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Polar Code Implications for Operational Ice Services

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Terminology used in the IMO Polar Code

Refers to:

- ❑ Old ice
- ❑ Thin/Medium first-year ice
- ❑ First year ice
- ❑ Ice free waters
- ❑ Open waters
- ❑ Bergy water
- ❑ Less than 1/10th ice concentration
- ❑ Ice image information
- ❑ Avoid ice and/or temperatures….
- ❑ … foreseen ice conditions
- ❑ … potential hazards of intended voyage
- ❑ … current information on sea ice and icebergs along intended route
- ❑ …statistical information on ice and temperature…
- ❑ … ice concentration of more than 2/10th
- ❑ … weather/ice forecast for the intended area of operation
- ❑ Ice shelf
- ❑ Fastice
- ❑ Ridging
- ❑ …Global and localized forecasts…
- ❑ … low visibility..
- ❑ Hazardous ice

- ❑ Icing
- ❑ Air temperature
- ❑ Severe weather
- ❑ Mean daily low temperature over 10 years
- ❑ Current air temperature

The frequency of updates should provide enough advance notice that the ship can take refuge or use other methods of avoiding the hazard if the conditions are forecast to exceed its capabilities.

Not mentioned: swell/waves, ice pressure, snow cover on ice, melting stage, floe size, ……

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The Polar Code recognizes the risk of operating at polar latitudes

1) Ship categories

- ❑ Category A: ship designed for operation in polar waters in at least medium first-year ice, which may include old ice inclusions.
- ❑ Category B: ship means a ship not included in Category A, designed for operation in polar waters in at least thin first-year ice, which may include old ice inclusions.
- ❑ Category C: ship means a ship designed to operate in open water or in ice conditions less severe than those included in Categories A and B

The ship Category is a reflection of the expected severity of ice conditions that the ship is anticipated to operate in.

2) Polar Service Temperature

3) Operational Limitations (included in Polar Ship Certificate)

Lloyds list of hazards: ice is listed as no. 1

4) Operational Assessement

- ❑ Validate operational limitations
- ❑ Establish operational procedures
- ❑ Establish Survival Ressources

→Polar Waters Operating Manual
→Meet Polar Code Requirements

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PWOM shall include risk based procedures for the following:

.1 voyage planning to avoid ice and/or temperatures that exceed the ship's design capabilities or limitations;

.2 arrangements for receiving forecasts of the environmental conditions;

.3 means of addressing any limitations of the hydrographic, meteorological and navigational information available;

.4 operation of equipment required under other chapters of this Code; and

.5 implementation of special measures to maintain equipment and system functionality under low temperatures, topside icing and the presence of sea ice, as applicable.

Example:
9.2.1 Nautical information
Ships shall have the ability to receive up-to-date information including ice information for safe navigation.

Example: Crystal Serenity NW Passage journey requires a PWOM → to obtain Polar Ship Certificate

11 VOYAGE Planning (extracted from Lloyds Guidelines)

The goal of this chapter is to ensure that the Company, master and crew are provided with sufficient information to enable operations to be conducted with due consideration to safety of ship and persons on board and, as appropriate, environmental protection.

11.2 Functional requirement
In order to achieve the goal set out in paragraph 11.1 above, the voyage plan shall take into account the potential hazards of the intended voyage.

11.3 Requirements
In order to comply with the functional requirement of paragraph 11.2 above, the master shall consider a route through polar waters, taking into account the following:

.1 the procedures required by the PWOM;
.2 any limitations of the hydrographic information and aids to navigation available;
.3 current information on the extent and type of ice and icebergs in the vicinity of the intended route;
.4 statistical information on ice and temperatures from former years;
.5 places of refuge;
.6 current information and measures to be taken when marine mammals are encountered relating to known areas with densities of marine mammals, including seasonal migration areas;
.7 current information on relevant ships' routing systems, speed recommendations and vessel traffic services relating to known areas with densities of marine mammals, including seasonal migration areas;
.8 national and international designated protected areas along the route; and
.9 operation in areas remote from search and rescue (SAR) capabilities.

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APPENDIX 2 - Model Table of Contents for the Polar Water Operational Manual (PWOM)

Example

Operations in ice. 1.1 Operator guidance for safe operation

Guidance: The PWOM should establish the means by which decisions as to whether ice conditions exceed the ship's design limits should be made, taking into account the Operational Limitations on the PSC. An appropriate decision support system, such as the Canada's Arctic Ice Regime Shipping System, and/or the Russian Ice Certificate as described in the Rules of Navigation on the water area of the Northern Sea Route, can be used... Bridge personnel should be trained in the proper use of the system to be utilized. For ships that will operate only in ice-free waters, procedures to ensure that will keep the ship from encountering ice should be established.

Hazards identified by the Polar Code		
#	Hazard	Considered for Operating Envelope?
1	Ice (sea ice, ice pressure, icebergs)	*Yes / No*
2	Ice accretion	*Yes / No*
3	Ice ingestion	*Yes / No*
4	Snow accumulation	*Yes / No*
5	Snow ingestion	*Yes / No*
6	Low temperature	*Yes / No*
7	Low air temperature (below -10 degrees)	*Yes / No*
8	Daily light hours	*Yes / No*
9	High latitude	*Yes / No*
10	Poor hydrographic data	*Yes / No*
11	Human factors	*Yes / No*
12	Rapidly changing weather conditions	*Yes / No*
13	Isolated / remote location	*Yes / No*
14	Lack of emergency response equipment	*Yes / No*
15	Environmental sensitivity	*Yes / No*

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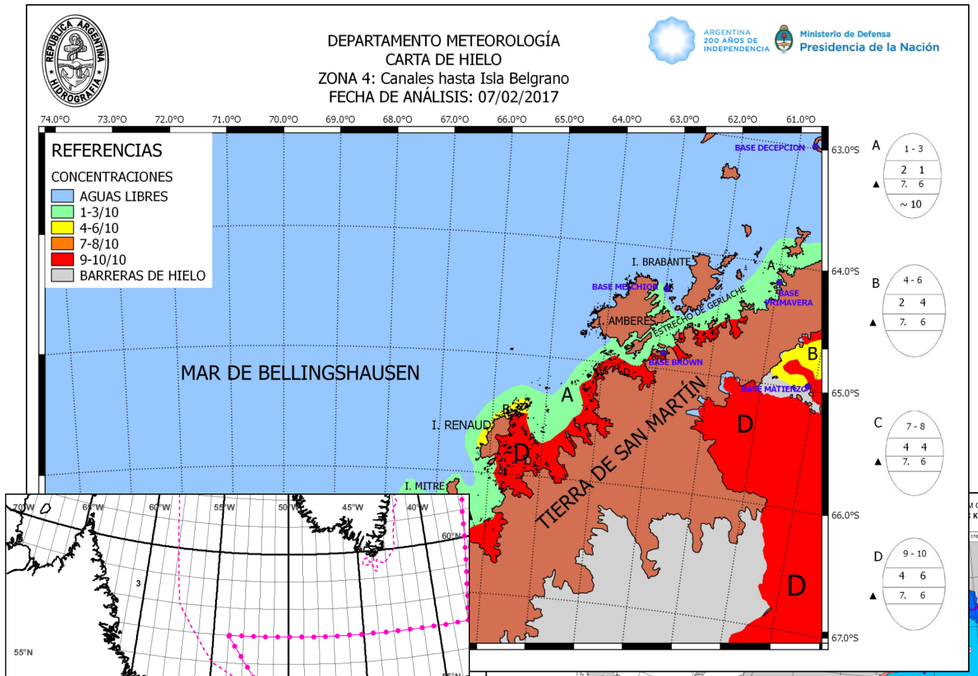
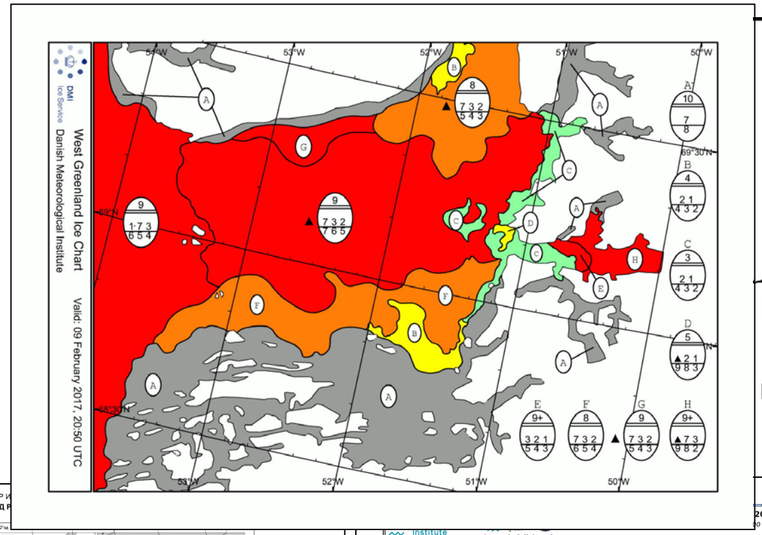
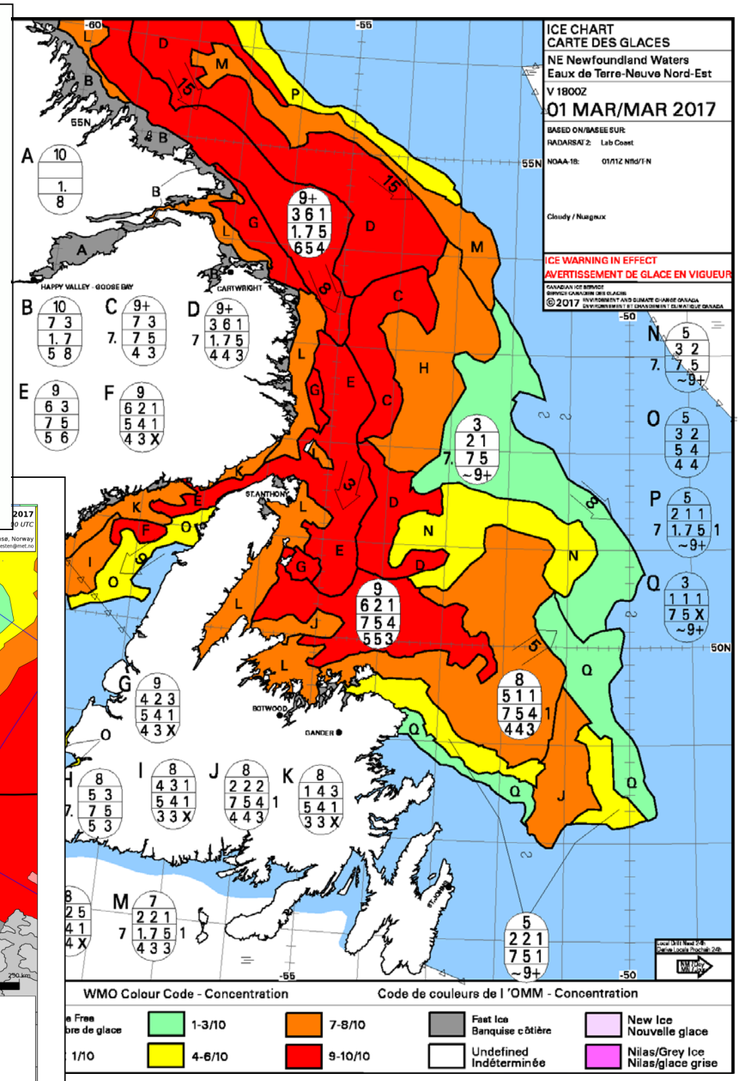
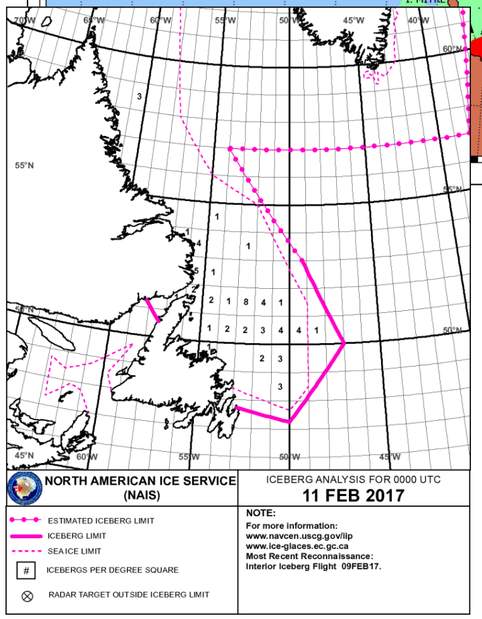
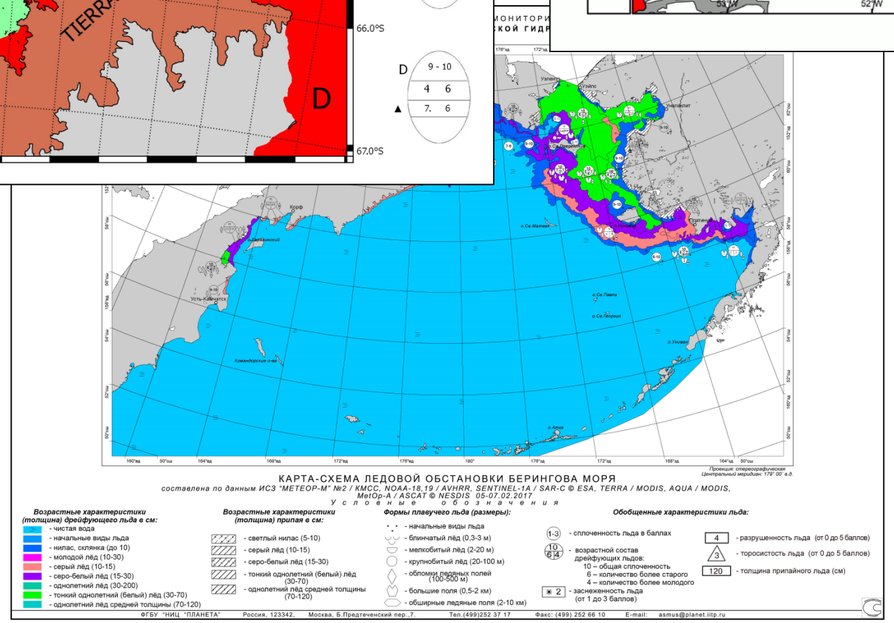
Ice charts for navigation issued daily from government services

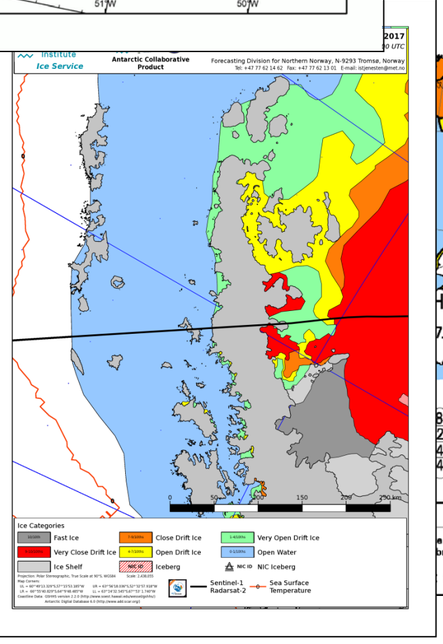












Three types of vessels use of ice-metocean information for risk management

Requirement for Type of operation	Historical information	Current information	Forecast information
Operations in ice	Parameter portfolio ”in ice”	Parameter portfolio ”in ice”	Parameter portfolio ”in ice”
Operations near ice edge	Parameter portfolio ”near ice edge”	Parameter portfolio ”near ice edge”	Parameter portfolio ”near ice edge”
Operations far from ice	Parameter portfolio ”avoid ice”	Parameter portfolio ”avoid ice”	Parameter portfolio ”avoid ice”

→ Break down to specific vessel ice class and requirements …

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Status, gaps to address for Ice Services

- **Historical data to shipping**
  - overall OK
  - some harmonization , more parameters, display tools needed
- **Current icemetocean info**
  - overall OK
  - Benefit from high res data
  - Benefit from large data volume
  - Automated versus manual production chain
  - Customized products, formats to mariners
  - Update frequency
  - Ice parameters significanse in satellite data
- **Forecasts icemetocean**
  - room for improvement
  - resolution near shore
  - short time/spatial scales for tactical navigation
  - integration of high resolution satellite data in models

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Ice centers addressing IceMetOcean and Polar Code :

- ❑ **Serve ships where ships go** (in ice, near ice edge, far from ice edge)
- ❑ **Serve different types of ships** (from ”no ice class” to ”Polar Class Icebreakers”)
- ❑ Ability to provide relevant **historical** icemetocean information (marine climatology, planning)
- ❑ Ability to provide relevant **current** icemetocean information (situational awareness)
- ❑ Ability to provide necessary **icemetocean forecasts** (along route safety and decision making)

❑ Many routine products and services already available !

❑ Understand our users requirements
❑ Make ice products visible and easy accessible
❑ Understand shipping/market development
❑ Sea ice retreat impact on shipping
❑ **INTERNATIONAL COLLABORATION** !

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Ice services can <u>individually / jointly</u> decide what they consider as best practice:

- ❑ Best products suite
- ❑ Government services available for all
- ❑ Commercial services

→ Developed in cooperation withmarine community, insurance, regulators, authorities…

→ within the WMO / JCOMM framework (ncluding IMO/IHO ?)

→ JCOMM ETSI to provide advice, guidance to ice charting community (IICWG)