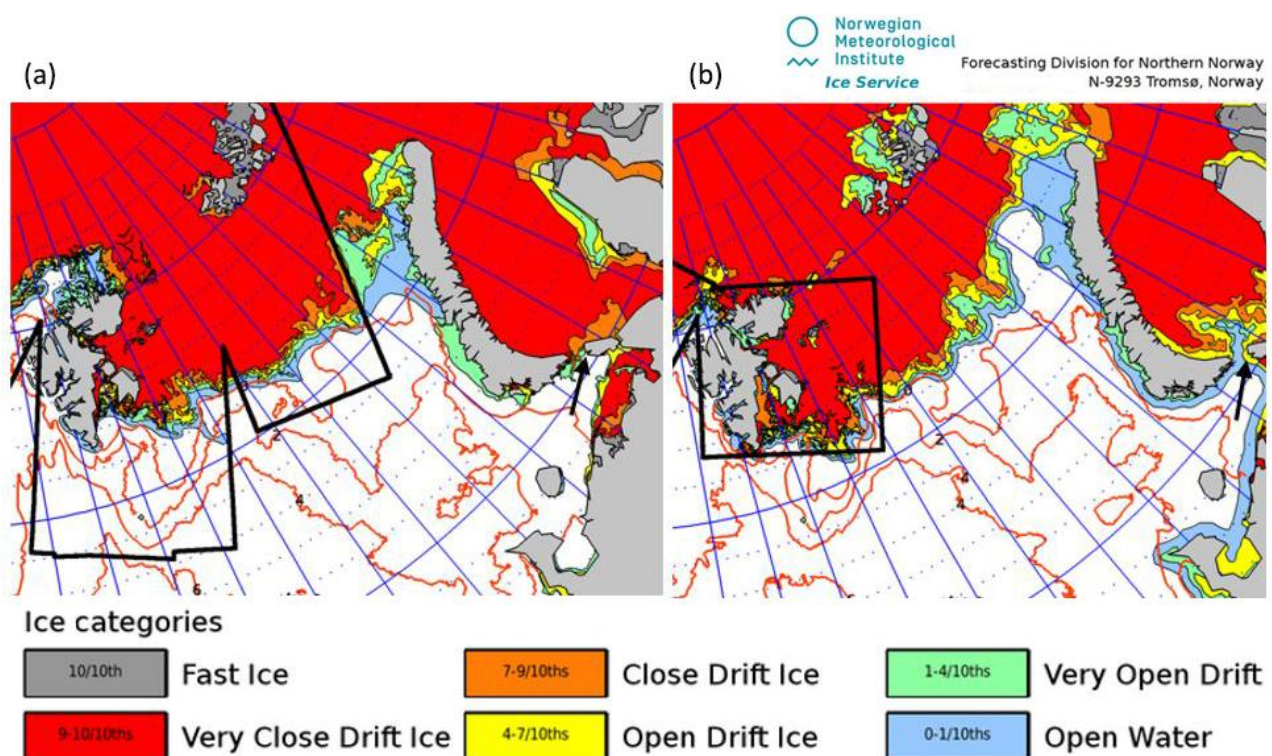


Supplementary file for: Larsen L.-H., Kvamstad-Lervold B., Sagerup K., Gribkovskaia V., Bambulyak A., Rautio R. & Berg T.E. 2016. Technological and environmental challenges of Arctic shipping—a case study of a fictional voyage in the Arctic. *Polar Research* 35. Correspondence: Lars-Henrik Larsen, Akvaplan-niva, Fram Centre, NO-9296 Tromsø, Norway. E-mail: lars@akvaplan.niva.no.



**Supplementary Fig. S2.** Sea-ice extent in the Barents and Kara seas for (a) 5 and (b) 22 December 2014. On 5 December, sea ice has started to form east of Vaygach Island, but there is still open water west of the island. By 22 December, ice has expanded west of Vaygach, but lightened towards the Kara Sea. The wreckage site of *Oleum* is indicated by a black arrow.

**Supplementary Table S1.** The main characteristics for the chemicals on board the *Oleum*.

Chemical/ category <sup>1</sup>	Function	Physical/ Gravity	Solubility logKow	Environmental Risk note I	Environmental Risk note II	Risk label <sup>b</sup>	Safety label <sup>b</sup>
BDF-513	fluid loss control	off-white powder  1030 kg/m <sup>3</sup> (sinking)	Low solubility in water	Based on the reported use pattern and apparent low toxicity to marine biota, the notified polymer is not expected to pose an environmental risk	Meets the Polymer of Low Concern criteria (Australia). Not expected to bioaccumulate in pelagic or benthic biota because of its high average molecular weight.		
Versavert PE New name: Parawet	Emulsifier	Black liquid/  0.94-0.97 (floating)	Oil soluble	The solvent is relatively toxic to marine organisms, but is easily biodegradable. It will therefore not cause long-term damage.	Little or no measurable toxicity to marine organisms. Biodegradable in seawater, but potential to bioaccumulate. Low acute toxicity to marine organisms.	R65 Danger: can damage lung tissue.	S24 Avoid contact with skin. S25 Avoid contact with eyes.
Test-WT-14 silicone comp.	Flocculent		Probable low solubility in water	No available information about the chemical: the HOCNF <sup>a</sup> papers are not public.			
2,4,5- Trifluorobenzoic acid	Water tracer	White to light yellow crystal powder	Water soluble 867.2 mg/l logKow = 2.13	The chemical has low logKow, and thereby low potential for bioaccumulation.		R36 Irritating to eyes. R37 Irritating to resp. system. R38 Irritating to skin.	S24 Avoid contact with skin. S25 Avoid contact with eyes.
CDR Liquid Power Flow Improver	Drag reducer	Black powder	Oil soluble	No available information about the chemical: the HOCNF <sup>a</sup> papers are not public.			

<sup>a</sup> Harmonized Offshore Chemical Documentation Format colour codes. <sup>b</sup> Risk and safety labels from Safety data sheets.