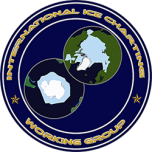




# International Ice Charting Working Group

## Ice Services Support to Safe Polar Navigation

Presented by Keld Qvistgaard, DMI Greenland Ice Service  
E-mail: [KQH@DMI.DK](mailto:KQH@DMI.DK)



# Polar Code requirements

## Subset of Part IA Chapter 11 - Voyage planning

11.2 ... the voyage plan shall take into account potential hazards of the intended voyage.

11.3 ... the master shall consider a route through polar waters, taking in to account the following:

.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;

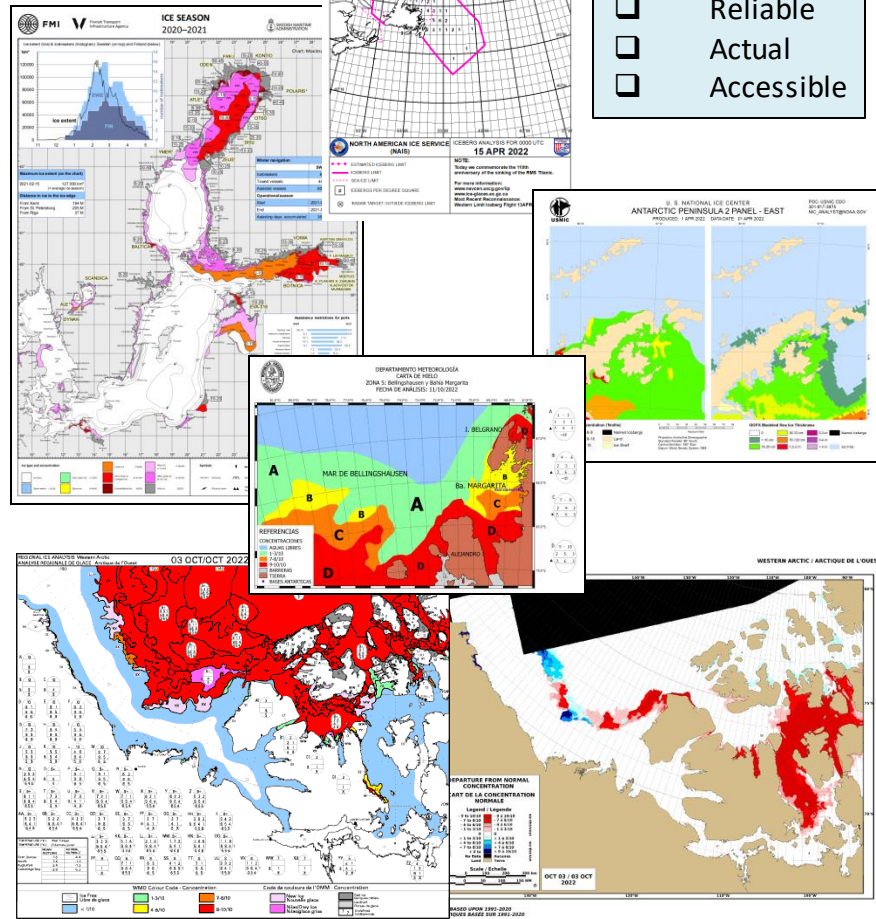


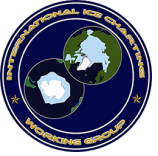


# The National Ice Services

- Organized under national meteorological services or marine agencies**
- Provides a **suite of products** targeted planning, strategic and tactical navigation in ice-covered waters
- Using **agreed standards** approved by World Meteorological Organization
- Reference to **SOLAS Chapter V, Regulation 5 and Polar Code**
- Ice information to ships via **GMDSS (NAV/METAREAS)**
- Freely available regional ice information, bulletins** via a variety of communication channels, time critical
- Local/tailored ice information** for tactical navigation or vessel specific requirements
- Ice climatology**
- Routine ice analysis and forecasting**, also outside Polar Code area (Baltic, Grand Banks, ...)
- Guidance, advice** to marine community and authorities
- Sharing best practices**
- Co-production** in certain regions
- Close collaboration** on user needs, technology advances, production in IICWG

- Relevant
- Accurate
- Reliable
- Actual
- Accessible





# International Standards for Ice-Metocean Information

Maintained / developed by World Meteorological Organization

- WMO No. 259 – Sea Ice Nomenclature Volume I, II, III
- WMO No. 574 – Sea Ice Information and Services
- WMO No. 558 – Manual on Marine Meteorological Services
- WMO No. 471 – Guide to Marine Meteorological Services
- WMO No. 1214 – A Vector Archive Format for Sea Ice Charts
- WMO No. 1215 – Ice Chart Color Code
- JCOMM TR. 80 – Electronic Chart Systems Ice Objects Catalogue
- JCOMM TR. 81 – S-411 Ice Information Products Specifications for ENC
- .....

Managed by  
WMO Service Commission

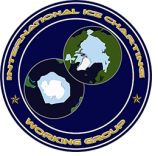
Standing Committee on  
Marine Meteorological  
and Oceanographic  
Services



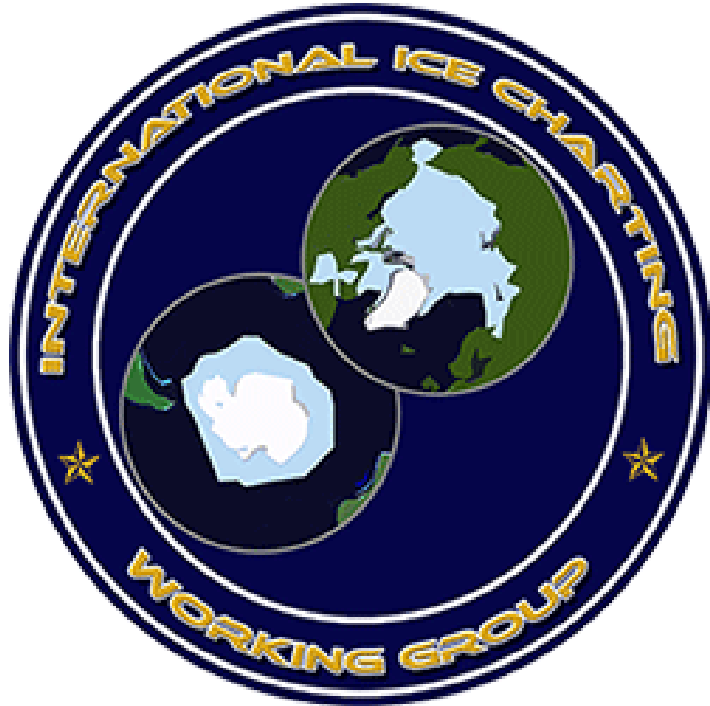
# Ice information supporting mariners and safe navigation in Polar Waters

- Relevant
- Accurate
- Reliable
- Actual
- Accessible





# International Ice Charting Working Group



Formed in 1999

## International Ice Charting Working Group Charter Signatories – Operational Ice Services

Argentina:	Argentine Naval Hydrographic Office
Canada:	Canadian Ice Service
Chile:	Chilean Navy Weather Service/Ice Service
Denmark:	DMI Greenland Ice Service
Finland:	Finnish Meteorological Institute
Germany:	Federal Maritime and Hydrographic Agency
Iceland:	Iceland Meteorological Office
Norway:	Norwegian Meteorological Institute
Poland:	Polish Institute of Meteorology and Water Management
Russia:	Arctic and Antarctic Research Institute
Sweden:	Swedish Meteorological and Hydrological Institute
UK:	British Antarctic Survey
USA:	US National Ice Center USCG International Ice Patrol
Observers:	Australia, China, Japan, New Zealand, South Africa

IICWG welcomes participation by private ice services, mariners and offshore operators, Coast Guards, research institutes, et al.



# International Ice Charting Working Group - 2022

Update from IICWG-XXIII (Buenos Aires, 26-30 September 2022)

Theme: Re-Connecting

## Completed tasks

- Iceberg Modelling Case Studies
- Implementation and use of L-band Synthetic Aperture Radar
- Enhanced Ice Information to Mariners
- Development and Test of Iceberg Risk Products
- Test of Sea Ice Pressure products



## New/continuing task teams

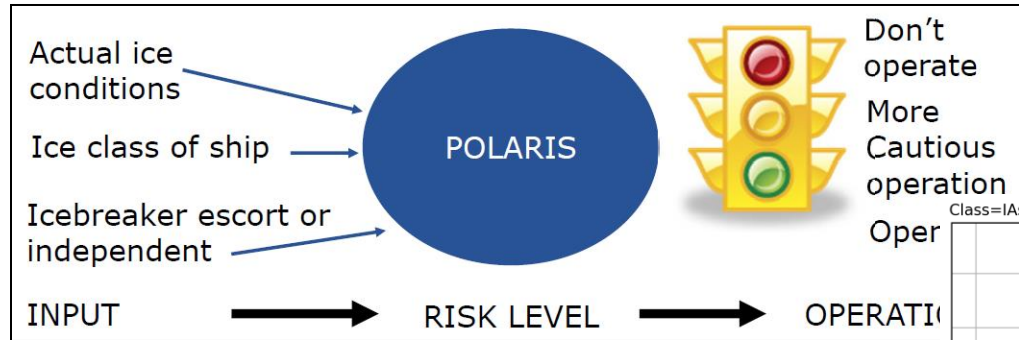
- Data Assimilation Workshop
- Ice Analyst Workshop
- Roadmap for NAIS Iceberg Model Development
- Sea Ice Pressure Products
- Iceberg Risk Portrayal
- Uncertainty in Ice Charting Products
- Southern Ocean Limit of known Ice
- Multi Spectral SAR in Southern Ocean Ice Charting
- Polar Code POLARIS Practice, Use, Gaps and Opportunities





# RISK ASSESSMENT – IMPLEMENTATION OF POLARIS

$RIO = Risk\ Index\ Outcome$   
 $= \text{Sum of (Partial Ice concentrations} \times \text{Risk Values)}$   
 $RIO = (C_1 \times RIV_1) + (C_2 \times RIV_2) + (C_3 \times RIV_3) + (C_4 \times RIV_4)$   
 $C_1, \dots, C_4$  - concentrations of ice types within ice regime (maximum of four from Egg Code)



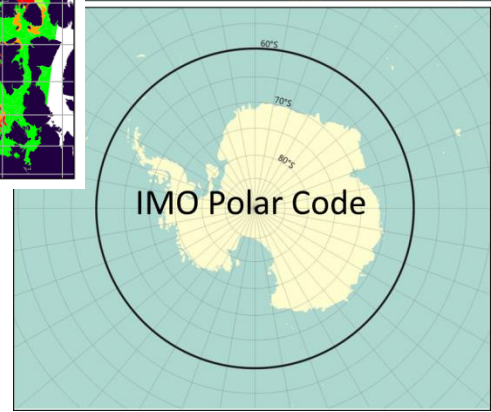
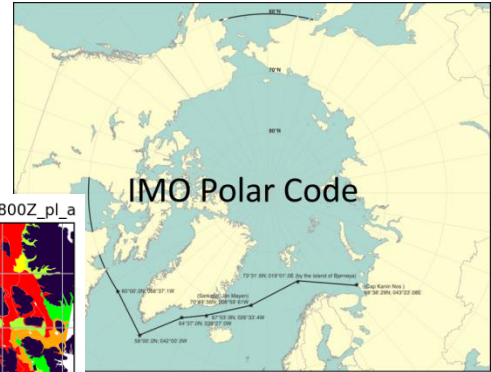
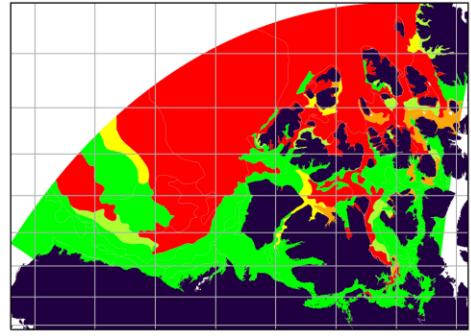
Increasing ice thickness (severity) →

Increasing ice class ↑

	RISK INDEX VALUES (RIVs) for each Ice Type										
	ICE FREE	NEW ICE	GREY ICE	GREY WHITE ICE	THIN FIRST YEAR 1ST STAGE	THIN FIRST YEAR 2ND STAGE	MEDIUM FIRST YEAR	MEDIUM FIRST YEAR 2ND STAGE	THICK FIRST YEAR	SECOND YEAR	MULTI YEAR
PC 1	3	3	3	3	2	2	2	2	2	2	1
PC 2	3	3	3	3	2	2	2	2	2	2	1
PC 3	3	3	3	3	2	2	2	2	2	1	0
PC 4	3	3	3	3	2	2	2	2	1	0	-1
PC 5	3	3	3	3	2	2	2	1	0	-1	-2
PC 6	3	2	2	2	2	1	1	0	-1	-2	-3
PC 7	3	2	2	2	1	1	1	0	-2	-3	-4
IAS	3	2	2	2	2	1	0	-1	-3	-4	-5
IA	3	2	2	2	1	0	-1	-2	-4	-5	-6
IB	3	2	2	1	0	-1	-2	-3	-4	-5	-6
IC	3	2	1	0	-1	-2	-3	-4	-5	-6	-7
No Ice Class	3	1	0	-1	-2	-3	-4	-5	-6	-7	-8

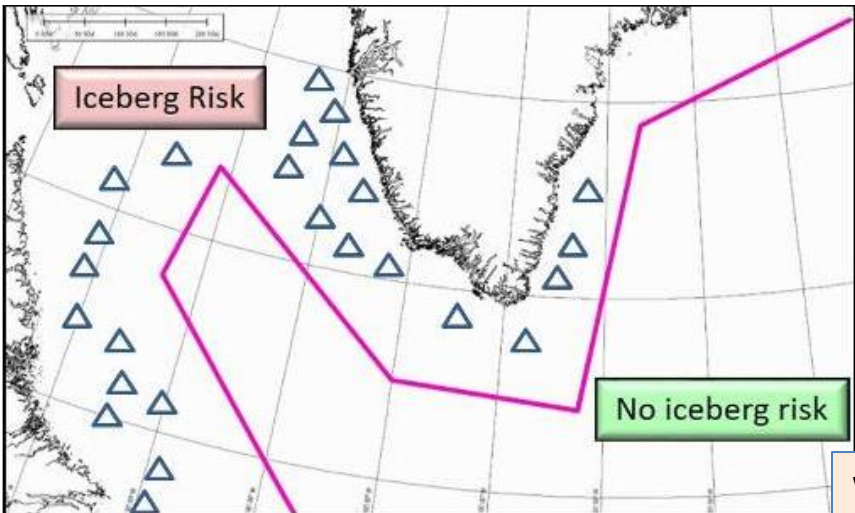
Increased Risk

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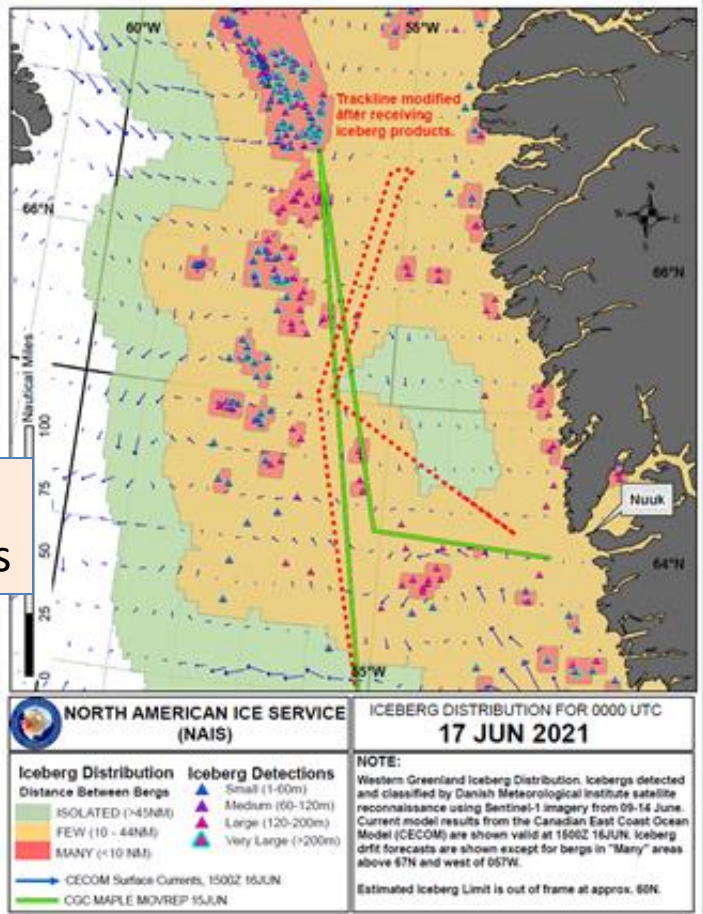
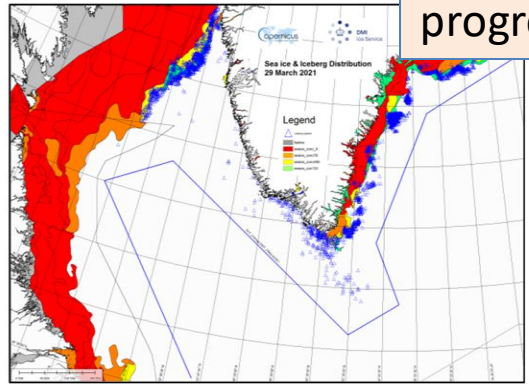
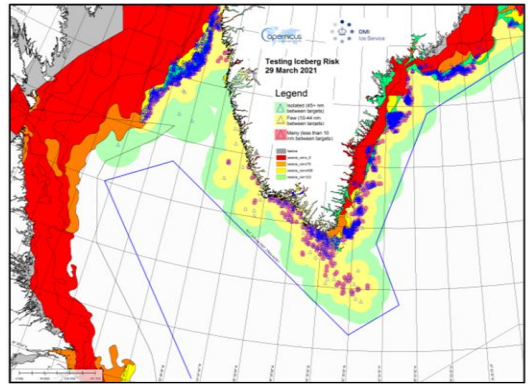


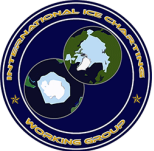


# Towards Sea ice and Iceberg Risk Products (ongoing work in IICWG)



Work in progress

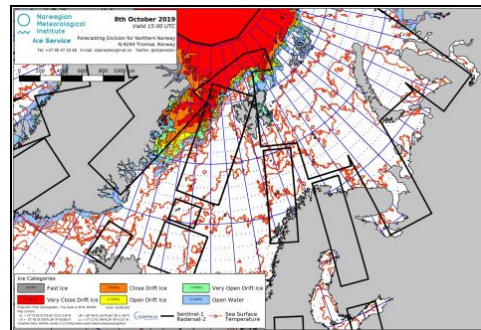




# IMPROVING BEST PRACTICES

## Ice services and marine community:

- MAINTAIN, DEVELOP RELATIONS
- ADDRESS CLIMATE CHANGE, OPERATING WINDOWS...
- TECHNOLOGY ADVANCES, POLAR CODE, TRAINING...



## THE IDEAL ICE SERVICE (based on IICWG Mariner Surveys)

- Know your **user base**, interact
- Better resolution and frequent updates** and ability to see/report hazardous ice (scale: 100-200m or less, sub-daily updates for certain regions)
- Satellite data must **have necessary resolution for ice charting**. Kilometer scale resolution should be avoided
- Tailored / high resolution ice information** for certain dynamic or critical locations.
- Ice information also as **risk assessment**
- Local/regional high resolution **forecast products for next 24-48 hours** for safe/efficient navigation in/near ice.
- Improve access to **scalable ice information** keep graphical formats for other displays.
- Extended access to automated / annotated **satellite quicklooks**
- Serve ships where ships go**

→ **International Collaboration**



Thank you