

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.

Ship navigation risk indicator

(led by FMI)

Ship navigability in ice-covered sea depends on sea ice concentration, ice thickness, fraction of pressure ridges and multi-year ice as well as ice speed and compression, but also importantly the ice class of the vessel. The International Maritime Organisation (IMO) has introduced a Risk Index Outcome (RIO) method to provide ship-specific guidelines for safe navigation in ice-infested waters. Calculating RIO needs accurate, high-resolution sea ice information.

Goal

Improved information on navigability – develop a method to calculate a navigation risk indicator similar to RIO from model data and to estimate probabilities of sea ice extremes.

Potential users

Open-source code would be published on GitHub for scientific use, and the forecast of risk index could be provided to shipping companies.

Models and data

In the first phase, Copernicus, ECMWF and CMIP6 sea ice forecasting products will be used to develop the navigation risk indicator. In the second phase, the calculation method will be implemented within the Climate DT environment where the input data will be streamed from the global high resolution climate digital twin. In addition, an ice / no ice climatology and trend will be derived.



Developments

In addition to traditional sea ice variables like concentration, thickness and velocity, sea ice pressure, fraction of deformed ice and RIO index will be derived. Statistic analysis includes estimating the return period of extreme events and their spatial and temporal variability.

Key innovations

Risk index outcome which is a new parameter in model

Foreseen DestinE capabilities

Risk index of ship navigation forecast

Capabilities provided to DestinE

Under global warming circumstances, the possible opportunities and the risk related to navigation in ice-infested water. It is important for offshore structure and ship designs.

Funding



Nordic Council
of Ministers

Partners



CSC
ICT Solutions for
Brilliant Minds



ILMATIETEEN LAITOS
METEOROLOGISKA INSTITUTET
FINNISH METEOROLOGICAL INSTITUTE



Norwegian
Meteorological
Institute

Contact

nocos@listat.csc.fi

