

An interdisciplinary and stakeholder-informed approach to understand sea spray icing risks and decision-making

Dina Abdel-Fattah, PhD

Associate Professor

Department of Technology and Safety

UiT – The Arctic University of Norway

Truls Bakkejord Ræder, PhD

SINTEF Tromsø

SPRICE



UiT The Arctic
University of Norway



KYSTVERKET
NORWEGIAN COASTAL ADMINISTRATION



Norwegian
Meteorological
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Spray icing

- Ice accumulation on vessels and other marine-based infrastructure
- Major risk and major challenge for marine activities in Arctic waters
 - Vessel instability and/or capsizing
 - Loss of economic revenue
 - Loss of life



Dehghani-Sanij, A. R., Dehghani, S. R., Naterer, G. F., & Muzychka, Y. S. (2017). Sea spray icing phenomena on marine vessels and offshore structures: Review and formulation. *Ocean Engineering*, 132, 25-39.

Spray icing prediction

- *It's complicated*
 - Chaotic nature of icing + its correlation with large number of parameters
- Historical data and climate change
 - Influence of meteorological parameters on icing rate from a statistical point of view (Mertins, 1968), and sea spray algorithms (Stallabrass, 1980; Samuelsen, Edvardsen and Graversen, 2017)
 - Under climate change, direct use of historical data does not lead to accurate predictions
- **A need for recent and frequently updated data**

Crowd-sourcing observations

- Types of observations:
 - Weather observations
 - Spray icing incidents
 - Accidents or near-miss accidents
- Use of sea spray icing forecasts

Benefits of crowd-sourcing observations

- Collects information from a real userbase, in real-time
- Creates a connection between science and society
- Allows for an opportunity to gain feedback from important stakeholders on the applicability of information collected, as well as how it is / can be used

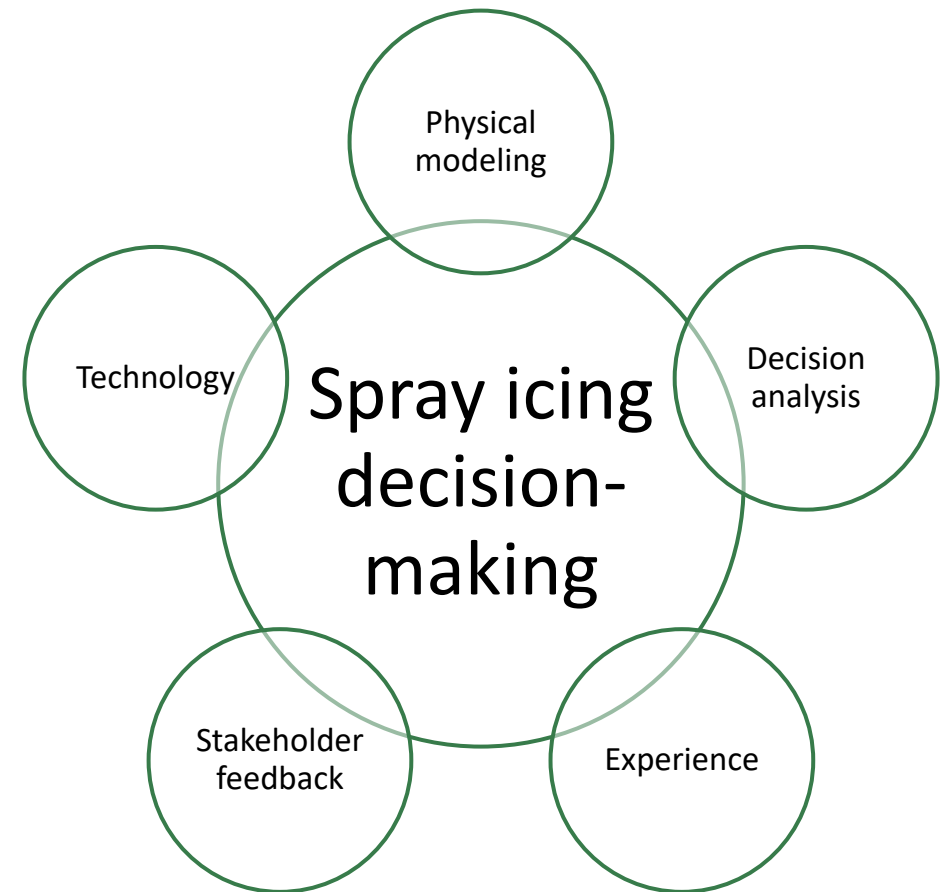
Spray icing decision-making



Interdisciplinary research,
combining the physical and
social dimensions of spray icing



*Complex problem, which
requires multi-faceted research*



Understanding spray icing decision-making

Can they actually use this information?

Who are “the stakeholders”?

What are their information needs?

What decisions do stakeholders face, in a spray icing event?



Source: Norges Fiskarlag

What are (some of) the decisions stakeholders face?

Spray icing event-related decision-making

- Land-based decision-making: to go out to sea or not?
- Water-based decision-making: how to read and interpret weather conditions
- Event decision-making: how to respond to a spray icing incident
- Post-event decision-making: how to recover (immediately) from a spray incident
- Future planning decision-making: lessons learned for future events based on a near-miss or spray icing accident

Long-term forecasting decision-making

- What factors will change in our understanding and interpreting of weather conditions
- How do these changes affect our ability to prepare, operate, respond, and recover regarding spray icing events

Who are “the” stakeholders?

Fishing community

- Small as well as large fishing boat operators

Fish farming industry

Maritime vessel operators

- Both leisure and professional vessel operators

Search and Rescue

Norwegian Coastal Administration

More to be identified!

What are stakeholder information needs?

- Traditional (i.e. tried and tested) and non-traditional (i.e. new products, previously not used before) information resources
- Traditional: “the way of doing things,” “what works”, experience
- Non-traditional: new, innovative products and information resources, interesting to consider but no proven or existing “good track record”

What are (some of) the barriers to information use by stakeholders?



Information

Availability

Accuracy

Frequency

Trust



Uncertainty

Changing weather and climate conditions

Landscape of relevant actors and maritime operators



Time

Too many demands, too little time to meet or prepare for them all

In the case of a spray icing event, rapid onset limits response capacity

Current progress

- Ongoing identification of potential pool of stakeholders
 - Do reach out with suggestions or if you want to participate yourself!
- Gathering and analysing stakeholder feedback (via interviews)
- White paper under preparation, to compile the different decision-making contexts for spray icing
- Initial launch of spray icing app interface

Path forward and collaboration opportunities

- Important to leverage other user-producer information production knowledge gained and lessons learned
- We are not only interested in creating a viable end product, but also a **process** that amplifies user and producer needs and information
 - User-centric design, stakeholder engagement, knowledge co-production, and collaborative software design are all research topics our project can contribute to more broadly
- We also can contribute to and support other apps and information product development that are focused on understanding their stakeholder / user decision-making contexts



Questions?

dina.abdel-fattah@uit.no