



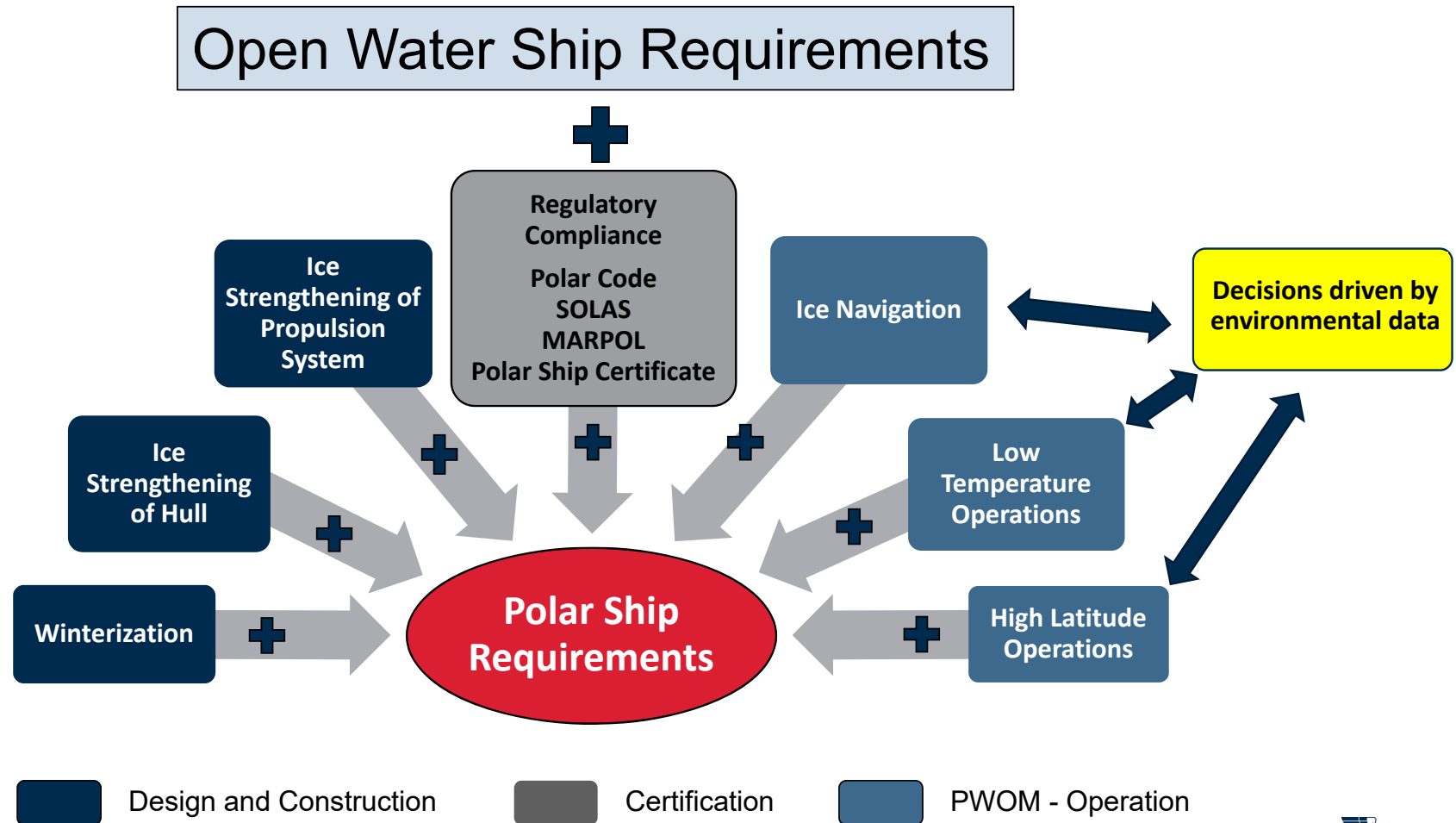
An Update on POLARIS: Using it to its full Extent

James Bond | 18 October 2018
Arctic Shipping Forum



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Requirements of Polar Ships



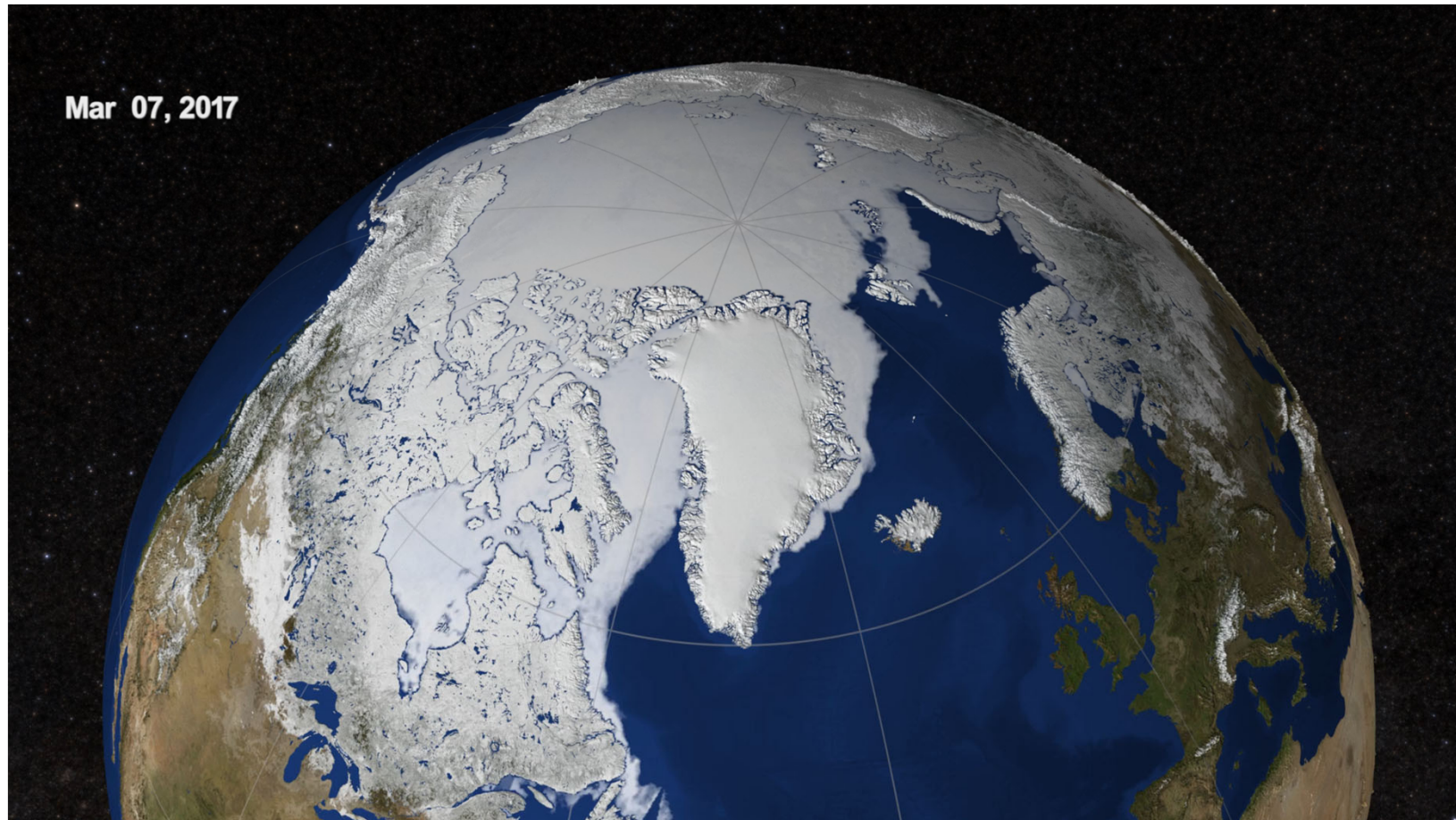
Confluence of events brings Arctic shipping into the mainstream

- Events
 - Unified Polar ship design requirements (PC Classes)
 - Satellite ice imagery
 - Ice image processing (CIS, NOAA, AARI, Danes, etc.)
 - WMO standardization of ice nomenclature and reporting (Egg Code)
 - Reducing Arctic ice cover
 - IMO Polar Code
 - Increased awareness and knowledge
- Multi-year ice in the mix, this is the most unique aspect of Polar operations
- Respect for the highly variable environment remains paramount



© Marine Log

Ice Variation: Rapid and Dramatic



Polar Code: Risk Mitigation

- Awareness: How is the Polar environment different?
- Understanding: How do those differences influence operations for the intended voyage?
- Planning: What to do about it?
- Documentation: Proof of understanding and documents on-board for use

Differences:

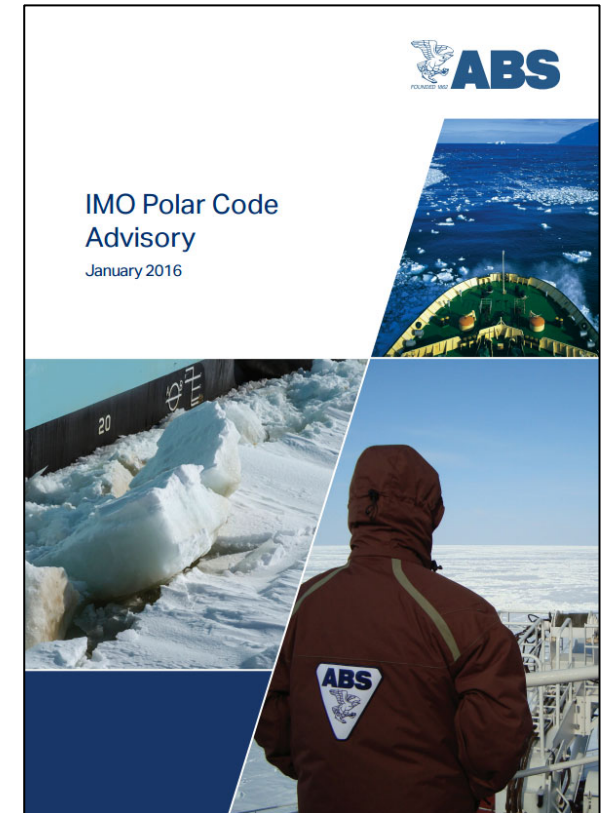
- (1) Presence of sea ice
- (2) Low temperature
- (3) Ice accretion
- (4) High latitude
- (5) Dark / Remote

Awareness:

- (1) Operations Profile
- (2) HAZOP / HAZID
- (2) Operations Assessment

Onboard Documentation:

- (1) Polar Water Operations Manual
- (2) Polar Ship Certificate



Operations Limitation: Dealing with Ice

- Relating Ice Class to operational area and time of year
- Available methodologies/systems
 - Canadian Zone/Date System
 - Rigid access control based on historical ice statistics
 - Canadian Arctic Ice Regime Shipping System (AIRSS)
 - Flexible access control based on real time ice conditions
 - Russian Ice Passport/Certificate
 - Detailed ship-specific description of ice limitations
 - **IMO's POLARIS**
 - POLARIS = Polar Operational Limit Assessment Risk Indexing System
 - Risk-based ice limitations for voyage planning and real-time decision making tied to ice class (PC and Baltic)
 - Documented in IMO MSC.1/Circ.1519



POLARIS

- Risk evaluated based on Ice Class (implied capability) and ice regime encountered by the ship
- $RIO = (C_1 \times RV_1) + (C_2 \times RV_2) + (C_3 \times RV_3) + (C_4 \times RV_4)$
 - $C_1 \dots C_4$ concentrations of ice types within ice regime
 - $RV_1 \dots RV_4$ Risk Values (RV) for each ice class

Increasing ice thickness (severity)

Decreasing ice class

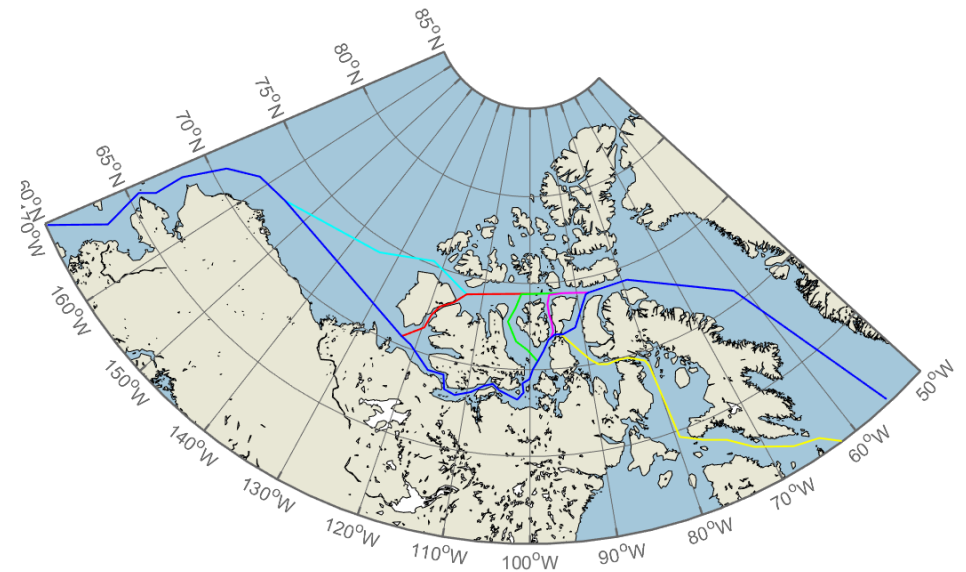
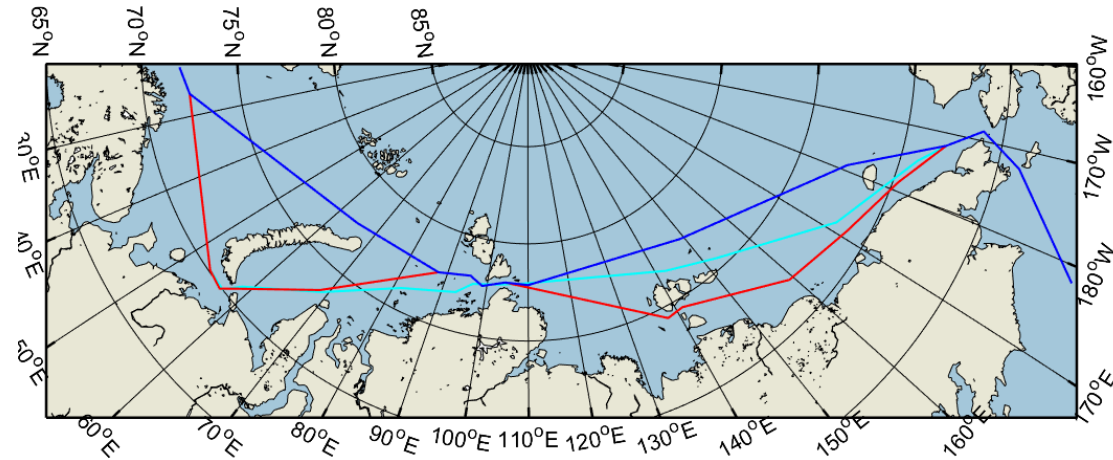
Increased Risk

		WINTER RISK VALUES (RVs)												
POLAR SHIP CATEGORY	ICE CLASS	ICE FREE	NEW ICE	GREY ICE	GREY WHITE ICE	THIN FIRST YEAR 1ST STAGE	THIN FIRST YEAR 2ND STAGE	MEDIUM FIRST YEAR 1ST STAGE	MEDIUM FIRST YEAR 2ND STAGE	THICK FIRST YEAR	SECOND YEAR	LIGHT MULTI YEAR	HEAVY MULTI YEAR	
		—	0-10 cm	10-15 cm	15-30 cm	30-50 cm	50-70 cm	70-95 cm	95-120 cm	120-200 cm	200-250 cm	250-300 cm	300+ cm	
A	PC 1	3	3	3	3	2	2	2	2	2	2	1	1	
	PC 2	3	3	3	3	2	2	2	2	2	1	1	0	
	PC 3	3	3	3	3	2	2	2	2	2	1	0	-1	
	PC 4	3	3	3	3	2	2	2	2	1	0	-1	-2	
	PC 5	3	3	3	3	2	2	2	1	0	-1	-2	-2	
B	PC 6	3	2	2	2	2	1	1	0	-1	-2	-3	-3	
	PC 7	3	2	2	2	1	1	0	-1	-2	-3	-3	-3	
C	1A Super	3	2	2	2	2	1	0	-1	-2	-3	-4	-4	
	1A	3	2	2	2	1	0	-1	-2	-3	-4	-4	-4	
	1B	3	2	2	1	0	-1	-2	-3	-4	-4	-5	-5	
	1C	3	2	1	0	-1	-2	-2	-3	-4	-4	-5	-6	
	NO ICE CLASS	3	1	0	-1	-2	-2	-3	-3	-4	-5	-6	-6	

RIO _{SHIP}	Ice classes PC1-PC7	Ice classes below PC 7	Color Code
20 ≤ RIO	Normal operation	Normal operation	
10 ≤ RIO < 20			
0 ≤ RIO < 10			
-10 ≤ RIO < 0	Elevated operational risk	Operation subject to special consideration	
-20 ≤ RIO < -10	Operation subject to special consideration	Operation subject to special consideration	
-30 ≤ RIO < -20			

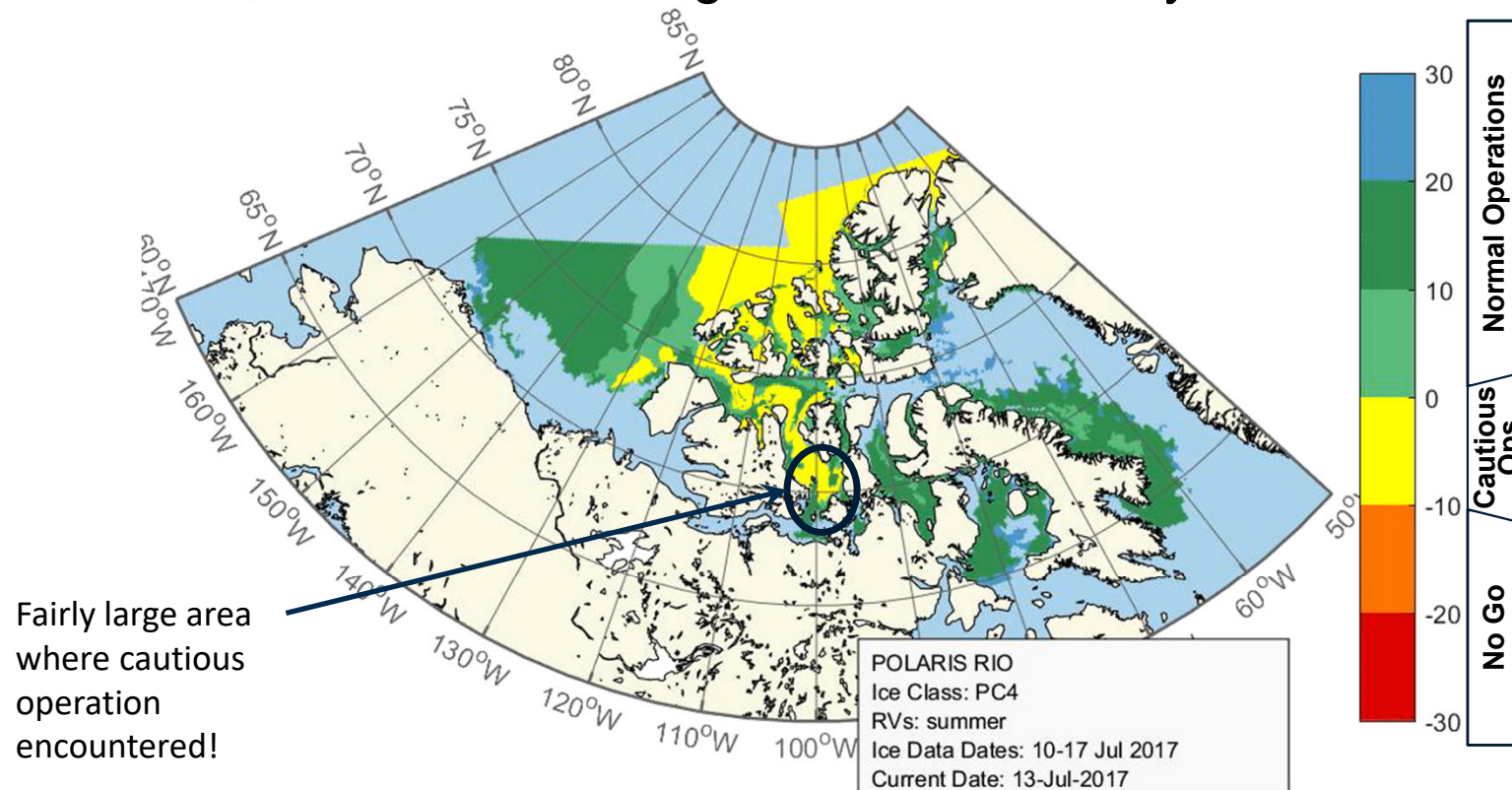
POLARIS: Multiple uses

- Selecting an appropriate ice class:
 - Is a PC5 needed or does a PC6 provide an adequate operating window?
- Voyage planning:
 - Where and when can a PC 6 operate?
 - Do IA Super and PC6 operational windows differ?
- POLARIS is relatively new, what is revealed by looking at past known voyages?



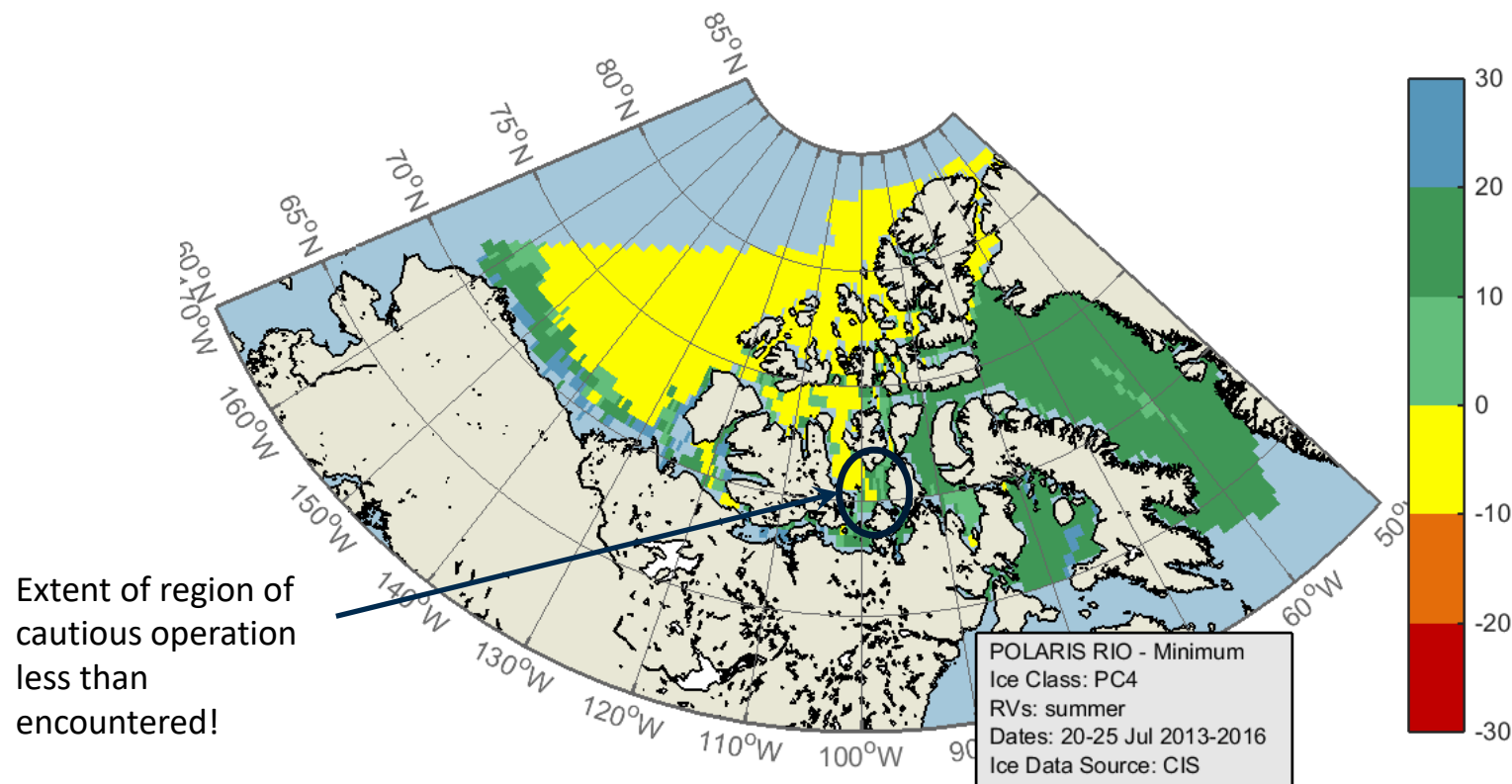
POLARIS: Applied to an Actual Ship Transit

- MV NORDICA, Northwest Passage transit 13-29 July 2017



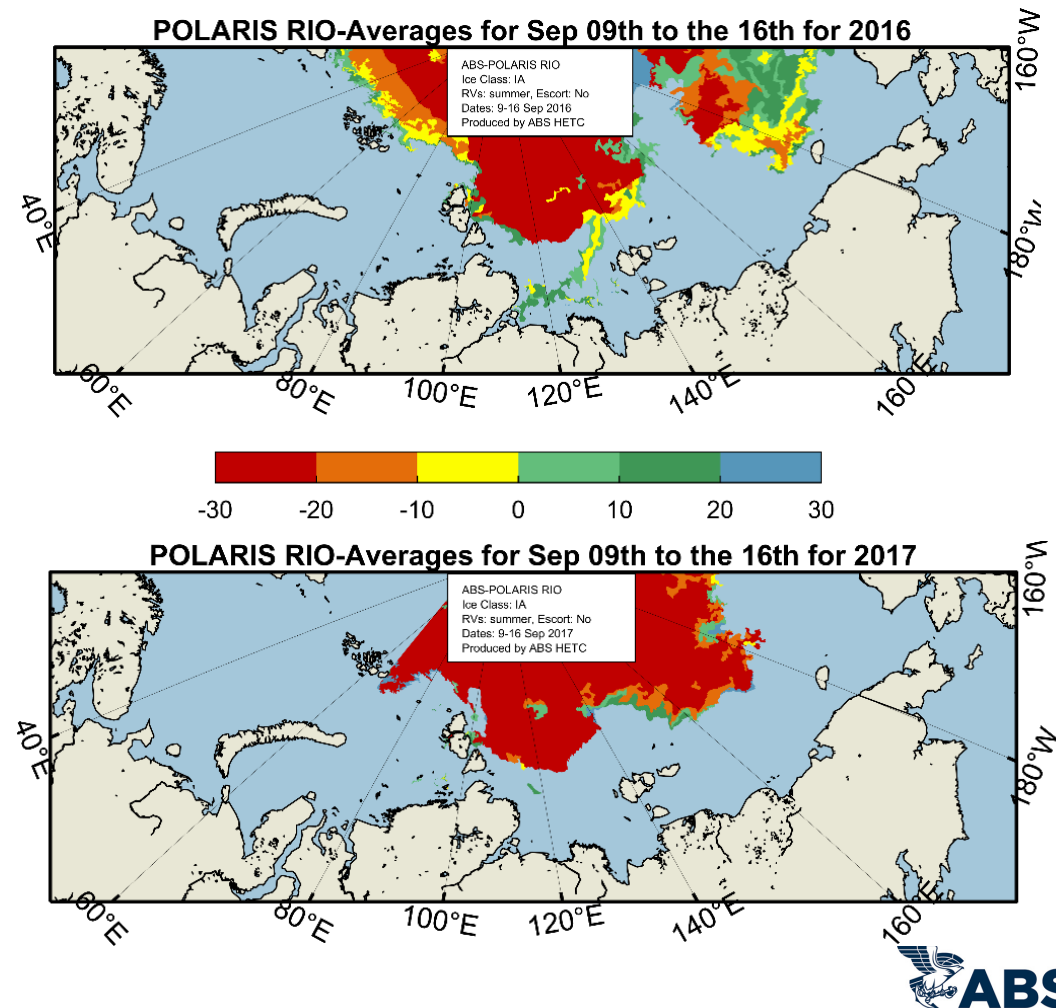
POLARIS: Should the NORDICA Have Sailed?

- MV NORDICA (PC4), NWP transit 13-29 July, data (minimums) from 2013-2016

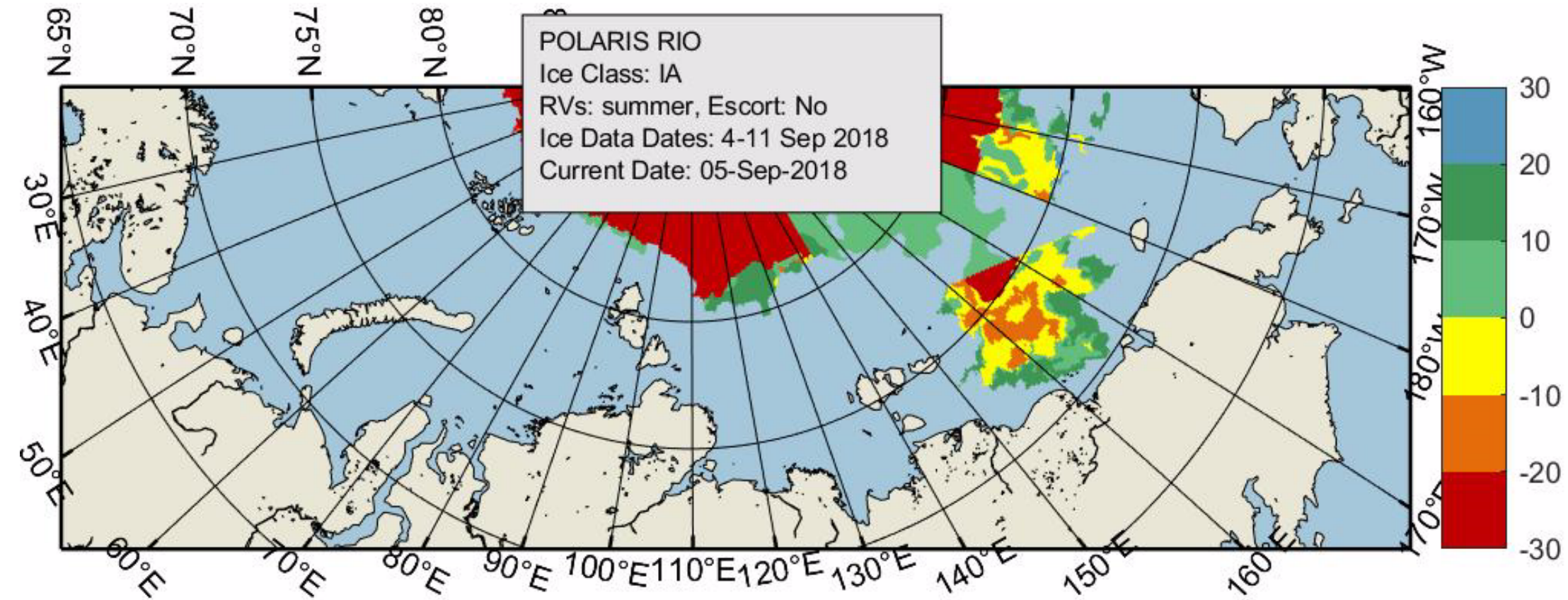


POLARIS: Ice Class 1A early Sept 2018 NSR Transit

- Is an East to West transit feasible? Impassable, risk of delay or stoppage?
- 5 year data indicates potential need for icebreaker escort at the mid-point of the Laptev Sea and entrance to Kara Sea
- Latest two years indicate no ice or “Normal Operations”, trend for 2018 indicates acceptable risk

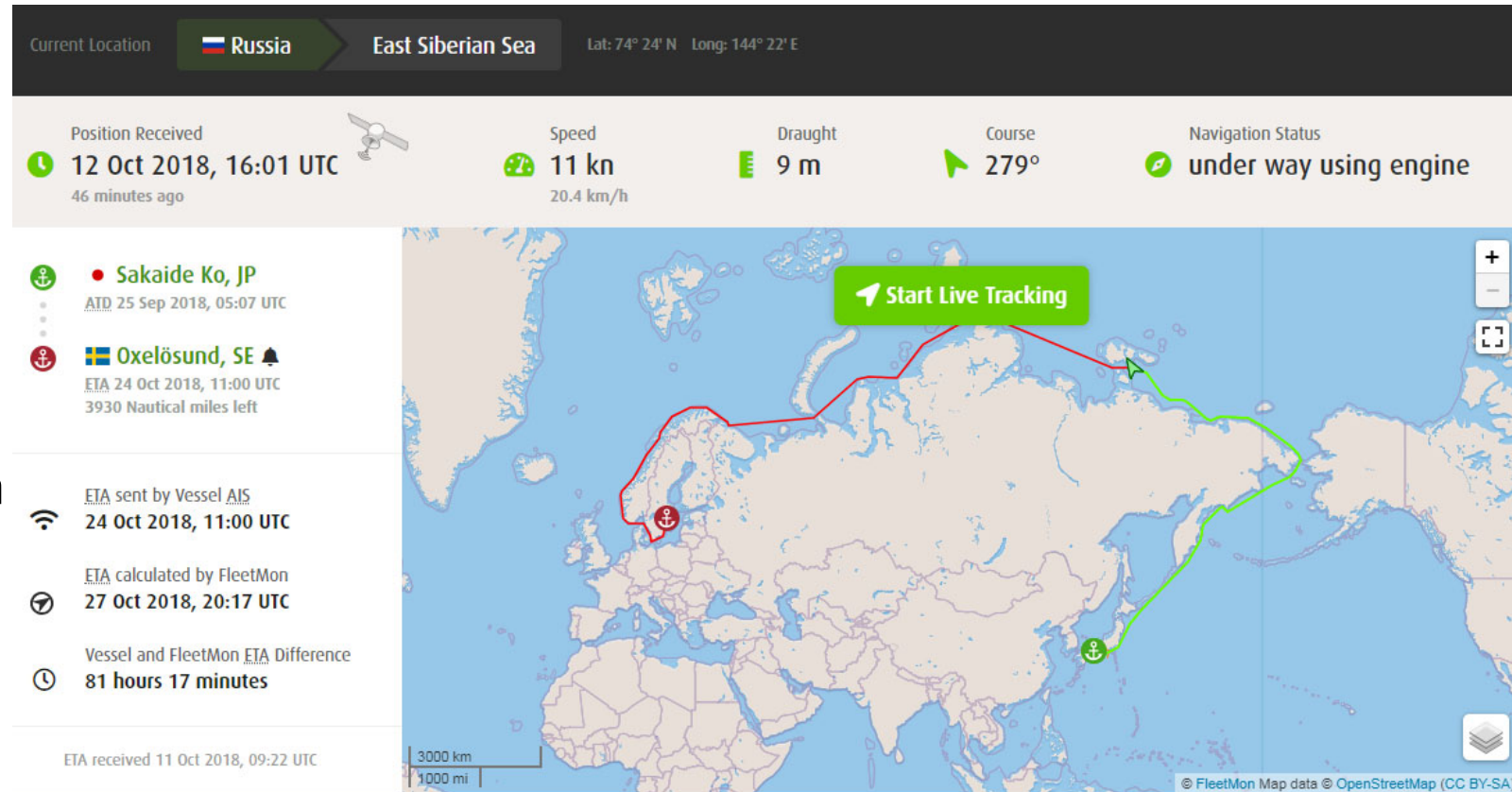


POLARIS: Ice Class 1A actual Sept 2018 NSR Transit



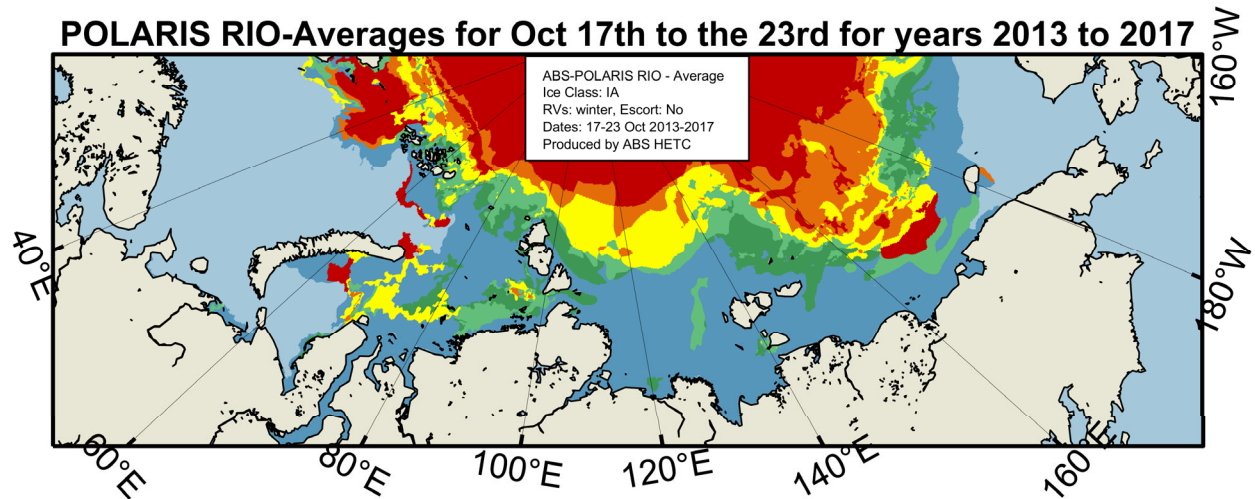
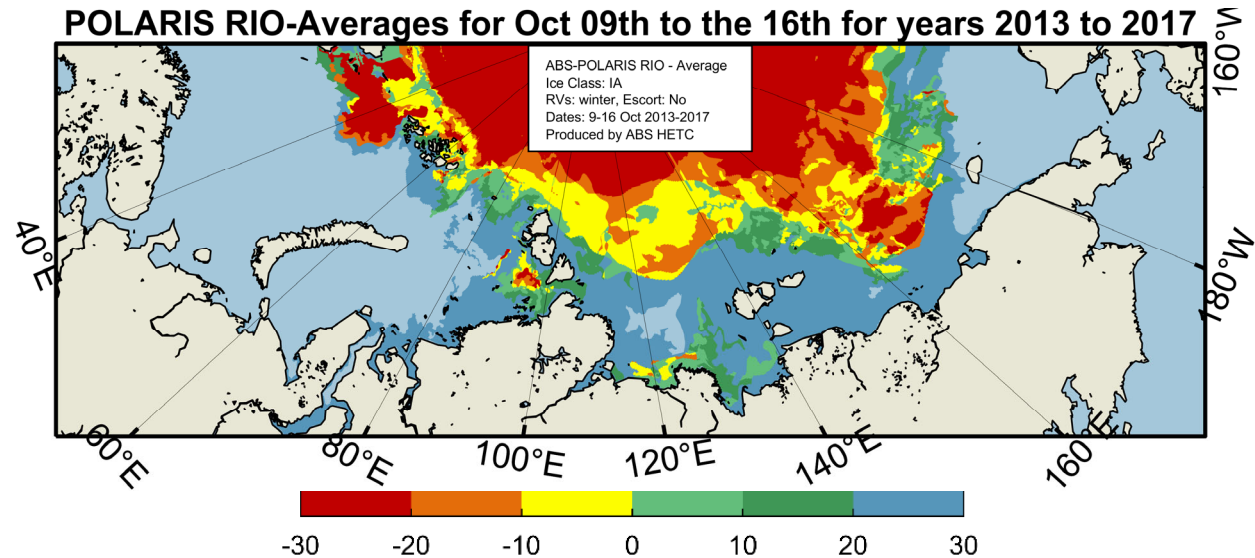
POLARIS: Ice Class 1A actual Oct 2018 NSR Transit

- After ≈15 September Arctic temperatures are decreasing and new ice is starting to form while older ice is strengthening
- Does POLARIS indicate the increasing risk? Is an NSR transit viable? Impassable, risk of delay or stoppage?



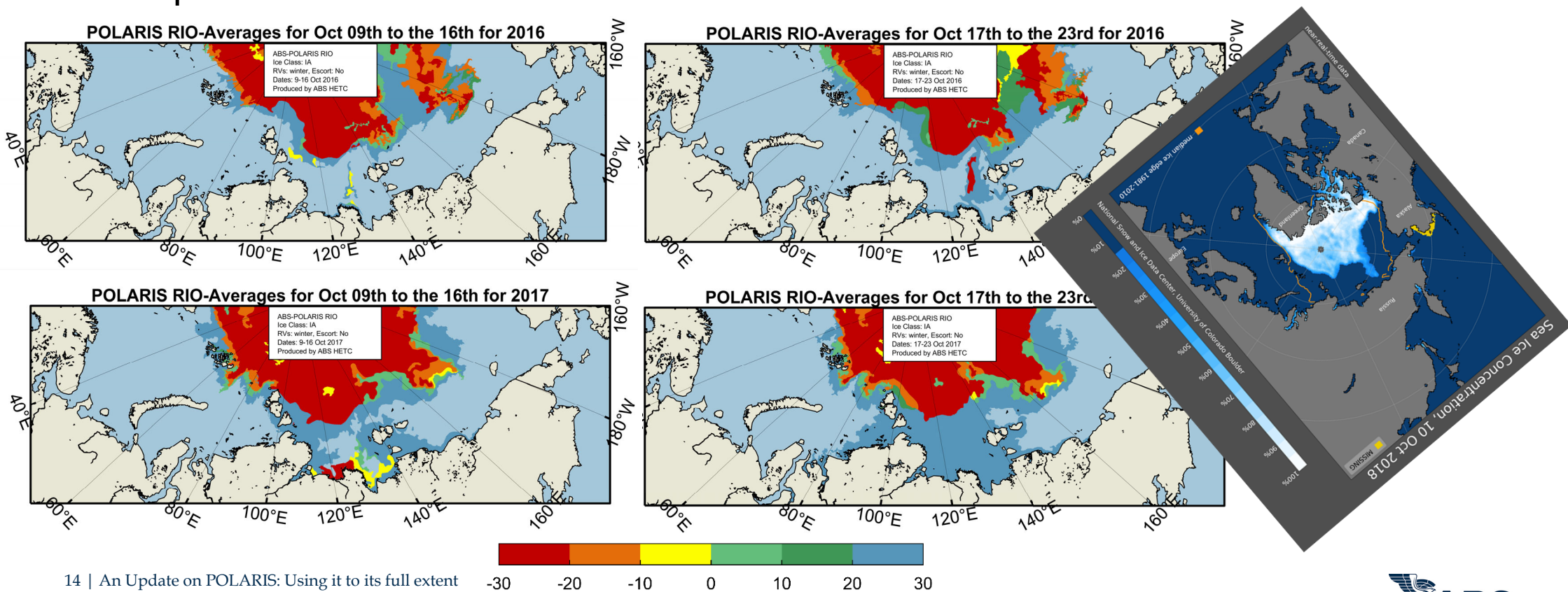
POLARIS: Ice Class 1A mid-Oct 2018 NSR Transit

- 5 year data indicates potential need for icebreaker escort at the entrance to and throughout parts of the Kara Sea



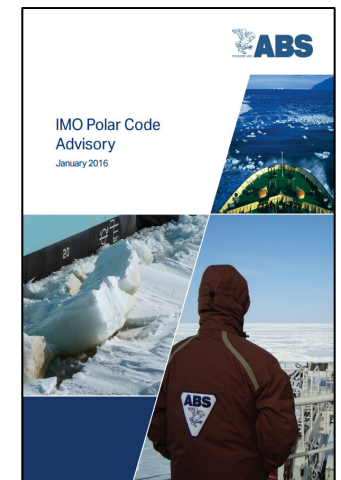
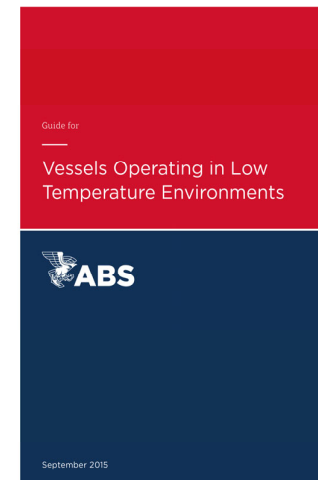
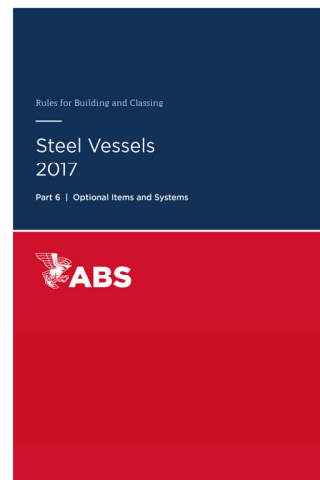
POLARIS: Ice Class 1A mid-Oct 2018 NSR Transit

- Latest two years indicate no ice or “Normal Operations”, trend for 2018 indicates acceptable risk



Conclusions: Use Data and Knowledge to Operate Safely

- Data is available to support decision making
- Safe polar operations requires an operator taking a ship into polar waters to:
 - Have a firm understanding of the operating environment; area and time of year (ice, temperature, high latitude, remoteness)
 - Relate the capabilities of the ship and crew to the operating environment
 - Have documentation onboard (PWOM) to assist the crew in mitigating the risk of operating in the highly dynamic polar regions
 - Understand and document the operational limitations imposed by the environment
 - Have a valid Polar Ship Certificate





Thank You

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