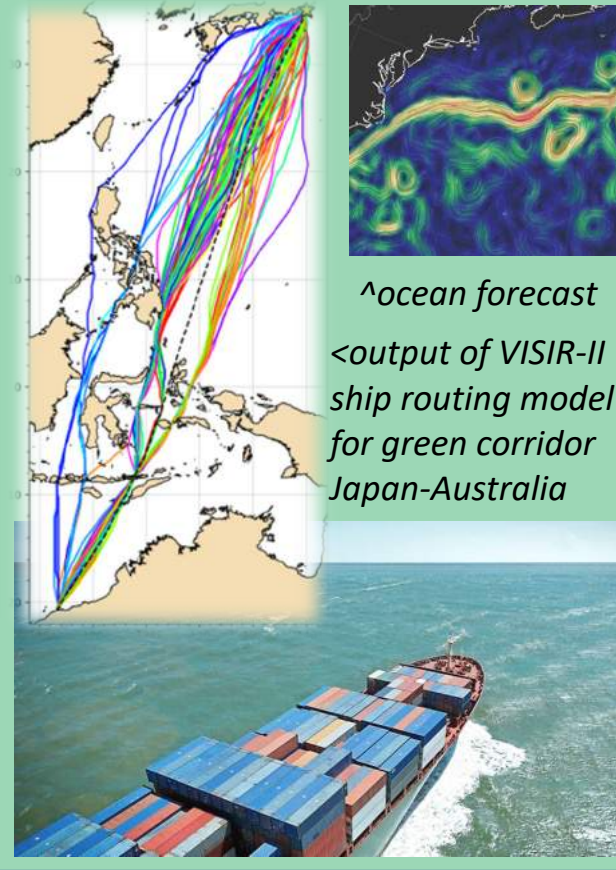Mapping habitat suitability ranges for protected species.

The Wadden Sea World Heritage Site
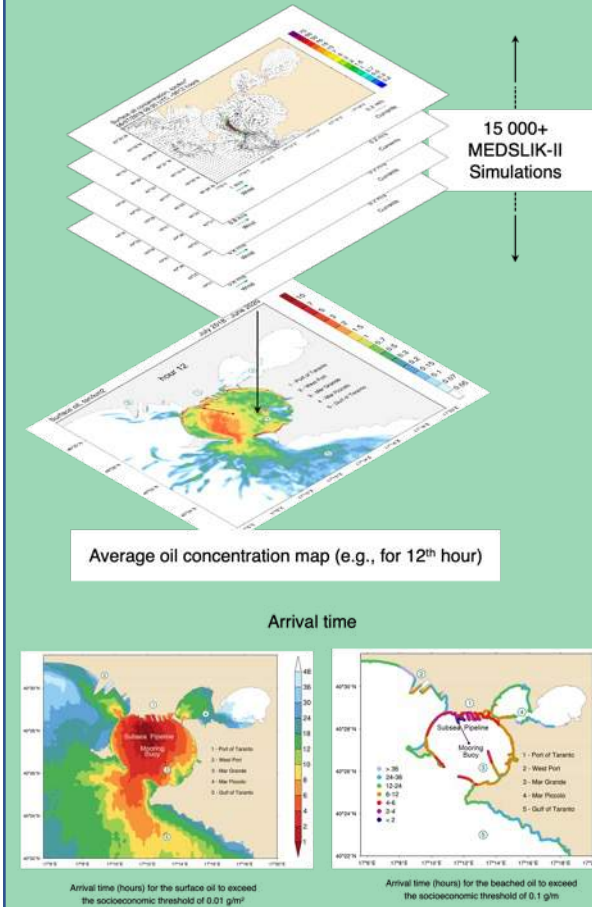
2. Ship routing for zero carbon
Using forecasts of ocean waves and currents to reduce CO2 emmissions

^ocean forecast

<output of VISIR-II ship routing model for green corridor Japan-Australia

3. Zero pollution
Simulating release of oil from ships and plastics from land.

15 000+ MEDSLIK-II Simulations

Average oil concentration map (e.g., for 12th hour)

Arrival time

Arrival time (hours) for the surface oil to exceed the socioeconomic threshold of 0.01 g/m²

Arrival time (hours) for the beached oil to exceed the socioeconomic threshold of 0.1 g/m

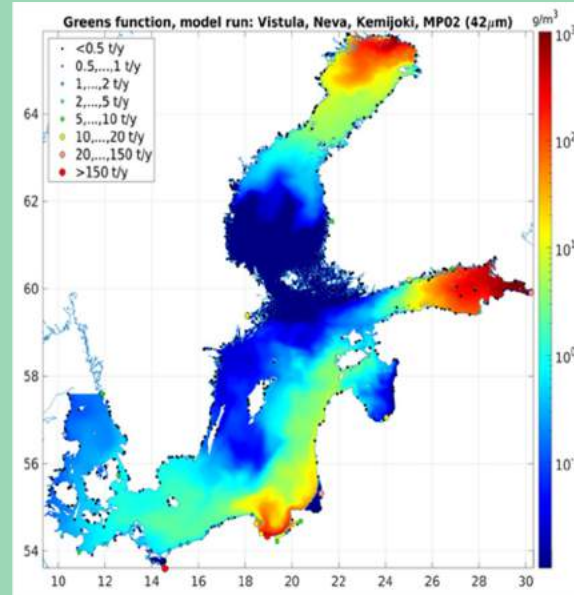# Demonstrate capabilities : *What if…? scenarios*

1. Nature based solution
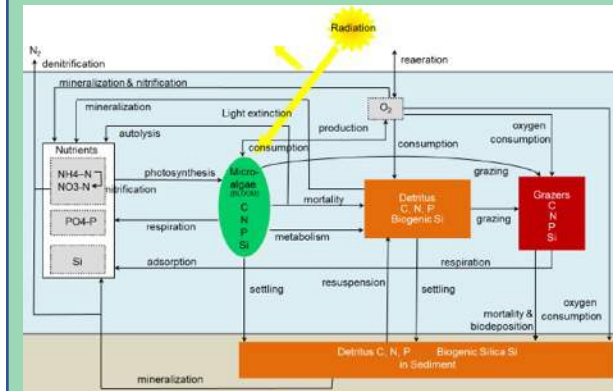
What if we reconstruct seagrass to absorb wave energy?
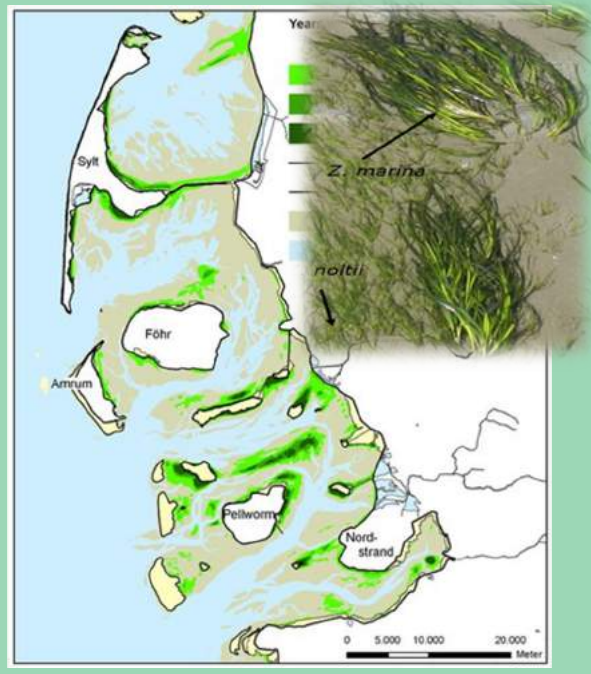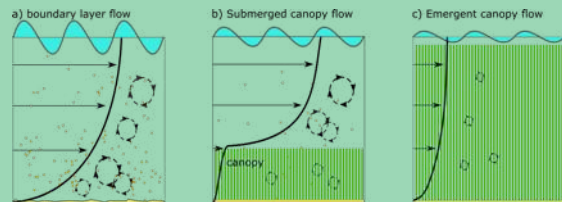
2. Marine Plastics

What if we capture plastics before they reach our seas? Modelling circulation and wave

Greens function, model run: Vistula, Neva, Kemijoki, MP02 (42μm)

3. Aquaculture & Zero Carbon

Simulating impact of large scale aquaculture farms (e.g. mussels) on carbon sequestration.

- Marine aquaculture offers growth opportunities for the Blue Economy.

- *What-if* Scenario to **analyze the impact of shellfish cultivation on carbon emissions**.

- Include **shell growth** of shellfish, using Dynamic Energy Budgeting (**DEB**) for **biocalcification**. *(Stechele & Levaud, 2023)*

- **Simulation of carbon** and nutrient **fluxes with Delft3D-FM** model of the Dutch Continental Shelf (**DCSM**), including Water Quality and DEB.
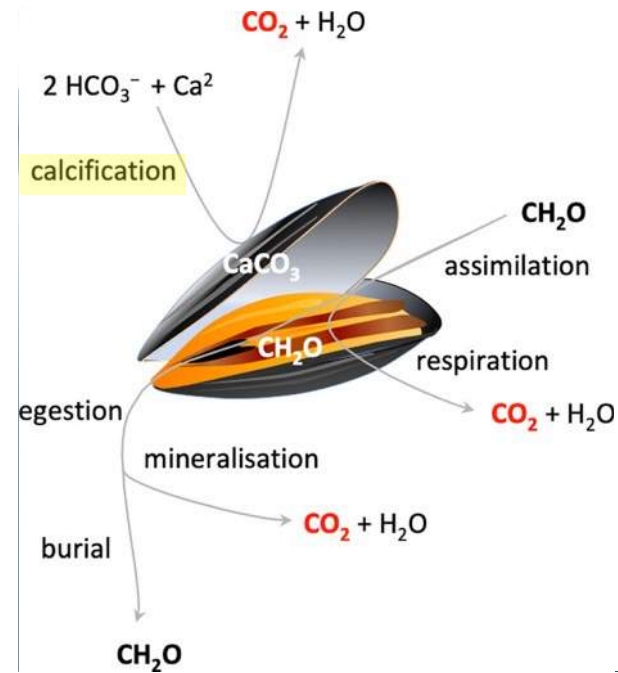
UI

Sea ice
NUMERICAL MODEL

Salinity
NUMERICAL MODEL

Temperature
NUMERICAL MODEL

Currents
NUMERICAL MODEL
ⓘ Learn more

Chlorophyll
NUMERICAL MODEL

Waves
NUMERICAL MODEL

0.8
0.6
0.4
0.2
0.0
m/s
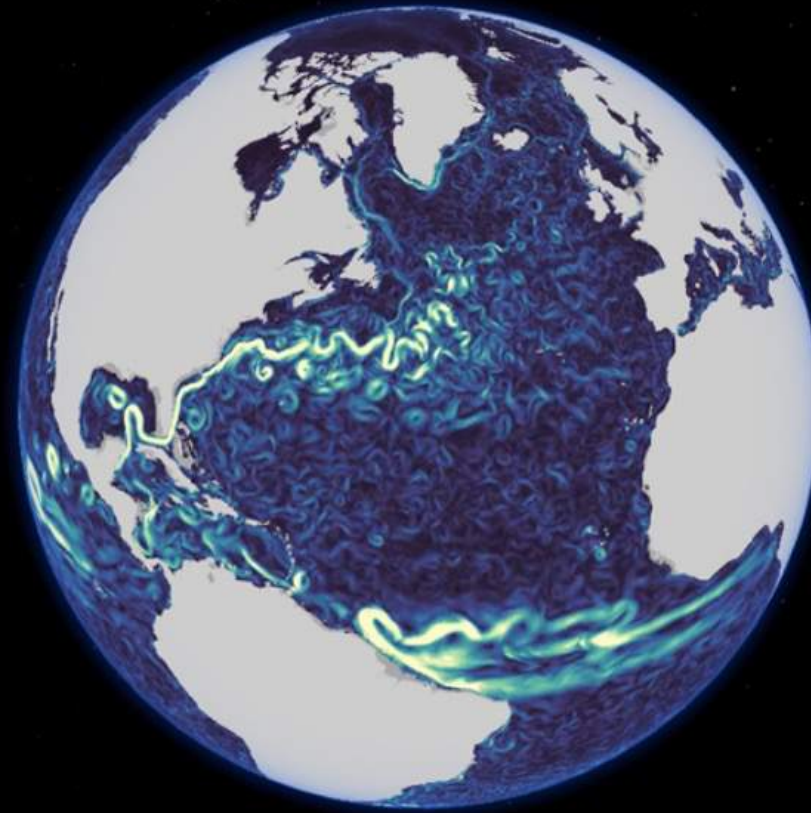
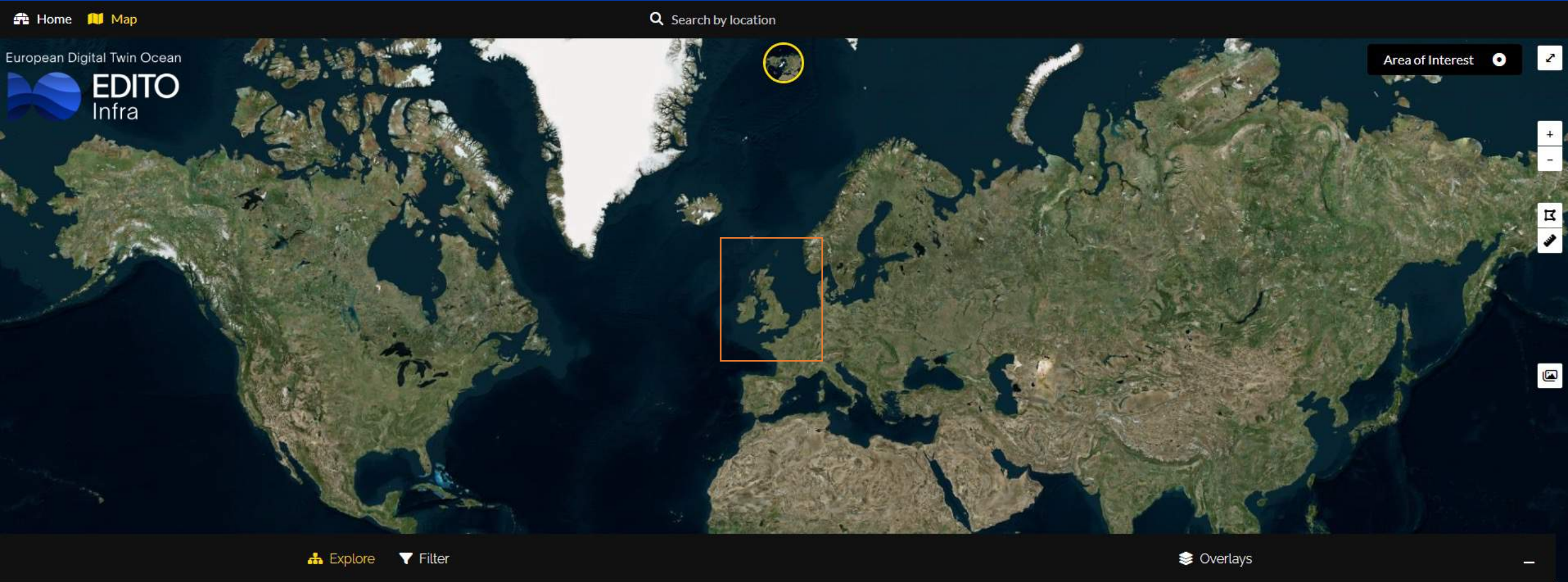*The EDITO-Infra Smart Viewer*

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