JCOMM Expert Team on Sea Ice

Denmark Member Report

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Introduction

1. The Danish Meteorological Institute (DMI), Greenland Ice Service, is responsible for operational monitoring and charting of sea ice conditions in the waters around Greenland and distributes this information to ships primarily as ice charts and reports. In recent years also annotated quicklooks of various satellite data have provided significant support to shipping as these products oftens deals with physical details not included in standard ice charts. The purpose of the sea ice service is to aid navigation and provide tactical and strategic support to the shipping community. The present ice service was established in 1959 but information about sea ice conditions has been gathered by the DMI since 1872. The ice service is managed by DMI and is located at DMI headquarters in Copenhagen and in Narsarsuaq (southern Greenland). The Greenland Ice Service is now a division under the DMI Center for Ocean and Ice, established at 01st January 2006. The Copenhagen ice branch is manned with DMI staff plus one navigator from Royal Arctic Line. The Narsarsuaq branch is staffed purely with navigators from Royal Arctic Line.

Operations, data, services and products

2. The service provided by the Danish Meteorological Institute, Greenland Ice Service, is mainly based on the SAR satellite platforms, e.g. RADARSAT-1/2 and ENVISAT. DMI's current usage of SAR imagery is 250-300 Radarsat images per year and numerous Envisat ASAR Wide scenes (HH-polarisation), partly delivered via a contracted ground station and partly via MyOcean/ESA Rolling Archive. Near Real Time access to SAR data in combination with visible satellite data sources like NOAA-AVHRR and AQUA/TERRA MODIS constitute the most important source of information for the ice service production of navigation ice charts. A fully automatic ingest and processing system has been implemented to make available SAR images from RADARSAT and ENVISAT in near real time for the ice analysts.

3. The operational use of SAR data from satellites since 1999 for ice charting has indeed proven very successful. Therefore, the need for air reconnaissance has been reduced only to be performed by helicopter in support of inshore shipping and passenger routes. Main area of activity is the South Greenland Waters south of 62N. Here ice charts for navigation are normally issued 3-5 times weekly. Other regions are mapped infrequently ship traffic dependent. Twice a week (normally every Monday) a general ice chart for all Greenland waters is published as part of the GMES/ESA Polarview programme. All products are freely available at http://www.dmi.dk/dmi/en/index/gronland/iskort.htm or at http://ocean.dmi.dk/polarview More than 420 navigation ice charts, 104 general ice charts and numerous inshore ice reports are issued every year. NAVTEX messages with relevant ice information are circulated routinely from Ice Patrol Narsarsuaq. All ice charts are produced in Near Real Time seven days a week.

4. Near shores ice reports and ice piloting are carried out on a routine basis from Narsarsuaq with a contracted helicopter. More than 70 locations south latitude 62N may potentially be surveyed during one helicopter recce. A written near shore ice report in Danish and Greenlandic is published after the recce.

Ice Charting System

5. In February 2006 DMI's new ice charting system called SIKU was launched for operational ice analysis and chart production. SIKU is a new state of the art development based on ESRI ArcGIS. The current version is now based on ArcGIS 9.3.1. SIKU follows all international ice charting standards and WMO Nomenclature including export of ice analyses in SIGRID-3, graphical formats and netcdf.

Distribution of ice information

6. Operational ice information (ice charts and ice reports) is typically distributed via dmi.dk or directly to dedicated users on attachments to emails. Specific requests on ice conditions or offline requirements are handled by the ice operations team hooked up on iskort@dmi.dk.
7. Once a year DMI has an annual user meeting to obtain feedback and present services/changes. Meeting user requirements with an open dialogue has proved its value.

Research, Development and Other Activities

8. Research and quality assurance projects have been conducted to optimize the use of SAR data and to increase customer satisfaction. The primary goal of the Greenland Ice Service is to provide timely and accurate information to the customers. Combined use of satellite observations and oceanographic models would certainly support this goal. To investigate this possibility the DMI setting up an experimental high resolution sea ice model for the North Atlantic including the Greenland Waters. DMI has developed an operational module which in a semi automated fashion can extract ice thickness data from Synthetic Aperture Radar. This is in a test phase for Greenland.
9. Secondly investigations of new SAR sensors and modes are ongoing for example with respect Radarsat-2 dual polarization or the KosmoSkyMed constellation. Long term priority is to ensure data continuity, backup, methods for classification of sea ice and icebergs

Sea Ice Climate

10. No regular products.
11. The Greenland Ice Service has received funding from national sources for digitization of all ice charts produced for the South Greenland Water since 1959. All ice charts will be vectorized into the ArcGIS environment at DMI. Several output formats for this data base can be produced. This includes SIGRID-3. The South Greenland sea ice database is expected to be completed in 2011. Data will also be passed to GDSIDB. This includes also general ice charts produced for all Greenland waters.

Icebergs

12. No routine products. Regular navigation ice charts contain iceberg information using the WMO symbology in terms of bergy water and few/many icebergs/growlers eventually polygons with concentrations of glacial ice.

Training

13. Since the introduction of SAR satellite based ice charting in 1999 training of ice analysts has been improved and adjusted to the specific needs of the Greenland Ice Service.

14. A significant amount of training material has been compiled; most of which is developed in house but valuable material has also been made available by other ice services through international cooperation. This has helped to make the training more effective and to decrease the amount of time needed to perform the training. A substantial part of the ice analyst training takes place in open sea as onboard training on some major client vessels operating in ice infested waters. It is important to be familiar with the offshore environment as well as the crews' daily routines and decision making. This also includes exchange of information, product contents, ship focused requirements, ice recognition.
15. The DMI Ice Team has benefited significantly from Ice Analyst Workshop I and II.

International Cooperation

16. The Greenland Ice Service is also involved in international cooperation with the aim of improving cooperation, services and products. The cooperation between the ice centres within the International Ice Charting Working Group is fruitful and recognized internationally. DMI participates in a number of international projects. Some examples are GMES MyOcean and ESA Polarview

Commercial activities

17. Since February 2005 DMI has been contracted to provide Near Real Time ice information for the North Caspian Sea to operating oil companies and local Kazakh authorities. The current contract also include training of Kazakhs and transfer expertise to the Kazakh agencies
18. Since 2006 oil/gas exploration at the Greenland continental shelf has increased significantly. The local authorities and oil companies has a strict set of Health, Safety and Environment regulations which through the recent years had required many ice related field/desktop studies or operational requirements which have involved DMI significantly.

Appendix/ices: none