



22nd Meeting of the International Ice Charting Working Group Executive Summary Report

The 22nd meeting of the International Ice Charting Working Group (IICWG) was held by videoconference during September 20-24, 2021. One hundred and seventy people representing 73 organizations from 22 countries registered for the meeting and about 100 participated in each session. Six business sessions dealt with specific tasks and three science sessions featured new ideas, developments, and partnerships.

Significant Outcomes

Multi-Spectral Synthetic Aperture Radar (SAR)

Wolfgang Dierking and Alvaro Scardilli reported on the progress and results of the Multi-Spectral SAR task, formerly known as ROSE-L. The project is nearing completion for the Northern Hemisphere. Several Ice Services have been assessing the value-added utility of L-Band SAR data as a complement to C-Band in operational ice analysis along with scientific assessment of L-band for ice classification. Results show that L- and C-Bands are complementary for ice analysis. L-Band has strengths in situations where C-band is weak (e.g. melt season and detecting icebergs in sea ice) and vice versa (e.g. floe structure in freezing season). Details are described in reports published in the framework of ESA's L-C ICE project and will be summarized for the IICWG in 2022. For the coming year, the task team will focus on the Southern Ocean to evaluate L-band SAOCOM data in combination with C-Band Sentinel-1 and X-Band from COSMOS SkyMed.

Maritime Training Centre Engagement

Over the past couple of years, an IICWG task team under the leadership of Keld Qvistgaard has worked to understand how Ice Services could play a more beneficial role in training mariners for polar navigation. The task team includes representatives from major maritime training institutes and the shipping industry. Over the past year, based on the results of earlier surveys, the team documented resources for understanding, observing, and reporting ice and for decision making in ice-covered waters. They described four examples of on-going cooperation between maritime training academies and Ice Services and developed an outline for a best practices guide for preparing mariners for ice-covered waters. Their findings are available on the IICWG website. Over the next year, the team will explore how a variety of ships in different ice regimes use enhanced ice and met-ocean information for risk management and voyage planning, summarize the type and nature of enhanced products used beyond Ice Services' standard offerings, explore how mariners are trained to access and use ice-met-ocean information for safe navigation, and prepare and circulate digital information sheets on specific product availability and use onboard.

Iceberg and Sea Ice Hazard Products

Two IICWG task teams were established at the previous meeting to investigate, develop, and assess new ice-information products designed to convey the level of risk to navigation presented by icebergs and sea ice. The iceberg task team led by Mike Hicks issued iceberg density charts developed at the International Ice Patrol and the Danish Meteorological Institute to selected mariners for evaluation at sea. Initial feedback was very positive with several suggestions for minor adjustment from the users. The sea ice team under the leadership of Scott Weese and Kevin Berberich provided an ice pressure chart developed at the Canadian Ice Service to selected mariners. A lack of significant ice in the Gulf of St Lawrence last winter forced a shift to the



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summer shipping season in the Canadian Arctic resulting a delay of several months. At the time of IICWG-XXII, feedback from users was still being collected. For the coming year, the iceberg task team will work to define the iceberg density product standards for adoption by all Ice Services. The sea ice team will incorporate user feedback into a next version of the ice pressure product.

Southern Ocean Limit of All Known Ice (SOLOKI)

The breakup of Antarctic ice shelves is generating thousands of icebergs, some of which are drifting farther and farther northward into traditional shipping lanes. Recognizing this increasing risk to maritime safety, the IICWG established at its last meeting a task team led by Jan Lieser and Andrew Fleming to investigate how a northern limit of ice in the Southern Ocean could be established operationally. Given the vast area involved, a combination of satellite observations and iceberg drift and deterioration modelling will be required. The team has developed plans for a pilot study in METAREA VI (Argentina), established a set of tests for iceberg detection methods, and engaged the IICWG iceberg model task team. Work will continue over the coming year.

Ice Chart Uncertainty

The IICWG has worked for several years to develop methods to quantify ice chart uncertainty measures for climatologists, Numerical Weather Prediction, and maritime users. Several approaches have shown that the problem is complex and depends on a combination of multiple factors. A task team led by Nick Hughes is focussing on uncertainty of the ice edge in the marginal ice zone as a means of simplifying. Over the coming year, they plan to define a common standard measure that can be employed by all Ice Services to portray ice edge uncertainty.

Automation in Ice Service Operations

A survey of the national Ice Services was conducted in 2021 to assess the use of automated products and processes in operational routines. The major finding was that, except for automated iceberg detection in SAR data and thin ice classification from SMOS in the Baltic Sea, there is little use of automatically generated products in the Ice Services. Services cite low resolution, inaccuracies, and a lack of formal validation as reasons. However, all Ice Services are implementing automated *processes* to handle the increasing flood of satellite observation data.

At IICWG-XXII, a panel of Ice Service and R&D managers, was convened to discuss how Ice Services could better optimize the mix of human expertise and automation. The panel agreed that, despite broad Internet presence, automated products based on Passive Microwave Radiometer data are not suitable for maritime safety, except as a last resort. Automated processes must deal with Synthetic Aperture Radar, the de facto standard for ice analysis to support navigation. Blending low- and high-resolution data was noted as a promising way forward getting greater attention.

All panelists echoed the sentiment that communication and collaboration among stakeholders, especially between operations and science, is critical to the success of new developments. It was clear from the discussion that there is extreme willingness by all parties to work together to automate processes that will help decision making so that humans can add the most value in providing critical services. Ice Services want to work more closely with R&D centres to develop new product lines but face resource limitations to free ice experts from routine production.

Next Meeting

The 23rd meeting of the IICWG is once again planned be held in Buenos Aires, Argentina during September 26 to October 1, 2022 hosted by the Argentine Naval Hydrographic Service.

IICWG Secretariat – October 5, 2021