LEVERAGING DIGITAL TWIN OPPORTUNITIES FOR KEY SEA-ICE IMPACT SECTORS IN THE NORDIC AND BALTIC CONTEXT

NOrdic CryOSphere Digital Twin – NOCOS DT

Project duration: 2022–2024

Explore and pilot the digital twin technology opportunities and showcase how output from key initiatives like the Destination Earth (DestinE) Climate Adaptation Digital Twin (Climate DT) could be leveraged for key sea ice impact sectors in the Nordic and Baltic context.

In the longer term, deliver a major Arctic and Baltic contribution to the climate change information system developed by Climate DT, with cryosphere-related use cases at the interface between science and policy, in line with the overarching Destination Earth approach.

Ridged ice

(led by TalTech)

Ridged ice can be hazardous for offshore and coastal construction and it limits the servicing and maintenance of offshore facilities. It is important to consider the ridged ice related risks during the design of constructions to assure optimal maintenance and servicing costs of each facility. Ridged ice occurs in areas of high ice dynamics and especially close to the coastal zone, which often coincides with the interest area of coastal developers (e.g. wind farms, aquafarms, Floating Storage Regasification Units). Knowledge about the probability of ridged ice occurrence is also beneficial for safe winter navigation and ice breaking. Knowledge of expected changes in ridged ice will have a considerable social impact as it helps to increase safety of wintertime navigation as well as to prevent ice-related hazards for coastal structures.

Goal

The goal of the application is to enhance and innovate the calculations of ridged ice probability.

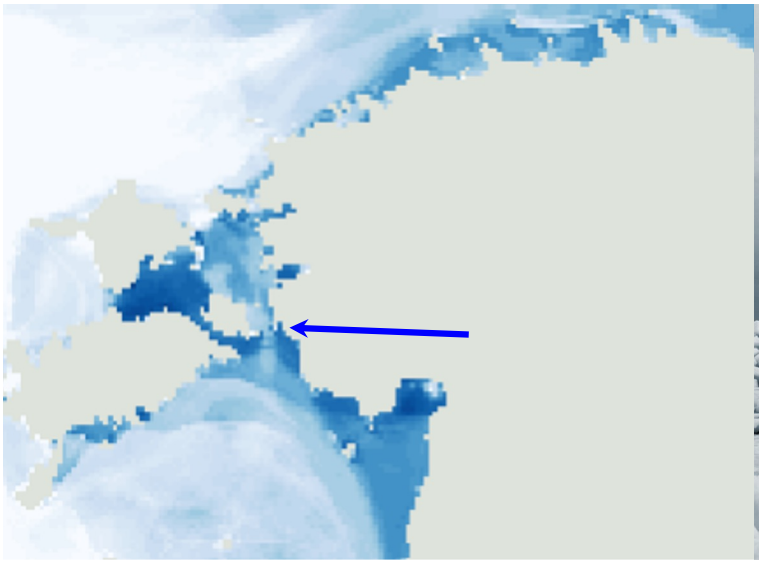
Models and data

The regional configuration of ice model data, supplemented with Copernicus reanalysis, is utilized to establish a climatology for ridged ice.

Potential users

Additional potentially interested parties besides wind farms, aquafarms and Floating Storage Regasification Units could be:

- Maritime Authorities: Authorities in Baltic Sea countries interested in ridged ice data for safe navigation, ice advisories, and icebreaker management.
- Shipping Companies: Vessel operators requiring information on ridged ice for assessing risks, planning routes, and ensuring maritime operations' safety.
- Fishing and Aquaculture Industry: Relies on accurate ice information to assess impacts, plan operations, and ensure safety for fishermen and vessels.
- Insurance Companies: Require ridged ice data to assess risks, underwrite policies, and set premiums for maritime assets in cold regions.



Ice ridging probability, 2014 February

Virtsu, 2014

Developments

Developing an application to estimate the quantities and probability of ridged ice and correlating it with the parameters available from the DT.

Foreseen DestinE capabilities

Probability of ridged ice.

Capabilities provided to DestinE

Provide accurate and reliable data on ridged ice, enabling improved navigation, safety, and risk assessment for maritime operations.

This also enhances operational efficiency and supports environmental monitoring and research efforts in understanding ridged ice dynamics and their impact on the marine environment.

Key innovations

Although ice ridging is not a common ice DT output parameter, the availability of reliable proxies for ridged ice can greatly enhance navigation and safety in marine activities.

Funding

Nordic Council of Ministers

Partners

CSC
ICT Solutions for Brilliant Minds

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