Oil Drift Modeling in Ice and the OpenDrift Tool

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Why are models important?



- 300,000 litres of diesel onboard;
- Harsh conditions: -20°C and strong winds;
- Ran aground next to the nature reserve in *Nordaustlandet*

Rescue: <u>https://www.tv2.no/v/1409065/</u> Simulation: http://app4sea.com/



Credits: Kystverket

www.app4sea.com



- 🔲 🚚 Oil Spill Response Sites, Vessels and Airplane
- 🔲 🛄 Oil spill incidents 🕢
- Dil Spill Simulation: Actual Incidents (1)
- 🔺 🖃 🛄 Oil Spill Simulation: Hypothetical Incidents 👔
 - Helge Ingstad 2018 (i)
 - Northguider 2018 (1)
- 🔲 🚚 Hydrocarbon fields in UK waters [DECC] 😱
- 🔲 🚚 Hydrocarbon fields in Norwegian waters 👔
- Arctic Shipping Traffic Density (1)
- 🔰 🔲 💭 Climate, ocean and weather 🕡
- 💿 🔲 Ecological zones 🕦

1 J Useful Information

- About App4Sea and NPA
- Oil spill incidents and response
- OSR best practice
- ITOPF Country Profiles
- Related sites and projects



OpenDrift - Open Source Lagrangian Framework (https://opendrift.github.io/)



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OpenDrift - Hypothetical Oil Spill in the Pechora Sea



Pavlov et al. (2021): https://doi.org/10.3390/resources11010001

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Aguiar et al. (2022): https://doi.org/10.1016/j.marpolbul.2022.113393

Difficulties and Limitations

• Sea ice adds a new dimension to an already difficult problem.

• Not enough data to better understand transport and weathering processes.

Numerical models have limitations (resolution, parameterizations, data assimilation), so not all scales are properly represented → encapsulation, percolation and oil-wave-ice interactions may not be made operationally available in the next few years.

Oil Spill Response in the Arctic and in the Baltic in Icy Conditions - POPCORN Webinar - 07.04.2022



• Numerical models are useful resources for operational OSR and impact assessment.

• OpenDrift is freely available for use and improvements.

• Limitations and uncertainties are intrinsic features in modeling.

• Still lots of work to do → improve weathering algorithms, provide uncertainty estimations and enhance communication with different stakeholders.