MOSIDEO/CIRFA Experiments on Behavior and Detection of Oil in Ice

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The Research Council of Norway

Goals

- Preparedness and response to oil in sea ice-covered waters
- When does oil melt out of the ice?
  → Scenario development to ensure preparedness
  → Optimize timing of spill response
- When can oil be detected with remote sensing techniques?
  → Optimize use of resources


Photo: D. Dickins


Photo: Gazprom

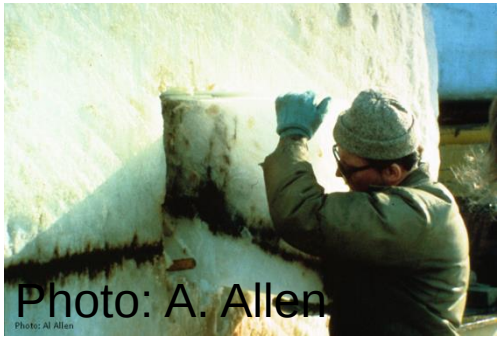
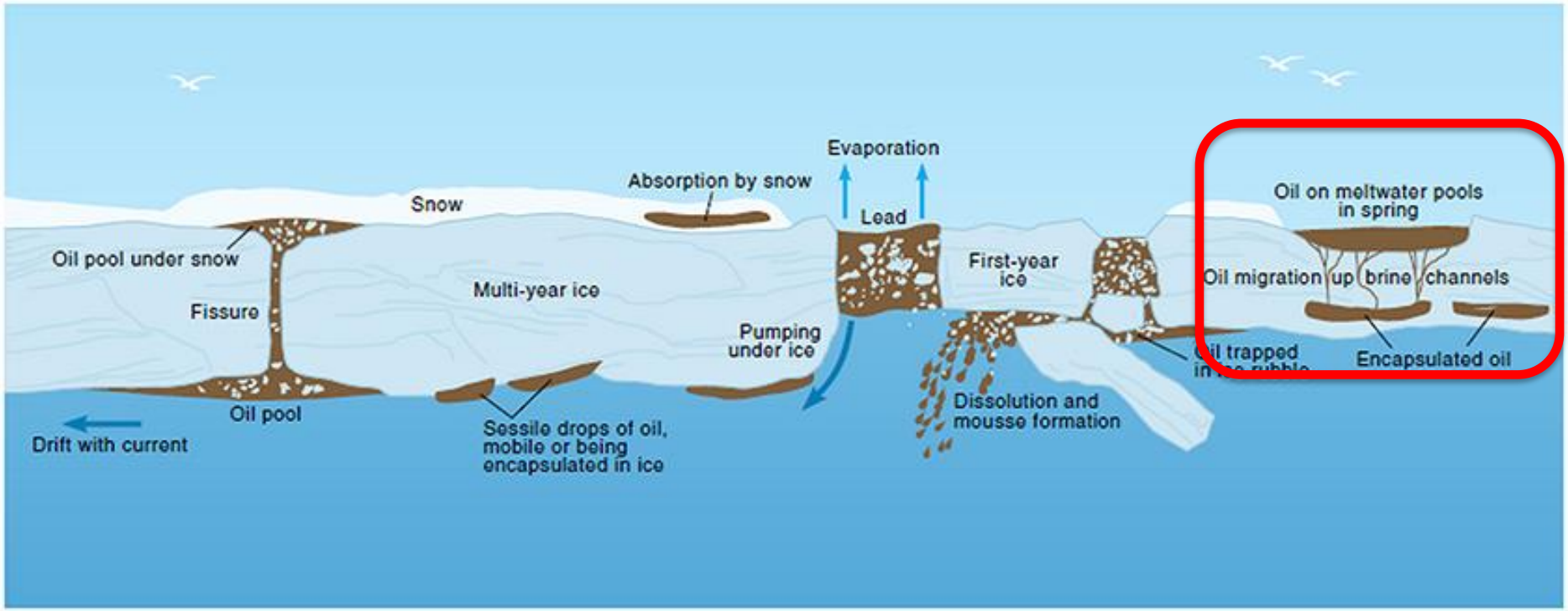


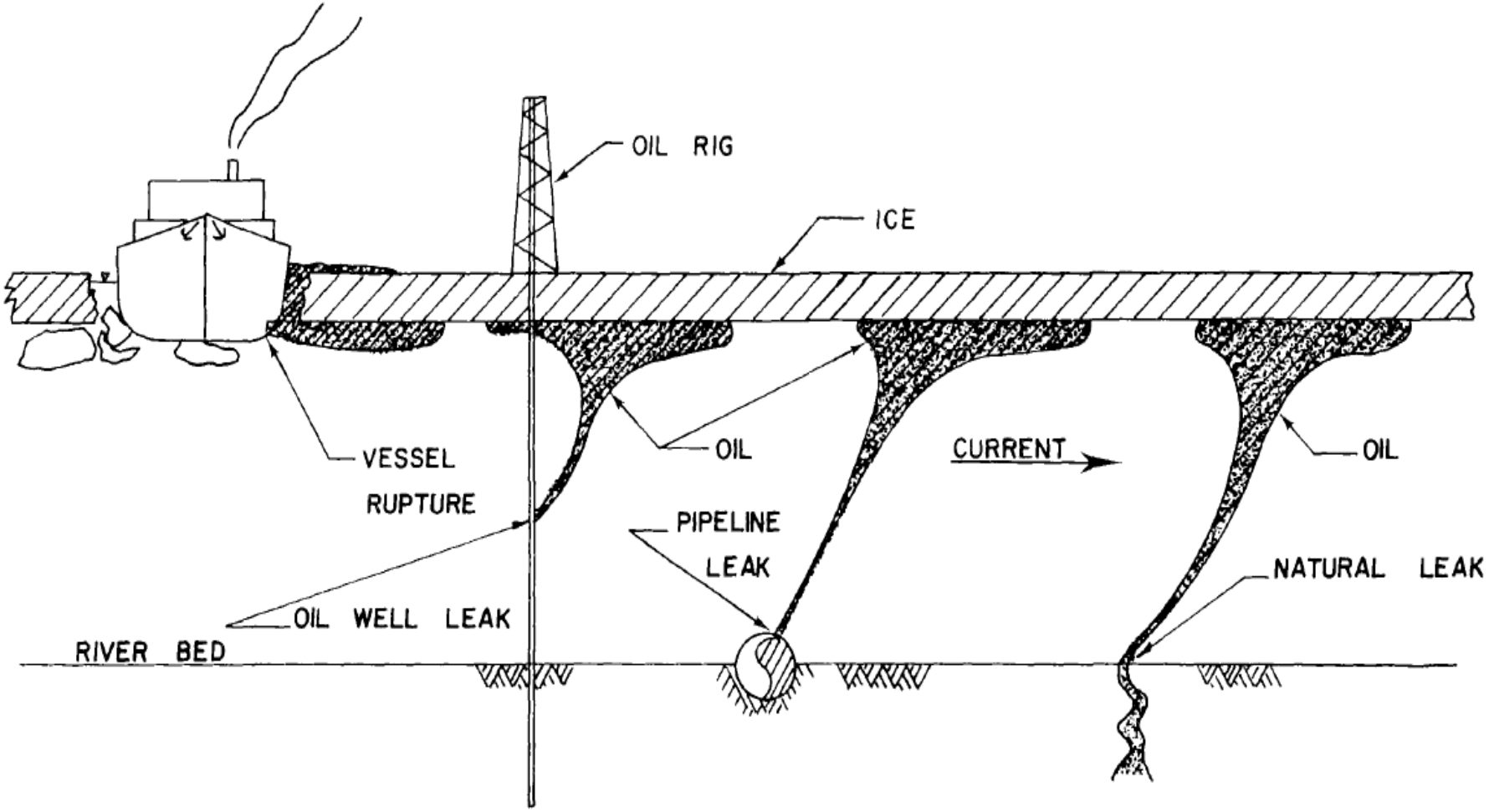
Photo: A. Allen


Photo: D. Dickins

Oil-in-Ice Scenario

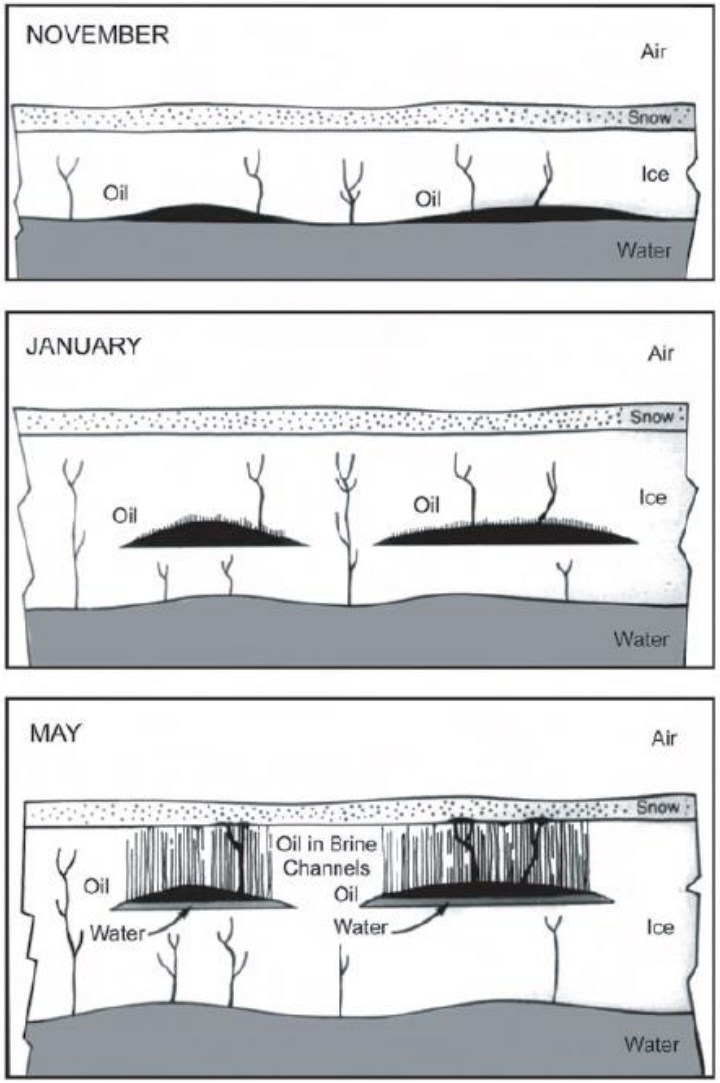


Oil-in-Ice Scenario

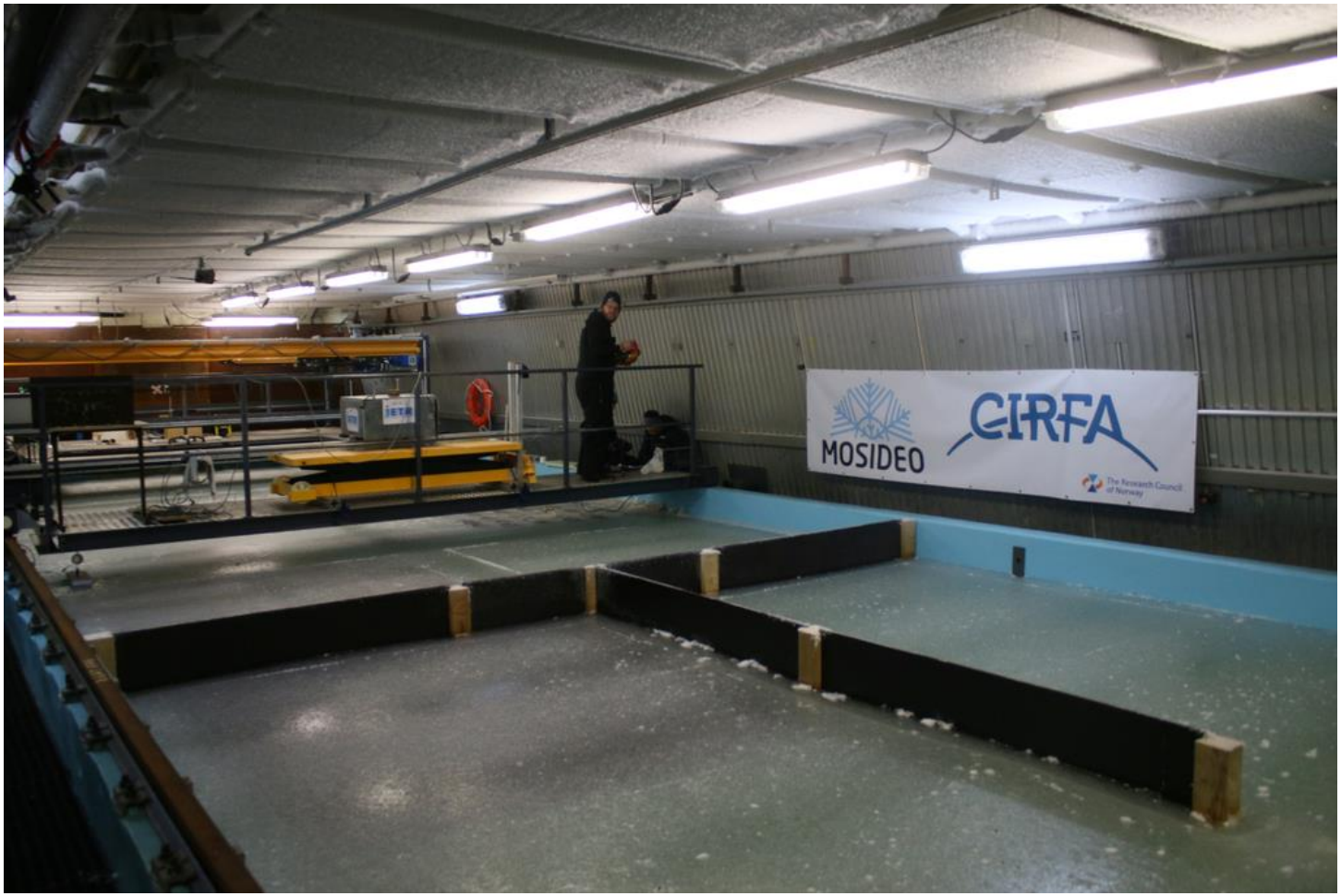


From: Uzuner et al. (1979)

Oil-in-Ice Scenario



Experiments performed at HSVA Arctic Environmental Test Basin (AETB), Hamburg



Experiments performed at HSVA Arctic Environmental Test Basin (AETB), Hamburg

* two research projects, jointly
* financed by Research Council of Norway and industry partners
* 3 weeks
* sea ice microstructure and
* remote sensing
* 14 researchers
* total: 1 man-year of time on-site

Experiment

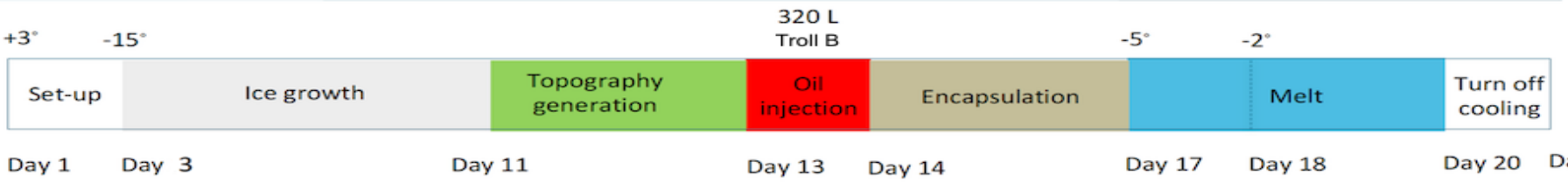
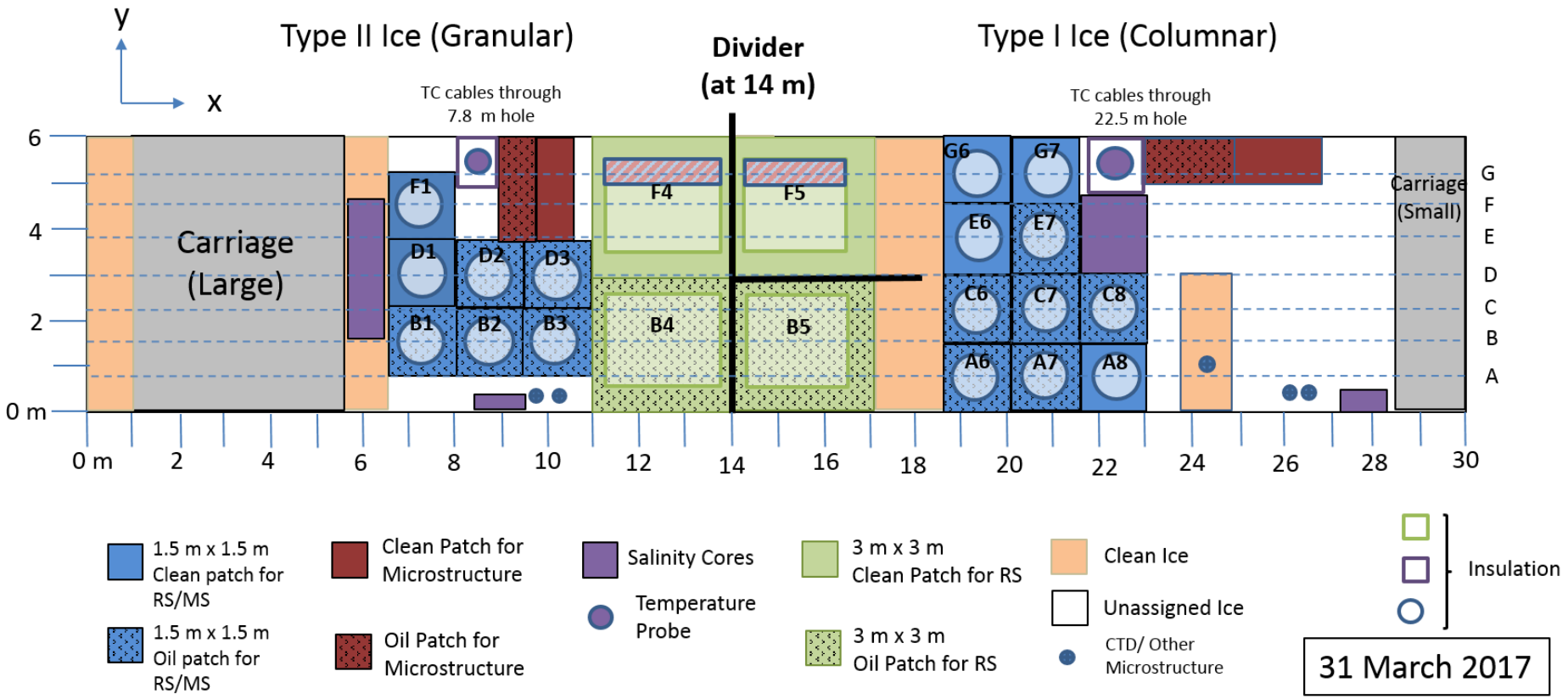
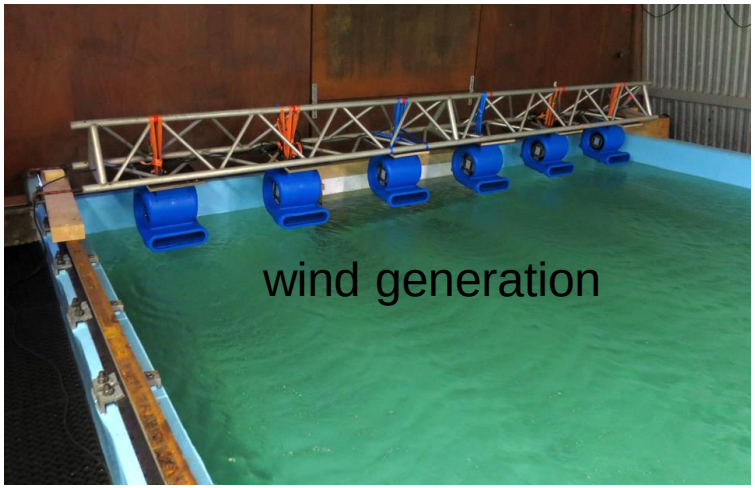


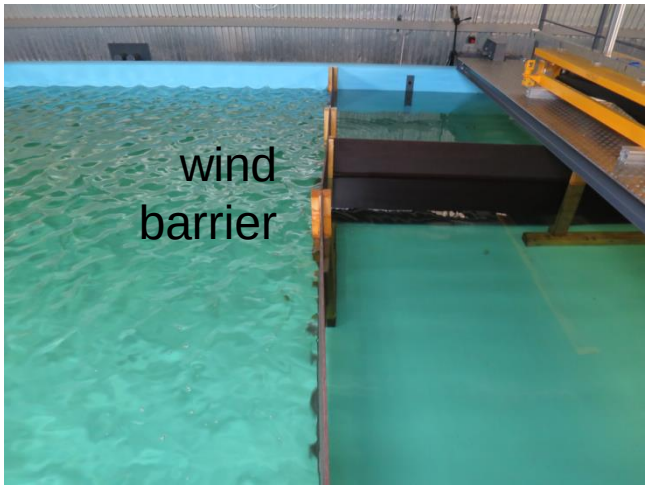
Figure: Marianne Myrnes

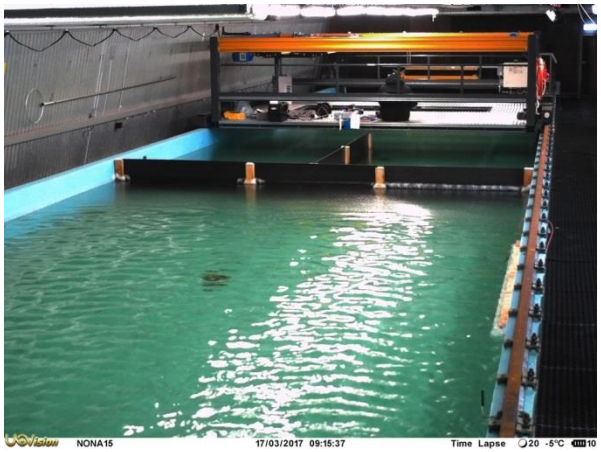


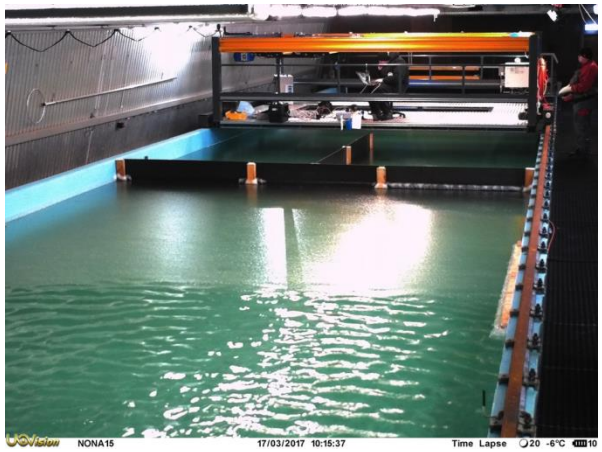
Sketch: Megan O'Sadnick

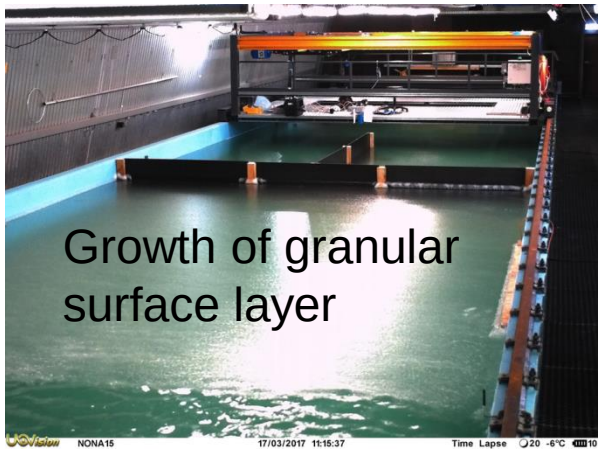
Simultaneous Generation of Granular and Columnar Ice











1 hour → 1 hour →

in the end: 7 cm granular surface layer

Artificial Snow Drifts

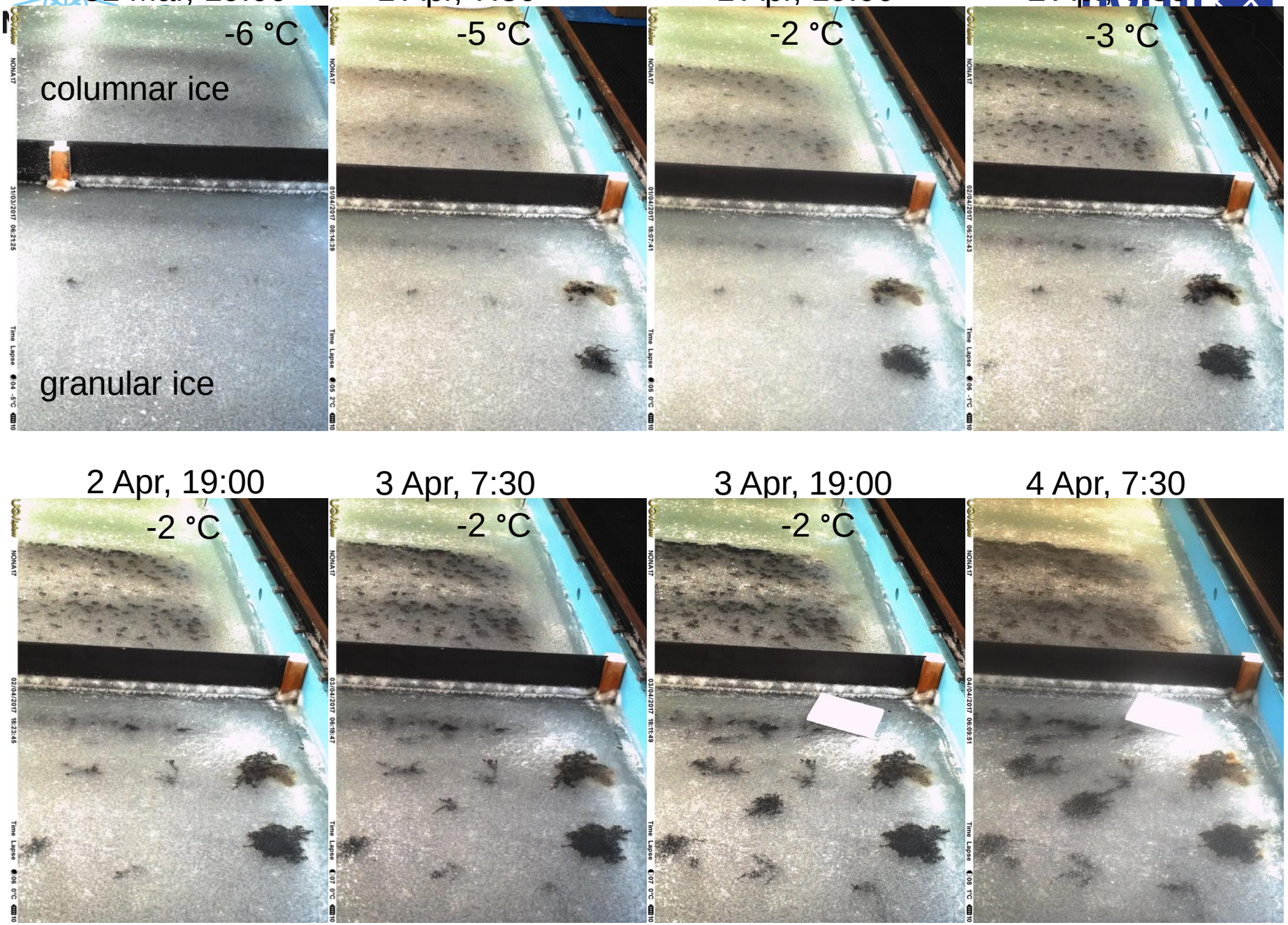
on the ice for 2 days

Pump and oil injection system designed to avoid injection of air

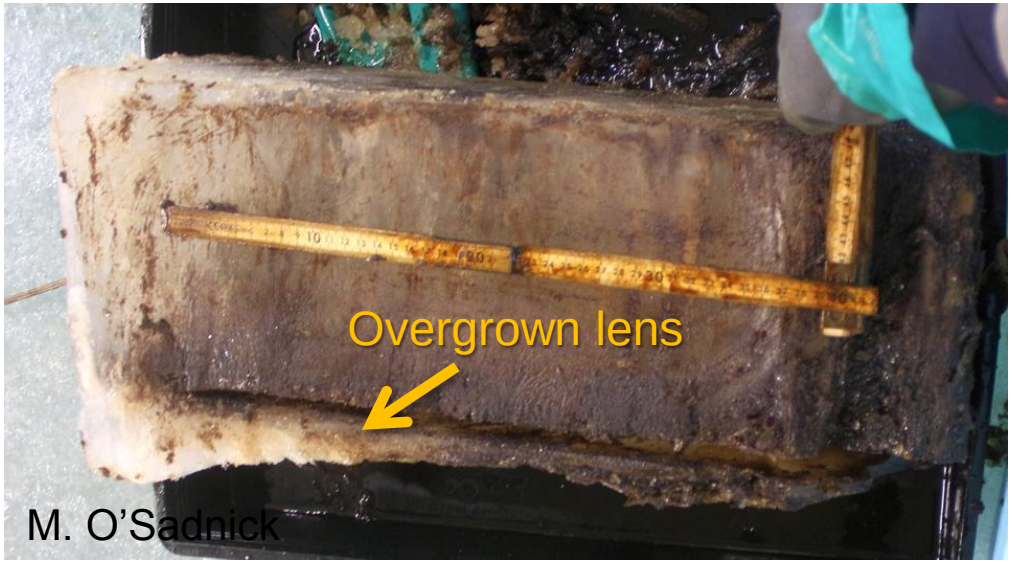
Photos © Giuliani von Giese

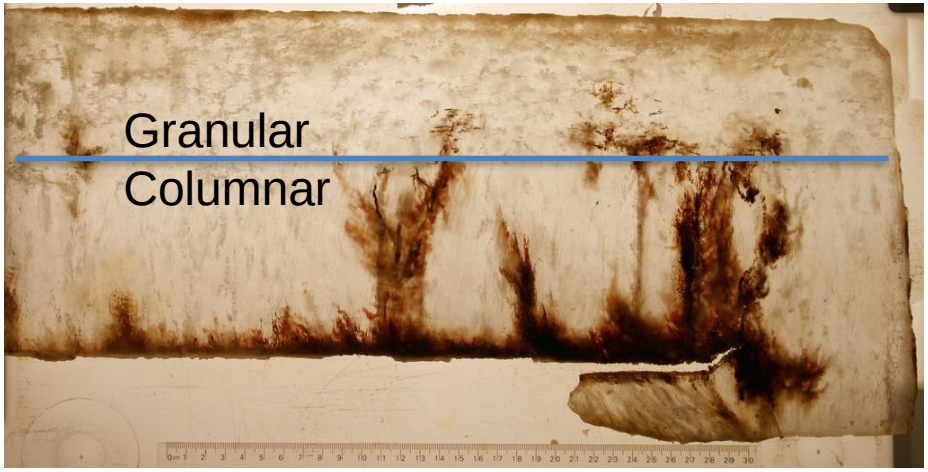
3D Tomographic SAR, University of Rennes 1

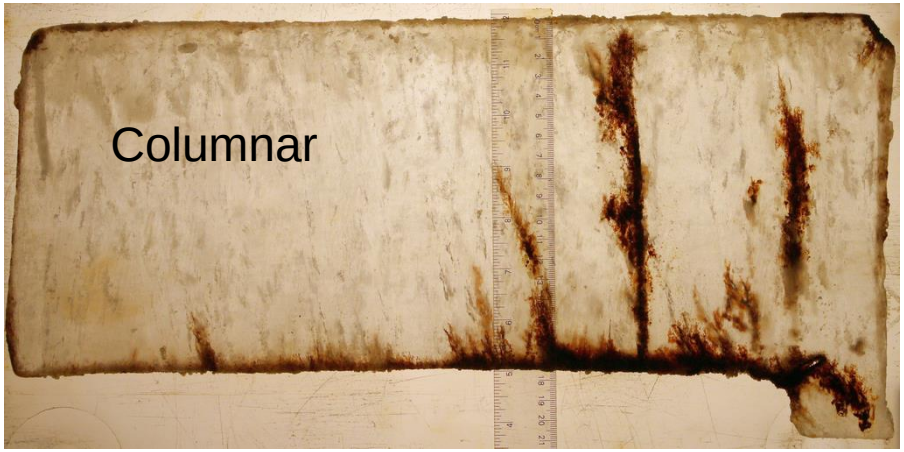
Transects of hyperspectral, fluorescent, and wideband RADAR sensors


31 Mar, 19:00
-6 °C
columnar ice
granular ice
1 Apr, 7:30
-5 °C
1 Apr, 19:00
-2 °C
2 Apr, 7:30
-3 °C
2 Apr, 19:00
-2 °C
3 Apr, 7:30
-2 °C
3 Apr, 19:00
-2 °C
4 Apr, 7:30

Example: Oil movement through ice

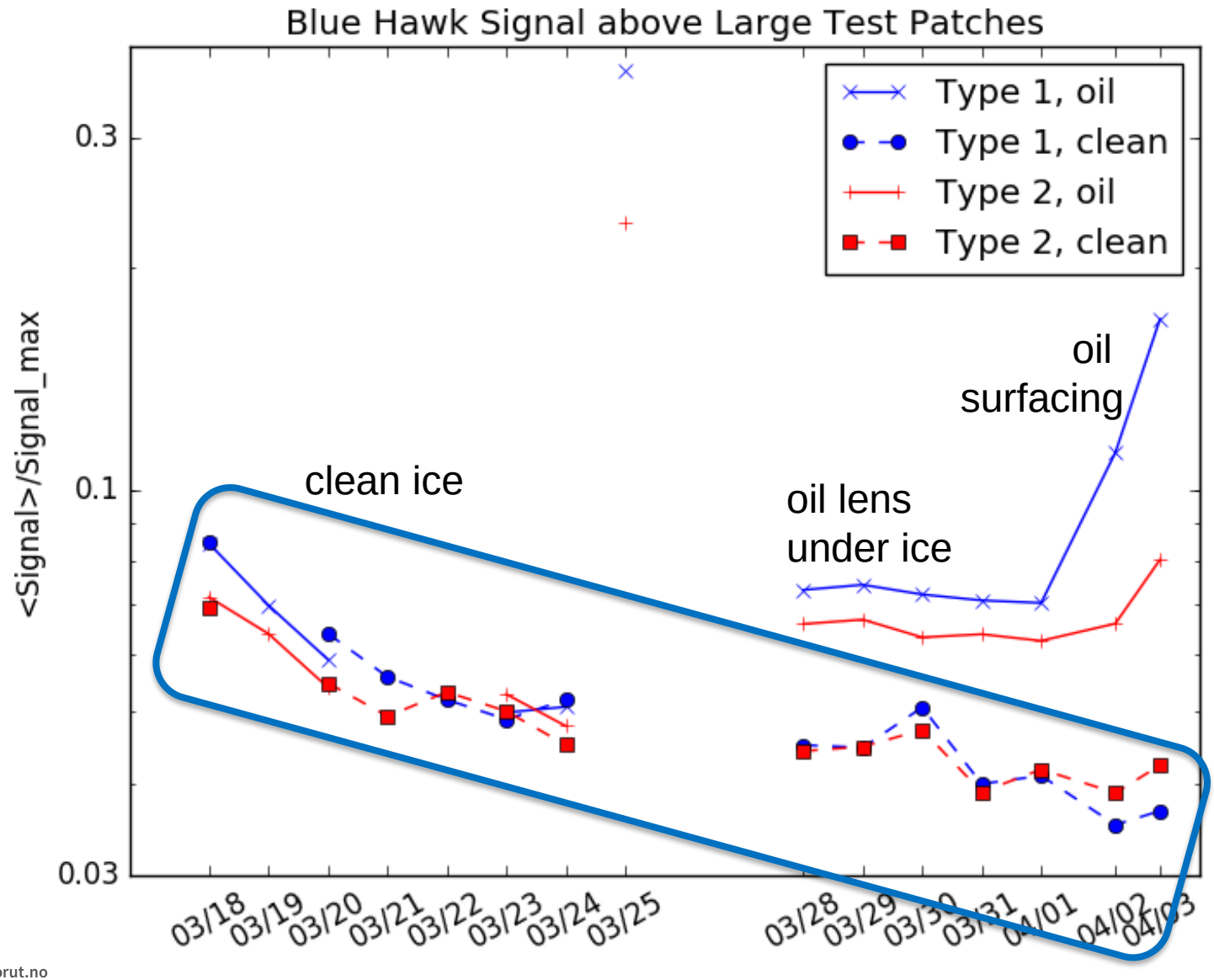






Samples of 31 March 2017

Example: Fluorescent Sensor



columnar ice

granular ice

Conclusions so far

- Experiment executed as planned, 20 cm ice thickness
- Generation of 7 cm granular surface layer was successful
- Oil behavior differed between columnar ice and granular ice
- Data analysis is ongoing

The Research Council of Norway

PETROMAKS2 program and SFI CIRFA industry partners