

EGU24-12451, updated on 18 Jan 2025

<https://doi.org/10.5194/egusphere-egu24-12451>

EGU General Assembly 2024

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## **Development of ship navigation risk indicator in sea ice-infested water**

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There's increasing transpolar shipping in both the Arctic and Antarctic as a result of the reduction of sea ice and the desire from social economics. Sea ice is a hazard for shipping in ice-infested water, 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, it also depends on the vessel ice class. IMO introduced Risk Index Outcome(RIO) to provide guidelines for safe navigation, calculation of RIO requires accurate sea ice information including sea ice concentration and thickness. We developed a method similar to RIO to calculate navigation risk indicators using forecasting models including ECMWF S2S data, Copernicus data, and DMI data. Other than conventional sea ice parameters sea ice concentration and sea ice thickness, ice salinity, and ice age are also taken into account in risk indicator calculation. We select the time March 2019 -Oct 2020 and adopt the initial condition of the model forecast for sea ice to demonstrate the capabilities of seasonal forecasting of this navigation risk indicator in different models. In future, the calculation method will be implemented within the ClimateDT environment.