WORLD METEOROLOGICAL ORGANIZATION

INTERGOVERNMENTAL OCEANOGRAPHIC COMMISSION (OF UNESCO)

JOINT WMO/IOC TECHNICAL COMMISSION FOR OCEANOGRAPHY AND MARINE METEOROLOGY

EXPERT TEAM ON SEA ICE
FIFTH SESSION

Ottawa, Canada, 25 – 28 March 2014

FINAL REPORT

JCOMM Meeting Report No. 114

WORLD METEOROLOGICAL ORGANIZATION

INTERGOVERNMENTAL OCEANOGRAPHIC COMMISSION (OF UNESCO)

EXPERT TEAM ON SEA ICE
FIFTH SESSION

Ottawa, Canada, 25 – 28 March 2014

FINAL REPORT

JCOMM Meeting Report No. 114

NOTES

WMO DISCLAIMER

Regulation 43 (WMO-No.15)

Recommendations of working groups shall have no status within the Organization until they have been approved by the responsible constituent body. In the case of joint working groups the recommendations must be concurred with by the presidents of the constituent bodies concerned before being submitted to the designated constituent body.

Regulation 44 (WMO-No.15)

In the case of a recommendation made by a working group between sessions of the responsible constituent body, either in a session of a working group or by correspondence, the president of that body may, as an exceptional measure, approve the recommendation on behalf of the constituent body when the matter is, in his opinion, urgent, and does not appear to imply new obligations for Members. He may then submit this recommendation for adoption by the Executive Council or to the President of the Organization for action in accordance with Regulation 9 (5).

Chairperson, Publications Board
World Meteorological Organization (WMO)
7 bis, avenue de la Paix — Tel.: +41 (0)22 730 84 03
P.O. Box No. 2300 — Fax: +41 (0)22 730 80 40
CH-1211 Geneva 2, Switzerland — E-mail: Publications@wmo.int

IOC (of UNESCO) disclaimer

The designations employed and the presentation of material in this publication do not imply the expression of any opinion whatsoever on the part of the Secretariats of UNESCO and IOC concerning the legal status of any country or territory, or its authorities, or concerning the delimitation of the frontiers of any country or territory.

C O N T E N T S

GENERAL SUMMARY OF THE WORK OF THE SESSION

1. OPENING OF THE SESSION

1.1. Opening

1.1.1. The fifth session of the Expert Team on Sea Ice (ETSI) of the Joint WMO-IOC Technical Commission for Oceanography and Marine Meteorology (JCOMM) was opened at 0900 hours on Tuesday 25 March 2014 at the Conference Room of the Hotel Courtyard Ottawa Downtown, Ottawa, Canada, at the kind invitation of the Canadian Ice Service (CIS) of Environment Canada.

1.1.2. Dr Vasily Smolyanitsky, ETSI Chairperson, welcomed all participants in the session. He noted that the main goal of this session was to review the Team's intersessional workplan (2012-2017) in contribution to WMO and IOC's long-term goals, including; 1) review of WMO sea ice guidance material; 2) technical aspects of sea ice information systems and product delivery; 3) requirements for sea ice information, and; 4) community-wide efforts for collaboration and capacity development.

1.1.3. Mr David Jackson, Director of CIS, welcomed the participants to Canada. He noted that, in addition to the essential work mandated by WMO and IOC Members, the ETSI should proactively engaged in the future work; including the ongoing development by the International Maritime Organization (IMO) of a mandatory International Code of safety for ships operating in polar waters (Polar Code), as well as the implementation of the Agreements on Cooperation on Aeronautical and Maritime Search and Rescue in the Arctic (2011; by the member states of the Arctic Council) and the Agreement on Cooperation on Marine Oil Pollution, Preparedness and Response in the Arctic. Dr Jackson expressed his hope that the Session would be a successful meeting and wished all the participants a pleasant stay in Ottawa.

1.1.4. On behalf of the Secretary-General of WMO, Dr Boram Lee welcomed the participants to the Session. She expressed the appreciation to the WMO Members which contributes to the work of JCOMM through the volunteer work of the Team Members and experts. Dr Lee commended continuous effort of the Team to ensure the robust and science-based sea ice services. She emphasized that emerging issues in the polar activities have further required interdisciplinary approaches and cross-sectional collaboration. Dr Lee thanked the CIS for their warm welcome and wished the Team success in the meeting.

1.1.5. This Session was held jointly with the 13th session of the Steering Group for the Global Digital Sea Ice Data Bank (GDSIDB) project, whose discussion focused on the relevant issues of sea ice climatology.

1.1.6. The list of participants is provided in ***ANNEX I*****.**

1.2. Adoption of the agenda

1.2.1. The team adopted its agenda for the session, which is provided in ***ANNEX II*****.**

1.3. Working arrangements

1.3.1. The Team agreed its working hours and other practical arrangements for the session. Following the usual practice of JCOMM meetings, the meeting (including the documentation) was conducted in English only. All documents and information were provided through the meeting web site: http://www.jcomm.info/ETSI5.

2. REPORTS

2.1. Guidance and Requirements from JCOMM and WMO-IOC

2.1.1. Dr Boram Lee, WMO Secretariat, reported on decisions and activities by the WMO governing bodies and JCOMM, that are relevant to the work of the Team. At the 4th session of the Joint WMO-IOC Technical Commission for Oceanography and Marine Meteorology (JCOMM-4, May 2012, Yeosu, Republic of Korea), all Groups and Teams including the ETSI were re-established with agreed Terms of References (***ANNEX III*** for the ToR for ETSI). All the decisions, resolutions and recommendations of JCOMM-4 were adopted through the *WMO Resolution 2 (EC-64) – Report of the fourth session of the Joint WMO/IOC Technical Commission for Oceanography and Marine Meteorology*. The Team agreed and recommended to keep the current ToR for the Team, during the intersessional period ***(DECISION)***.

2.1.2. The Team recalled that the JCOMM Services and Forecasting System Area Coordination Group (SCG) at its 7th session (March 2013) reviewed and agreed on the list of priority activities as well as the harmonize the intersessional Workplan (2012 - 2017) of the JCOMM Services and Forecasting Systems Programme Area (SFSPA), in line with the priority of WMO and IOC. The list of priority activities endorsed at JCOMM-4, which directly calls for the activities of ETSI, included the following:

…

- Continue supporting Maritime Safety Information Services (with IMO and International Hydrographic Organization: IHO) including ice navigation services and information on complex sea states, and enhance Electronic Navigational Chart (ENC)/Electronic Chart Display Information System (ECDIS) or other display capabilities for met-ocean safety information, under the agreed scheme for IMO e-Navigation;
- Maintain and update technical documentation, including the Manual on Marine Meteorological Services (WMO-No.558), Guide to Marine Meteorological Services (WMO-No.471), relevant parts of the Manual on the Global Data-Processing and Forecasting System (GDPFS, WMO-No. 485), and sea-ice standards and reference material;
- Continue supporting and harmonizing sea-ice related training (e.g. Ice Analyst Workshop,IAW; Cooperative Programme for Operational Meteorology, Education and Training, COMET; manual for ice experts —ice observers).

…

2.1.3. The Team recalled that the intersessional workplan of the JCOMM SFSPA are structured as a set of “projects” (see http://www.jcomm.info/SFSPAWP), It recognized that the following projects were expected to be carried out by / with input from the ETSI during the intersessional period (2012 – 2017). The Team reviewed the expected outcome, main activities and leading persons for each project, and revised the description of project accordingly, under agenda item 10 ***(Decision)***, for:

- Project #13: Capacity Development
- Project #20: Catalogue on Met-Ocean Object Class for ENC and e-Navigation
- Project #26: Support and enhance the polar components of the Global Maritime Distress and Safety System (GMDSS)

- Project#27: Support and enhance ENC/Electronic chart Display Information System (ECDIS) for ice navigation

- Project #28: Maintain and update sea ice technical documentation

- Project#29: Support for Sea ice climatology

- Project#31: Enhancing the integrated ice services and forecasting

2.1.4. The Team took note of the ongoing development by JCOMM, pursuant to Recommendation 5 (JCOMM-4), for quality management approach for globally acceptable requirements for marine meteorological and oceanographic services. It noted that the final draft for Marine Weather Competence standard framework was drafted by the ad hoc JCOMM Task Team on Marine Competency Requirements (TT-MCR), as a minimum baseline standard of competence considered necessary to perform the duties of a marine weather forecaster (MWF). The Team noted with satisfaction that the sea ice aspects are well reflected in the current draft, through the active participation of Mr Antti Kangas as member of the ad hoc Task Team. The Team noted that the final draft of the framework would be submitted to the WMO Congress in 2015 for approval. In terms of future implementation, the Team agreed on the need to work with the International Maritime Organization (IMO) on possible future working arrangements to continuously update QMS requirements.

2.1.5. Dr Lee informed that the JCOMM has been under review the overall structure for the Manual on Marine Meteorological Services (WMO-No.558) and the Guide to Marine Meteorological services (WMO-No.471), in view of making a recommendation for a new structure of those mandatory publications without duplication and/or potential conflict in contents. Such a review should also develop clear guidelines for Members applying to be Preparation/Issuing Services for the Global Maritime Distress and Safety System (GMDSS) Marine Broadcasting System. The Team noted that, until the formal revision/re-publication would be adopted, these two publications should continuously be reviewed and updated under the current structure as references for operational services and for joint WMO/IMO/IHO implementation for WWMIWS. The ETSI, in coordination with the Expert Team on Maritime Safety Services (ETMSS), was requested to review and propose amendments for the WMO-No.558 and WMO-No.471 regarding sea ice services in parallel with the ongoing review/update of other sea-ice related guidance material ***(Action, corresponding to the implementation of SFSPA Projects #28 and #31; by D.Langlois with input from ETSI members; Regularly)*.**

2.1.6. The Team took note of WMO's ongoing efforts for, and progress in, the establishment of the Global Framework for Climate Services (GFCS). Dr Lee recalled that JCOMM decided to fulfil the requirements by focusing on its core service mandates, while avoiding duplicated efforts or new creation of tasks that might impair the essential work. The Team noted that contributing to GFCS implementation for marine and coastal communities was recognized as a programmatic priority of the parent organizations of JCOMM, and that a number of Teams' activities are directly related to various GFCS components; such as the ongoing development of the sea ice climatology and ice information services, in particular, strengthened service in polar regions in support of GMDSS.

2.2. Report by the Chairperson of the ETSI

2.2.1. Dr Vasily Smolyanitsky presented his report, outlining the status of the ETSI activities since its last session (ETSI-IV, St.Petersburg, Russia, March 2010) and priorities for this Team outlined by JCOMM-4 (Yeosu, Republic of Korea, May 2012) and the 7th session of the Services and Forecasting Systems Coordination Group (SCG-7).

2.2.2. Dr Smolyanitsky noted that the Team was re-established at JCOMM-4 with the current ToR and membership, taking into account the work of the Task Group on Electronic Navigational Chart Ice Objects (TG ENCIO), led by Dr Jürgen Holfort, with an objective "to develop and to maintain an international standard for Ice Objects as a class of Marine Information Objects (MIO) that is based on the standards of the International Hydrographic Organisation (IHO) for Electronic Navigational Charts (ENC)". The ToR for TG ENCIO is reproduced as ***ANNEX IV*** to this report.

2.2.3. Dr Smolyanitsky then summarized the activities and achievements of the Team during the past intersessional period. He noted that the Team's focus was given to responding to new requirements for sea ice products and services for improved safety at ice navigation, including; 1) support for provision of sea-ice information in ENC/ECDIS; 2) support for extending formats for exchange and archival of ice information, and; 3) implementation of the new Arctic METAREAS XVII-XXI in full operation since July 2011. In doing so, much of the Team's work has been completed in close collaboration with the JCOMM Expert Team on Maritime Safety Services (ETMSS) as well as the Expert Team on Marine Climatology (ETMC), and linkages with other relevant bodies, in particular, the Working Group on Transfer Standard Maintenance and Applications Development (TSMAD) of the International Hydrographic Organization (IHO), WMO Global Cryosphere Watch (GCW) and regional and international sea ice projects and alliances including IICWG, BSIM and CliC. The Team reviewed and agreed on the status of the Action Plan made at the previous ETSI session, as reproduced at ***ANNEX V***. The Team agreed to continue implementing those action items that were under way during the current intersessional period ***(Decision)***.

2.2.4. Among the Team's achievements, Dr Smolyanitsky highlighted the following areas:

1) The five new Arctic METAREAs XVII-XXI of the Global Maritime Distress and Safety System (GMDSS) came into Full Operational Capability (FOC) from July 2011. Preliminary Team's work included developing a) specifications for sea ice information coding for the GMDSS SafetyNET bulletins, b) regulations for information exchange including naming conventions for the regions and provision of continuity of the ice edge across the bounding METAREAs and c) testing the new standards in practice, through the 3rd Ice Analysts Workshop (IAW-3) in June 2011, Copenhagen, Denmark. The IAW-3 served as a critical milestone for training on sea ice analysis, besides developing and testing the regulations for the SafetyNET bulletins, and helped facilitating the harmonization of different analysis techniques.

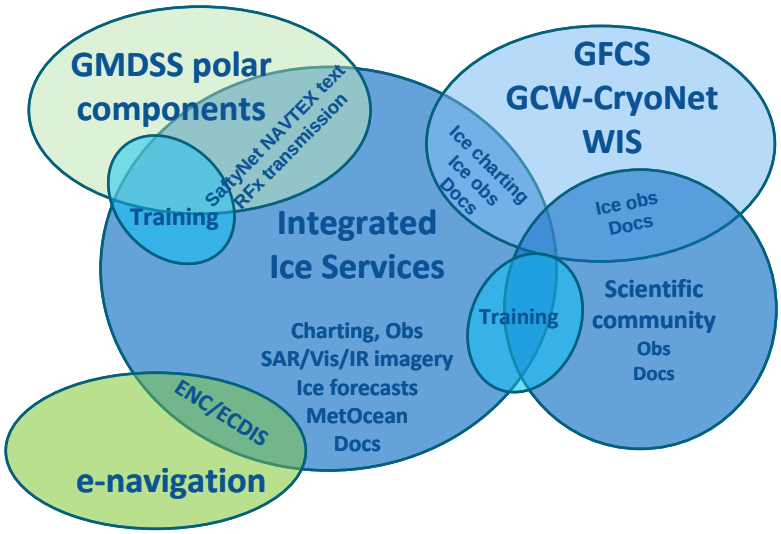
2) Sea ice information became mandatory for presentation on Electronic Navigational Charts (ENC) though the scope of sea ice parameters and presentation mechanisms differ across the IHO standards (MIO, AML and S-10x) and implementations of sea ice presentation in various Electronic Chart Display Information System (ECDIS). The IHO/TSMAD adopted the "Ice Objects Catalogue" in the effort to harmonize existing national practices and to extend the IHO S-57 standard for sea ice both for 'ice' and 'ice-free' navigation. The Catalogue was submitted to the IHO Registry of Marine Information Objects by the Team's TG ENCIO, undergoes regular update and presently available from the IHO depository as a version 5.0.1. Closely related to the Catalogue activity is developing of the ice specifications as a new IHO standard S-107 carried out by TG ENCIO with support of the German Ice Service since 2012.

3) Continuous effort has been made to review and update the WMO technical guidance on sea ice, including nomenclature/glossaries, coding, exchange and presentation procedures as well as best practices. It includes; 1) updating the "Sea Ice Nomenclature" (WMO-No.259) published in electronic form in four languages

(EN/FR/RU/ES); 2) developing the sea ice exchange format "SIGRID-3" in collaboration with the IICWG; 3) review of Ice Objects Catalogue, and; 3) ongoing process for new WMO publications on "Understanding and Identifying Old Ice in Summer" and "Manual for Ice Experts – Ice Observers". All sea-ice documents and the latest version of those publications can be accessed through the JCOMM web-site (http://jcomm.info).

4) Effort for sea-ice climatology, in the context of the "Global Digital Sea Ice Data Bank" (GDSIDB), has continued through active participation of ice services including BSIS, Canada, Japan, Russia, and USA. Presently most of the ice charting data prior to 2000s are stored in a 0.25°x0.25° raster SIGRID and SIGRID-2 (WMO, 1989 and 1994) or Ease-grid formats, while after 2000s the data is stored in a more flexible vector SIGRID-3 format (WMO, 2004). The whole sea ice charting collection for the period of instrumental ice observation (i.e. ~1933 till present moment, i.e. March 2014) is available either via the GDSIDB centers at the server of Russian Arctic and Antarctic Research Institute (AARI; http://wdc.aari.ru/datasets), NSIDC (http://nsidc.org), dedicated web geo-portals of the U.S. National Ice Center (NIC; http://www.natice.noaa.gov) or AARI (http://gisa.aari.ru).

2.2.5. Taking into account the requirements for close collaboration of the Team with national and international initiatives for ice research and services, Dr Smolyanitsky presented the following concept for linkages of integrated ice services:



Concept of linkages of integrated ice services - national practices – scientific community – CryoNet – GCW

2.2.6. The Team was then introduced with the intersessional workplan of the JCOMM Services and Forecasting System Programme Area (SFSPA), http://www.jcomm.info/SFSPAWP, where the Team is underneath, and reviewed the parts to be led by / expecting contribution from the Team. The updated and agreed Workplan (in the form of SFSPA "projects") are summarized under agenda item 10 and ***ANNEX IX.***

2.3. Reports on national and regional practices

2.3.1. Reports by the Members of the ETSI

2.3.1.1. The Team members presented their national report describing the sea ice information services, by Canada, Denmark, Finland, Germany, Japan, Norway, Russian Federation and USA. The full reports are published as session documents at http://www.jcomm.info/ETSI5.

2.3.1.2. The Team agreed that the corresponding parts of "Sea ice Services in the World" (WMO-No.574), with additional input from other countries which currently provides sea ice services, should be updated with the reports received at this session ***(Action; by V.Smolyanitsky; by July 2014 and yearly)***.

2.3.2. Regional Reports

Baltic Sea Ice Service

2.3.2.1. Dr. Jürgen Holfort, reported the results of the 25th Baltic Sea Ice Meeting held in Gdynia, Poland, from 25 to 27 September 2013. In addition to the discussion for improved collaboration among ice services, as well as to new developments of data acquisition and interpretation, the meeting also discussed on the use of ice symbology and ice colour codes. A suggestion was to differentiate colours for fast ice and for rotten fast ice. The Team noted that a new colour scheme could be applied as far as an appropriate legend/explanation is provided with charts ***(Agreement)***.

2.3.2.2. The Team noted that Sweden was elected as new chair of the Baltic Sea Ice Service.

European Ice Services

2.3.2.3. Mr. Antti Kangas presented a report by the European Ice Services (EIS). The EIS is a joint effort by DMI (Denmark), FIMR (Finland), Met.no (Norway), SMHI (Sweden), and since 2013, IMO (Icelandic Meteorological Office); and currently chaired by DMI (Dr Nicolai Kliem). In 2013 EIS became a working group of NORDMET the cooperation of the national meteorological institutes of the Nordic Countries.

2.3.2.4. The Area of Responsibility for the EIS covers all waters of Europe including Greenland, which contain sea ice, and which are of operational interest to users. As a network of basic ice service, the EIS assists:

- providing an ice service of a higher quality and better cost efficiency than the former level,
- providing better ways to distribute products and services,
- providing uninterrupted services in the case of mission critical failure in either centre,
- improving the capacity to participate and contribute in an international infrastructure development,
- providing common opportunities for the participating Parties to benefit from the cooperation.

2.3.2.5. Mr Kangas informed the Team that the FMI and SMHI have been working together for a new ice charting program that is based on ArcGIS10. The first development version has been released, and the goal is to have an operational version by the end of 2014. The Ice Object Catalogue will be used in the new ice charting program. FMI and SMHI have provided

comments on the catalogue draft. The Team also noted that the research project ICEMAR is running as an EIS activity, ending by the end of 2014.

2.3.2.6. The Team took note of the plan for EIS to share training material and manual observations among its members, and to carry out discussions on harmonizing ice charts particularly for those overlapping areas of interest in the Greenland Sea.

North American Ice Service

2.3.2.7. Ms Darlene Langlois provided un update on the activities of North American Ice Service (NAIS), which is a partnership between the Canadian Ice Service (CIS), the International Ice Patrol (IIP) and the U.S. National Ice Center (NIC), in support of: 1) Safe and efficient maritime operations; 2) Weather and environmental modelling; 3) National and environmental security; 4) Research and climate understanding; and, 5) International treaty obligations.

2.3.2.8. The Team noted that the NAIS has provided ice information for the Great Lakes, Alaska and the waters South East of Newfoundland:

- Products: daily Ice and iceberg charts and bulletins, 30-day ice forecasts, Seasonal Outlooks and Seasonal Summaries. These products are produced jointly; either sharing production of the different parts of the product or alternating during the week or during the year. In support of these products, satellite imagery is shared to the maximum extent possible.

- Data Sources: RADARSAT-2 data is shared between the NIC and the CIS over the Great Lakes. Both centers use US satellites such as NOAA AVHRR, Modis and VIIRS. Ship reports of ice conditions or icebergs are shared. Information about icebergs detected from RADARSAT-2 is shared between the three centers.

- Information Technology: Both the IIP and the CIS use the Berg Analysis and Prediction System (BAPS) for managing the iceberg database, modeling their forecast movement and chart production. BAPS is in the final stages of being updated to be able to use Windows 7.

2.3.2.9. The Team noted that, since January 2006, all current CIS charts are available in Sigrid-3 format and the regional products are provided to the U. S. National Snow and Ice Data Center in real time. Iceberg climatology is available through the IIP. It also noted that iceberg modelling –the International Ice Patrol is evaluating a different iceberg model for operational use.

International Ice Charting Working Group

2.3.2.10. Mr John Falkingham provided a report of IICWG, as secretariat of the IICWG. He noted that the IICWG is an ad-hoc working group open to the ice charting nations of the world, addressing issues of coordination of products and services among the ice charting services. It serves as an advisory body to the Expert Team on Sea Ice.

2.3.2.11. Mr Falkingham informed of the results of the 14th meeting of the International Ice Charting Working Group (IICWG-XIV), held in Reykjavik, Iceland, from 21 to 25 October 2013. Sixty-five attendees representing 34 organizations from 14 countries participated, to discuss on the “Ice Information for Marine Safety and Security”. Plenary sessions were devoted to Antarctic Ice Information and Integrating Ice Information, with breakout groups discussing on various issues. The topics covered at the IICWG XIV included:

- Ice in Electronic Navigation Charts;
- Joint Antarctic Ice Chart Production;
- Engaging Southern Hemisphere Ice Services and Users;
- Role of Ice Services in Emergency Response (both Search-and-Rescue and Environmental) ;
- Role of Ice Services in Trans-Arctic Shipping;
- International Maritime Organization (IMO) Mandatory Polar Code.

2.3.2.12. Mr Falkingham explained that several members of the IICWG are also members of the WMO Executive Council Panel of Experts on Polar Observations, Research and Services (EC-PORS), that a suggestion was made for the IICWG to propose projects for the EC-PORS research and observations committees to influence the work that EC-PORS supports. The IICWG Applied Science and Research Standing Committee was asked to suggest research projects to EC-PORS in time to influence decisions on resource allocations. The discussion extended to a possibility to share resources to support developing seasonal ice forecast products, as well as on avoiding duplicated efforts of two groups in modelling activities. The Team agreed with Mr Falkingham that the interaction between JCOMM/ETSI and EC-PORS should be strengthened in the same context, particularly to address WMO on relevant issues of regulating, harmonizing and sharing best practices of sea ice services in the world ***(Decision)***.

2.3.2.13. The Team recalled that the IICWS has been actively working with ETSI and IHO to further the availability of ice information in Electronic Navigation Charts (ENCs). Mr Falkingham expressed his appreciation to the leadership of Dr Jürgen Holfort in developing technical specifications for ice information in S-10x format. A nearly complete draft product specification, including feature catalogue, XML schemas, portrayal and test data sets was presented to the IICWG for review and approval over the coming months (See also agenda item 5.2).

2.3.2.14. The Team noted that, building on initiatives from the previous meeting, AARI, NIC and the Norwegian Ice Service agreed to commence a pilot project to undertake joint production of ice charts for Antarctic waters. The technical ability to integrate ice charts from multiple sources has been well demonstrated and the three organizations will now work on implementing policies and procedures to ensure that ice information for marine safety in the Antarctic will remain paramount while achieving efficiencies through joint production.

2.3.2.15. Mr Falkingham noted the continuing effort, with limited success, of IICWG to engage the ice services of the southern hemisphere in an effort to improve the availability of ice information in the Southern Ocean in the interest of marine safety. In a significant development, the Meteorological Service of the Chilean Navy would host the next IICWG in Punta Arenas, Chile during October 20-25, 2014. The meeting would focus on ice information in Antarctic waters with a view to engaging both producers and users. In a parallel development, Mr Andrew Fleming of the British Antarctic Survey assisted by Dr Jürgen Holfort would present a working paper informing about IICWG initiatives at the meeting of the Antarctic Treaty Consultative Meeting in May 2014.

2.3.2.16. With interest in trans-Arctic shipping growing and non-Arctic nations beginning to contemplate the use of new Arctic routes in future, the IICWG discussed how ice services might enhance marine safety in the international and multi-national waters of the Arctic. While no commitments were made, these discussions marked an initial step towards exploring how information, beyond the basic ice edge delineation currently provided, could be produced and delivered in the Arctic METAREAs.

3. MARINE SAFETY INFORMATION (MSI) RELATED TO SEA ICE

3.1. Report by the ETMSS chairperson including the Arctic METAREAs

3.1.1. Mr John Parker, vice-chairperson of the JCOMM Expert Team on Maritime Safety Services (ETMSS), provided a report on ETMSS activities since its last ETSI session, and on priority activities for the current JCOMM intersessional period (2012-2017).

3.1.2. Mr Parker highlighted the achievement through joint effort by ETMSS and ETSI in the full implementation of the meteorological Maritime Safety Information (MSI) service for GMDSS in the Arctic, since July 2011, through Canada (METAREAs XVII & XVIII), Norway (METAREA XIX), the Russian Federation (METAREAs XX & XXI) and the supporting Preparation Services from Denmark and USA. ETSI prepared the specifications for ice information in SafetyNET bulletins (including the definition of ice-edge and the common set of Sub-Areas agreed by Preparation Services), formally adopted by JCOMM-4 to be included in the Manual on Marine Meteorological Services (WMO-No. 558). The Commission also adopted the list of abbreviations for ice information to be used in NAVTEX bulletins, to be included in the list of abbreviations in the Guide on Marine Meteorological Services (WMO-No.471).

3.1.3. Mr Parker recalled that the following documents have been developed and maintained jointly by WMO, IMO and IHO for reference and application in providing MSI:

- IMO MSC.1/Circ.1287, 2008, Resolution A.705(17): Promulgation of Maritime Safety Information (Effective 1 January 2010, as amended);
- IMO MSC.1/Circ.1310, 2009: Joint IMO/IHO/WMO Manual on Maritime Safety Information (MSI) (Effective 1 Jan 2011);
- IMO Resolution A.1051(27), 2011: IMO/WMO Worldwide Met-Ocean Information and Warning Service (WWMIWS) - Guideline Document;
- International SafetyNET Manual: IMO MSC.1/Circ.1364, 2010 (Effective 1 January 2012);
- NAVTEX Manual: IMO MSC.1/Circ.1403, 2011 (Effective 1 January 2013).

All those reference documents are available on the JCOMM website (http://www.jcomm.info/GMDSS). The main contribution of WMO through JCOMM is to the IMO/WMO World-Wide Met-Ocean Information and Warning System (WWMIWS). The Team noted that the current version of Joint Manual contained potential confusion on the provision of ice information, and provided a proposal for amendment, for the coming cycle of the Document Review (planned in the first half of 2014) ***(Action; by D. Langlois and WMO Secretariat; Done)***.

3.1.4. Mr Parker recalled that the JCOMM at its 4th session (May 2012) endorsed the revision of Manual on Marine Meteorological Services (WMO-No. 558) and the Guide on Marine Meteorological Services (WMO-No. 471), of which the changed included the parts on provision of sea ice information, availability of MSI prepared for the GMDSS on the GTS, and references to the WWMIWS and METAREA Coordinators. Mr Parker draw the Team's attention to the plan of the Commission, to be led by ETMSS, to review the overall structure and contents of these publications (see also paragraph 2.1.5) that required input from the ETSI.

3.1.5. Mr Parker informed that the self-assessment of all METAREA Coordinator was conducted in 2013 with a revised format that focused on improving the clarity and utility. The results would be used for, and reviewed during, the upcoming Second Maritime Safety Services Enhancement Workshop planned in August 2014 in Wellington, New Zealand. The Workshop would also discuss on the Quality Management of meteorological MSI services as well as coordination with the NAVAREA Coordinators, with the expectation of a joint session during one of the days of the Workshop.

3.1.6. The Team recalled that, during the past years, the Marine Pollution Emergency Response Support System (MPERSS) has been extended to the Arctic Ocean, with minimum capabilities achieved. Mr Parker noted that such a global coordination should be developed beyond the minimum requirements in the future, to provide appropriate products in case of complex events such as radioactive leaks or oil releases at the bottom of the ocean, as well as for Search and Rescue. Mr Parker informed that ad hoc task team under the JCOMM SFSPA has been reviewing the current arrangement and propose a strategy to enhance global coordination for Marine Environmental Emergency Responses, to be proposed to the WMO Congress in 2015.

3.1.7. The Team took note of the intersessional workplan for ETMSS, to be carried out jointly with ETSI; Graphical products for mariners, contribution to e-Navigation and review of the GMDSS. JCOMM-4 re-emphasized the usefulness of numerical/graphical products for mariners, and requested ETMSS and ETSI to work toward the relevant technical regulations. The increase of Electronic Navigation Charts (ENC) systems on SOLAS vessels as regulatory material and the emergence of the e-navigation concept within IMO reinforce the priority given to this requirement. ETSI have been developing the Ice Objects Catalogue and is engaged in developing the S-411 version (latest IHO standards) of this catalogue, which includes descriptions of extended set classes, attributes and presentation libraries (see also agenda item 3.2). In 2009, ETMSS initiated the development of a catalogue of Met-Ocean Object Classes and Attributes. Following JCOMM-4 the writing team (led by the United States of America representative on the ETMSS team), created the first draft of the Encoding Documents in summer of 2013 and distributed for comments from the ETMSS members. Those comments were incorporated into a second draft of the Encoding Documents and the first draft of Product Specification Documents was created. Both are currently under review by the ETMSS members (action SFSPA #20). The next steps include proceeding with registration in IHO S-411 and engage the IHO and TSMAD for the creation of a IHO domain for a Met-Ocean Feature Catalogue, similar to the path followed by ETSI on the Sea Ice Feature Catalogue. As not all the SOLAS vessels are equipped with ENCs, the Commission requested the continuing broadcast of MSI in text format. Considering the concerns of the Issuing Services on the high telecommunication cost of providing both text and graphical products, the Team is also encouraged to explore issuing MSI in text format that could be displayed on ENC systems.

3.2. IHO Report on the use of S-411 within the sea ice information / e-Navigation

3.2.1. Dr Jürgen Holfort report on the status in developing the S-411 Sea Ice Production Specification, on behalf of the International Hydrographic Organization (IHO). Dr Holfort recalled that the IHO Hydrographic Services and Standards Committee (HSSC) on its 5th meeting in November 2013 assigned the JCOMM/ETSI with the specification of S-100 based product. The Team noted with appreciation that the BSH finalized the draft version of S-411 in consultation with IHO-TSMAD.

3.2.2. The Team was presented with the final draft version of specification. It noted that the actual ice objects catalogue approved by ETSI was used. The Tem also noted that the geographic markup language (GML) was used in this version to encode the data and adheres to the published S-100 specification. Dr Holfort informed that the discussion has

been under way within the IHO-TSMAD on some technical specifications regarding S-100, especially pertaining portrayal. The portrayal specification using styled layer descriptors (SLD) as used for S-411 follows OGC standards, has been discussed within TSMAD, with an anticipation that this would be included as one of several possibilities of portrayal specification within S-100. The S-411 data could actually be read and presented using open source GIS software (e.g. QGis) and python scripts are available to convert shapefiles, specially also SIGRID-3 files, into the S-411 format. Three polygon portrayals are given within the S-411 specification, one according to the vessels ice capabilities, the second being the WMO ice concentration colour code and the third the WMO colour code for stage of development. Portrayals for line and point objects also follow the WMO symbology.

3.2.3. The Team recommended that the final draft version of S-411 Sea Ice Product Specification (formally known with the preliminary number of S-1xx in the development stage) should be adopted, and to be followed by the subsequent development and registration of metocean and sea ice catalogues ***(Decision)***.

3.3. Sea Ice MSI in the sub- and non-Arctic METAREAs and Antarctic

3.3.1. The Team recalled that the "Sea Ice GeoReferenced Information and Data – 3 (SIGRID-3)" was formally adopted and maintained by the Team, as a mechanism exchange ice chart data between ice services and with user applications – see also agenda item 5.1. The Team encouraged all countries to provide chart data in SIGRID-3 format **(Decision & Recommendation)**. The Team suggested to investigate technical implication of using poligons instead of linear object in SIGRID-3 format for ice information in the production of SafetyNET bulletins, and if any change in the practice should be made, make necessary test/validation for common practice ***(Action; by Canada and Norway; by June 2014)***.

3.3.2. The Team noted that the schemes of the Arctic METAREAs' (XVII to XXI) sub-Areas should be updated. The Team requested all METAREA Coordinators of these Areas to provide shapefiles of latest status, to the ETSI chair, and to the WMO Secretariat for update on WMO-No.9, Volume D ***(Action; by METAREA Coordinators of Canada, Denmark, Norway, and Russian Federation; by June 2014).*** The Team also requested all members to provide summaries to ETSI Chair on currently missing ice information in northern hemisphere sub-Arctic METAREA bulletins ***(Action; by all ETSI members; July 2014)***.

3.3.3. Dr Smolyanitsky proposed to make North Pole as one sub-Area, and to decide on a single responsible country for sea ice MSI provision. The Team agreed, firstly, to investigate the case of NAVAREA sub-Area coordination for the North Pole, then decide on the course of actions in a consistent manner and through agreement by all concerned Arctic METAREA Coordinator countries, and taking into account technical feasibilities under operational environments ***(Action; by V.Smolyanitsky in consultation with Canada, Denmark and Norway; by October 2014 for investigating status of NAVAREA Coordinator for Polar sub-Area(s) and to reach an agreement for recommendation).***

3.3.4. The Team agreed to identify and use the single point access to SafetyNET bulletins for all Arctic METAREAs –XVII and XVIII, as for XIX to XXI ***(Decision & Action; by Canada, and Russia, by June 2014)***.

Southern Ocean / Antarctic METAREAs

3.3.5. Mr Parker recalled the request by the Commission to Members / Members States providing MSI in the polar METAREAs, especially those covering the Southern Ocean, to follow the agreement by Arctic METAREAs (XVII to XXI) on exchange and preparation of

GMDSS sea ice information ***(Recommendation)***. To facilitate it, the Team agreed to develop an inventory of current knowledge between the Southern Ocean METAREAs Preparation Services of WMO/IHO requirements to SafetyNET bulletins for areas with occurrence of floating ice ***(Action; by J.Holfort; by June 2014)***. This inventory should be used at the planned Ice Analysts workshop in June 2014, and be discussed at the second Maritime Safety Services Enhancement Workshop in August 2014.

3.3.6. The Team recalled that the IICWG proposed to implement a regular collaborative method to analyse and disseminate a weekly Antarctic sea ice analysis, in view of contributing to a safer ice navigation in the Antarctic waters as well as regional GMDSS. Should this be agreed by participating national sea ice services, a process could be established for a sustained weekly hemispheric ice analysis, by using a common geospatial dataset and coastline and through a common process for analysis and dissemination. The Team reviewed an initial matrix of specifications for the Southern Ocean ice analysis, reproduced in ***ANNEX VI***, and agreed to implement the adopted specifications ***(Action; by ETSI members of sea ice services; continuous)***. The Team suggested to present a gap analysis of the mandatory sea ice component in meteorological MSI delivered through GMDSS in the sub-Arctic and Southern Ocean Regions at the 2nd Maritime Safety Services Enhancement Workshop (18-22 August 2014, Wellington, New Zealand), with a goal to develop a consensus and commitment on including this mandatory information ***(Action; by ETSI Chair; by August 2014)***.

3.4. Role of ice services in Search and Rescue (SAR)

3.4.1. The Team noted that ice services could often have a significant role in marine Search-and-Rescue and Environmental Emergency Response operations taking place in the vicinity of ice. The Team noted that the IICWG, at its 14th meeting in October 2013 held a special session on this subject and initiated actions to better inform the response agencies about the capabilities of the ice services through appropriate mechanisms. A summary of the IICWG discussion was presented by David Jackson, head of Canadian Ice Service.

3.4.2. The Team noted that SAR is commonly a responsibility of appropriate authorities. Service provision by Ice Services can vary widely due to unique conditions for each incident with variation from a broad overview to detailed geographic examination though two things are important for each incident - knowing who and how to contact and data reception and transmission infrastructure.

3.4.3. Key recommendation by IICWG include:

- To develop an inventory of which SAR agencies the ice services currently support in their own countries;

- Each Ice Service to provide two points of contact to the U.S. National Ice Center (and share with everyone else for information). As the only ice service with a 24/7 response capacity, the NIC would maintain these in the duty officer file and post on their splash page. This would serve as a single point of contact for SAR agencies globally. The duty officer would know how to contact any other Ice Service in an emergency.

3.4.4. Short / medium term recommendations for the Ice Services include:

- If they don't already have them, Ice Services should develop internal procedures, associated with their point of contact so employees know what to do in the event of a call for assistance to a SAR operation;

- Ice Services develop, share and maintain a list of contact information – people, phone numbers, e-mail addresses, web sites, ftp sites; including login information required to access information;

- Map how routine Ice Service products overlay on the SAR areas and identify gaps in the provision of ice and weather information;

    - Follow-on step would be to determine how best to fill the gaps;

- Reach out to the Rescue Coordination Centers (likely through the SAR area coordinators) to inform them about the capabilities of the Ice Services and how to avail themselves of that capability;

- Consult with national SAR agencies on the best mechanism for the Ice Services to support them;

- suggest common Ice Services and products be tested and applied in SAREX 2014;

- Develop a conceptual model for how the Ice Services could collaborate in supporting SAR agencies;

- Investigate the International Charter of Space and Major Disasters to determine the extent to which it may apply and be helpful in providing ice information support to SAR operations;

- Develop ways of providing ice information in formats compatible with the common operating picture of the SAR agencies (Arctic ERMA is a possible model)

- Work collaboratively to map areas where ice presents the greater risks so that SAR agencies can better plan their response strategies

- Collaborate with the SAR agencies in their planning activities

- Test the model for Ice Service support by participating in SAREX exercises with the SAR agencies.

- Investigate the best mechanisms for handling data to support various scales of SAR operations in consultation with data providers, SAR agencies and other stakeholders.

3.4.5. During the summary discussion the Team agreed on the proposed mechanism on Ice Services involvement in SAR operations, including the NIC offer to serve as an initial point of contact to direct response organizations to the appropriate ice service for support to an operation and the Canadian Ice Service to contact authorities to see how ice services can support the 2014 Search-and-Rescue Exercise (SAREX-2014) ***(Action; Canadian Ice Service)***. Further discussion on implementation of SAR was held under item 10.1.

3.5. Report on Polar Code development

3.5.1. Mr David Jackson, Director of the Canadian Ice Service, the IICWG introduced this subject in terms of the implications of the ongoing development of the International Maritime Organization (IMO) Mandatory Polar Code for the national ice services.

3.5.2. Mr Jackson noted that operation in polar waters may expose vessels to hazards not found elsewhere. IMO Guidelines for Ships Operating in Arctic Ice-covered waters were introduced in 2002. These guidelines were updated in 2009 to include all polar waters (Antarctic waters included, reference to ice-covered waters dropped). Development of a mandatory Polar Code, which began in 2010, is scheduled to complete at the end of 2014, although recent developments regarding MARPOL amendments may push back completion by 6 months.

3.5.3. The Code has two Parts: Part I Safety Measures and Part II – Pollution Prevention with each Part having two sections: A - Mandatory measures, B - Guidance in interpreting/implementing mandatory measures. Part I - Safety Measures applies to SOLAS vessels operating in polar waters – cargo vessels > 500 gross tonnage and passenger vessels on international voyages. There is a proposal under discussion to amend to extend application of Part I to such vessels on domestic voyages in Antarctic waters to be discussed. Operational requirements will apply to new and existing vessels while construction and most equipment requirements are unlikely to be applied to existing vessels. Part II – Environmental Protection Measures application (as Part I, as per individual MARPOL Annexes or other) is still under discussion. Aspects of particular relevance to tourism vessels and so far for the Ice Services include:

- Documentation;
- Polar Ship Certificate;
- Polar Waters Operations Manual;
- Lifesaving Appliances;
- Navigation;
- Communications;
- Voyage planning;
- Manning;
- Pollution prevention.

3.5.4. A Polar Ship Certificate and a Polar Waters Operations Manual (PWOM) are required for any vessel operating in polar waters - if the Code applies to the vessel. How certificates will be issued, the information it will contain and the extent of approval/review required for manuals require clarification. Application for the certificate must include a risk assessment listing the vessel's operational capabilities and limitations (mainly for ice operation and low temperatures). The risk assessment must take into consideration:

- the hazards of the operation (those listed in the Code plus any others identified during the assessment);

- the anticipated range of operating conditions;

- plans, provisions, procedures, additional safety equipment necessary to satisfy the Code / mitigate incidents with potential safety or environmental consequences.

3.5.5. Polar Waters Operations Manual is required in addition to the Certificate. The Manual is to set out:

- ship-specific capabilities and limitations as determined during the in relation to the risk assessment, including limitations for operation in ice and low temperature (as applicable), voyage duration and capabilities for communication and navigation in high latitudes;

- specific procedures to be followed in normal operations and in order to avoid

encountering conditions that exceed the ships capabilities; and

- specific procedures to be followed in the event of incidents in polar waters.

3.5.6. Evacuation and survival measures are to take into account “possible adverse environmental conditions” and the “maximum expected time of rescue”. Measures include: adequate thermal protection, insulated immersion suits for each person on board, only totally or partially enclosed lifeboats, personal and group survival equipment, consideration for evacuation in ice-covered waters or onto ice (as applicable). At the IMO Ship Safety and Equipment Sub-Committee meeting held March 10 to 14, it was agreed that standards for low temperature may be needed, but will wait for the Polar Code to be finalized before addressing the issue.

3.5.7. In terms of Navigation, vessels to have, pending confirmation from NCSR 1:

- ability to receive and display ice information
- ……

3.5.8. Voyage plan is to take into account the potential hazards of the intended voyage and other pertinent information including:

- quality of charts,
- statistical information on ice and temperatures from former years
- current information on the extent and type of ice and icebergs in the vicinity of the intended route
- ….

3.5.9. Manning or basic and advance training requirements (i.e. two-tier approach) for masters and officers in charge of a navigational watch on board ships should be defined in chapter V of the STCW Convention and Code. Following IICWG and the Norwegian Nautical Institute proposals, the final “Ice Navigator: 2013” requirements were accepted in a way proposed by Canadian Ice Service and include following basic knowledge of ice characteristics and areas where different type of ice can be expected in the area of operation:

- Ice physics, terms, formation, growth, aging and stage of melt;
- Ice types and concentrations;
- Ice pressure and distribution;
- Friction from snow covered ice.
- Implications of spry-icing; Danger of icing up, precautions to avoid icing up and options during icing up;
- Ice regimes in different regions. Significant differences between the Arctic and the Antarctic, first year and multiyear ice, sea ice and land ice;
- Use of Ice imagery to recognize consequences of rapid change in ice and weather conditions;
- Knowledge of ice sky and water blink;
- Knowledge of differential movement of icebergs and pack ice;
- Knowledge of tides and currents in ice covered waters;
- Knowledge of effect of wind and current on ice.

3.5.10. The Team noted that final steps for the Polar Code development in 2014, after which the Code is done, included meeting of DE committee (now called SDC: Ship Design and Construction) Jan 2014 and meeting of Human Element Training and Watchkeeping committee in Feb 2014. Further, the Code is to be submitted to MSC in for safety discussion

and approval, to MEPC for Pollution Prevention discussion and approval and then pass COMSAR/Nav Safety sub-committee to be adopted in April 2015 and coming into force by 1 January 2017.

3.5.11. The Team noted that there are still several key issues to be resolve that could impact the outcome/timelines of the Polar Code:

- Application of SOLAS provisions to vessels not on international voyages;
- Application of pollution prevention measures (MARPOL) vs. SOLAS applicability (e.g. small vessels/fishing vessels);
- Application of provisions to existing vessels;
- Prohibition on discharges of oil/oily mixture, HNS vs. adequacy of port reception facilities;
- Certification and documentation vs. administrative burden resulting from Polar Code;
- Operational limitations vs. vessel category and/or ice capability;
- Content of Polar Waters Operations Manual;
- Development of guidance material for Part IB and IIB.

3.5.12. During the follow-up discussion the Team noted that it finds development of the Polar Code appropriate and consistent with Ice Services vision though several things remain unclear to the Members and need to be addressed during the possible period of providing amendments to the Code within the Team's pilot project #26. That includes clarification of requirements to navigation in terms of ability to receive and display ice information (without specifying whether or not any kind of ECDIS will be used), clarification of definition of what standardized ice information will be provided to a global information/reporting/identification system, harmonization of maps showing applicability of Polar Code with e.g. METAREAs with sea ice occurrence, etc. ***(Action: ETSI; October 2014).***

3.6. Guidelines for sea ice MSI in WMO manuals and guides

3.6.1. The Team recalled that the new edition of the Manual on Marine Meteorological Services (WMO-No. 558) was published in 2012 and made available on the WMO and JCOMM websites (http://www.jcomm.info/558), and that the Guide to Marine Meteorological Services (WMO-No. 471; http://www.jcomm.info/471) was under review for update. While taking into account the ongoing process led by ETMSS to review the overall structure of these publications, the Team reviewed the WMO-No.558 and agreed on the proposed amendments to the Volume I of the WMO-No. 558, as reproduced in ***ANNEX VII***, in order to keep the Manual updated with the recent development and for consistency with the other sea ice reference documents for the use of terms ***(Decision & Recommendation)***. The Team requested the WMO Secretariat to work with the ETMSS that those amendments would be considered in the next revision of WMO-No.558 through the established procedure ***(Action; by WMO Secretariat and ETMSS; 2015)***.

3.6.2. The Team agreed that no particular amendment should be proposed for the Guide to Marine Meteorological Services (WMO-No.471) or for the WMO No-9, Volume D, upon the latest amendments adopted through Recommendation 6 (JCOMM-4) - *Modifications to the Manual on Marine Meteorological Services – WMO No. 558, the Guide to Marine Meteorological Services – WMO No. 471, and WMO-No. 9, Volume D, Information for Shipping*.

3.6.3. The Team was advised that the Manual on Maritime Safety Information (MSI), IHO Special Publication No. 53, was re-published as the Joint IMO/IHO/WMO Manual on Maritime Safety Information (IMO MSC.1/Circ.1310, 2009: effective 1 January 2011). The Team agreed on the proposed amendment to this publication (see also paragraph 3.1.3), to

be submitted to the regular document review process by IHO, WMO and IMO ***(Action; by WMO secretariat and ETMSS; by April 2014).***

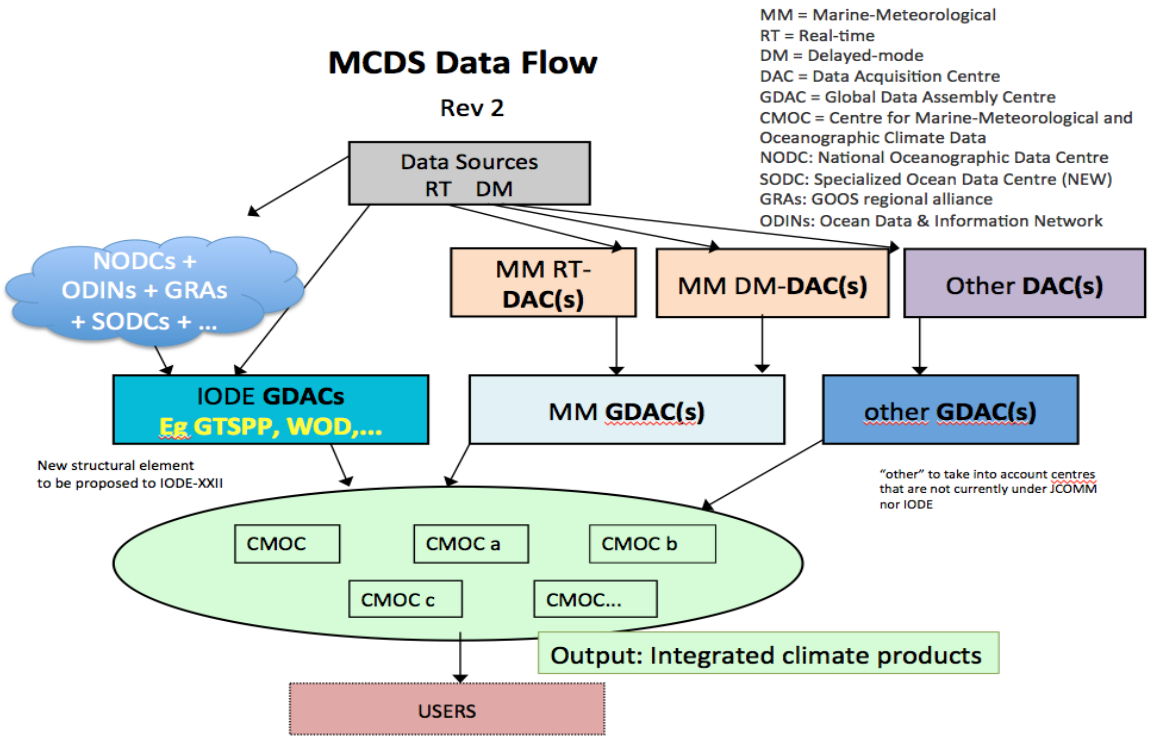
3.6.4. The Team invited all members to review those WMO publications, joint WMO/IMO/IHO publications as well as other sea ice publications to verify any possible inconsistencies or agreement with national practices, and provide feedback to Ms Darlene Langlois ***(Action; all ETSI members; by April 2014)***.

4. SEA ICE CLIMATOLOGY (13TH SESSION OF THE STEERING GROUP FOR THE GDSIDB PROJECT)

4.1. Sea-Ice Climatology in the context of the new JCOMM-IODE Marine Climate Data System (MCDS)

4.1.1. The Vice-Chair of the JCOMM Expert Team on Marine Climatology (ETMC), Ms Gudrun Rosenhagen, presented the development of the new Marine Climate Data System (MCDS) as a follow up of the modernization of the Marine Climatology Summaries Scheme (MCSS) established in 1963. She noted that the new data system would be one important element of JCOMM's contribution to the Global Framework for Climate Services (GFCS).

4.1.2. Ms Rosenhagen explained that the primary objective of MCDS is to improve availability, recovery and archival of contemporary and historical data, metadata and products and obtain standardized quality of a high level in a more timely manner. Groups of CMOCs will operate within a given data domain (e.g. global, regional, atmospheric, surface and sub-surface oceanic) and provide complimentary functions. To achieve maximum continuity, reliability and completeness of data, metadata and products, specialized CMOCs would be established that mirror the processes, data and metadata across the CMOC domain. The Team noted the MCDS data flow, as described in the figure below.



4.1.3. Ms Rosenhagen noted that the ETMC and ETSI should collaborate to resolve as soon as possible the issues within the outdated Marine Climatological Summary (MCS) products from the MCSS. Following the guidance made at JCOMM-4 and following discussions, the ETMC has been exploring how oceanographic and sea-ice climatologies could be coordinated with the marine meteorological data, so that the results could be viewed as an integrated product.

4.1.4. Ms Rosenhagen suggested that the above issue might be dealt with by including the sea ice climatological products (ice charts) in the information delivery through the future Centres for Marine Meteorological and Oceanographic Climate Data (CMOCs). The Team noted that the various level of ice charting material and their flow to services would need further deliberation to clarify the respective roles, for example; for the ongoing activities and data flow through the Global Digital Sea Ice Data Bank (GDSIDB) that could be a Global Data Assembly Centre (GDAC); for National Ice Services to play a potential role as Data Acquisition Centres (DACs), and for the GCW portal (in Met.No) to locate metadata and ensure interoperability. In this context, the Team agreed to work with ETMC to further clarify the role of those elements against the MCDS framework ***(Action; by ETMC chair/vice-chair and ETSI chair; by October 2014)***. The Team also agreed that the MCDS framework and data flow should be clearly defined in compliance with the WIS structure and associated regulations.

4.1.5. The Team noted the potential value of this process. As the first step for joint effort, the Team agreed that the ETSI and ETMC would work together to develop an inventory of applicable/available quality control procedures for ice charting material, and an outline for ETSI members for future implementation. It is targeted to develop an outline by the GCW meeting planned for the 3rd quarter of 2014 ***(Action; led by ETSI Chair and ETMC Chair with input from all ETSI members; by the 3rd quarter of 2014)***.

ICOADS International partnership

4.1.6. Furthermore, Ms Rosenhagen reported on the status of the collaboration within the 'International Comprehensive Ocean-Atmosphere Data Set (ICOADS) Partnership' to ensure the long-term sustainability of the ICOADS that was originally maintained by the USA. The partnership was formed to facilitate future formalization of ICOADS, if possible, as a Centre for Marine-Meteorological and Oceanographic Climate Data (CMOC) under the WMO-IOC MCDS.

4.2. Reports of the GDSIDB centers (AARI and NSIDC) and the ice services

Arctic and Antarctic Research Institute

4.2.1. Dr Vasily Smolyanitsky provided a report on sea ice activities of AARI (Russian Federation) related to the WMO Global Digital Sea Ice Data Bank project (GDSIDB) and JCOMM sea ice climatology during the current intersessional period. The AARI World Data Center Sea Ice (WDCSI) department continued to provide informational support to the WMO GDSIDB project including national and international operational and climatological activities in terms of standards, collections and presentation of sea ice material. Simultaneously, requirements from the Russian federal program ESIMO – Unified Information system on the World Ocean provides impetus and technical specifications for development of techniques of sea ice data processing and publication.

4.2.2. Accepted by the WDCSI paradigm for informational support, which differentiate WDCSI from the similar climatological centres worldwide, is:

- Support for all historical ice charting collections and datasets in the WMO exchange formats SIGRID, SIGRID-2, SIGRID-3, Baltic Code and Ease-Grid format;

- Support for sea ice climatology based on ice charting;

- Provision of both 'simple' and 'full' interfaces to ice charting collections with unrestricted (at most of the cases) access;

- Implementation of user interfaces on a basis of OGC (Open Geospatial Consortium) open source software.

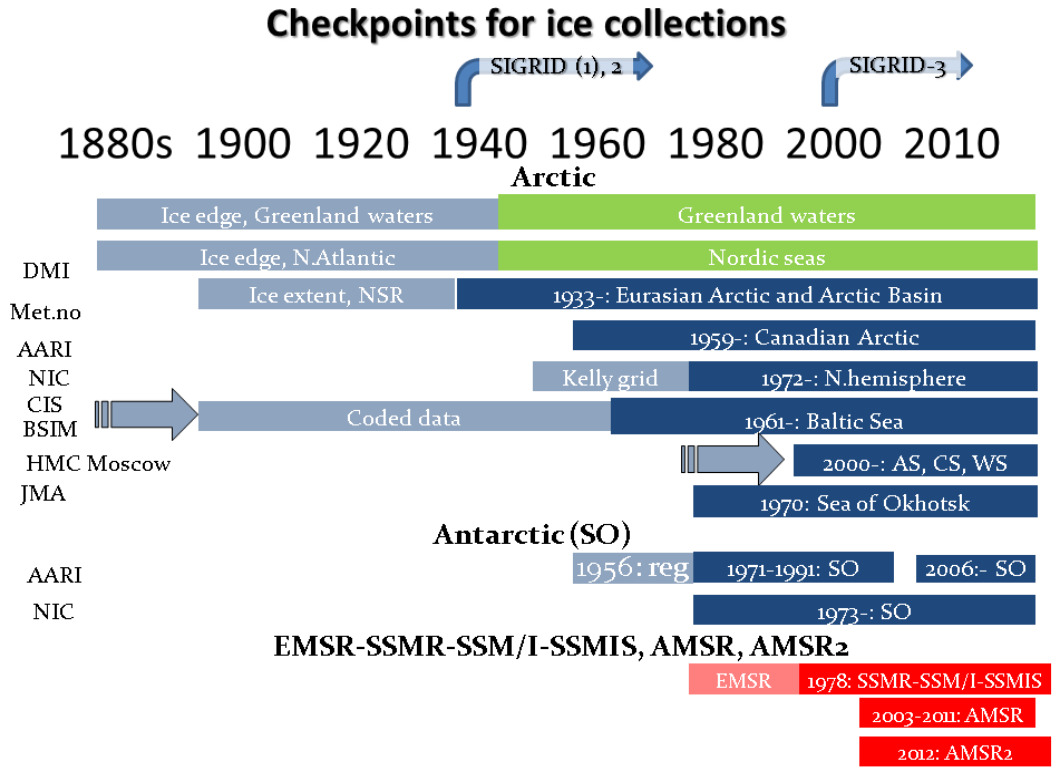
4.2.3. The major sea ice collections at AARI GDSIDB/WDCSI by March 2014 include more than 26000 ice charts in WMO exchange raster and vector standards. Raster SIGRID, SIGRID-2, Baltic Code and Ease-Grid format collections include:

- 10-30 days AARI Arctic Ocean ice charts for 1933-1992 & 1997-2008 – 2984 charts
- 10-30 days AARI Southern Ocean ice charts for 1971-1991 – 495 charts
- 1-4 days BSIM Baltic Sea ice charts – 2653 charts (Baltic Code & SIGRID)
- 7-days CIS Canadian Arctic ice charts for 1968-1998 – 3433 charts
- 5 days JMA Sea of Okhotsk ice charts for 1970-2013 – 2309 charts
- 7-days NIC Northern Hemisphere ice charts for 1972-1994 – 1200 charts
- 7-14 days Northern hemisphere ice charts for 1972-2007 – 2796 charts (Ease-Grid)
- 7-days NIC Southern Ocean ice charts for 1973-1994 – 1148 charts

4.2.4. The newer, constantly growing collections in the WMO vector SIGRID-3 format

- 7 days AARI Arctic Ocean ice charts from 2008…. - > 300 charts
- 15 days AARI Southern Ocean ice charts from 2006…. > 252 chars
- 7-days AARI Eurasian Seas ice charts from 1998… - >5200 charts
- 7-days BSH Baltic Sea ice charts from 2012…. - > 40 charts
- 7-14-days CIS Canadian Arctic ice charts from 2006… - > 1600 charts
- 7-days HMC Moscow Azov, Caspian &White Seas from 2000… - >400 charts
- 14 days NIC Northern Hemisphere ice charts from 2003…. - > 300 charts
- 14 days NIC Southern Ocean ice charts from 2003…. - > 270 charts

4.2.5. The major checkpoints for sea ice collections at GDSIDB/WDCSI are given as figure below. Collections marked by 'dark blue' are available in the exchange formats to the user community. Collections marked by 'grey colour' are either 1-dimensional (ice index) or still awaiting digitization. Collections marked by 'green colour' do exist in digital form but are awaiting submission to WDCSI.

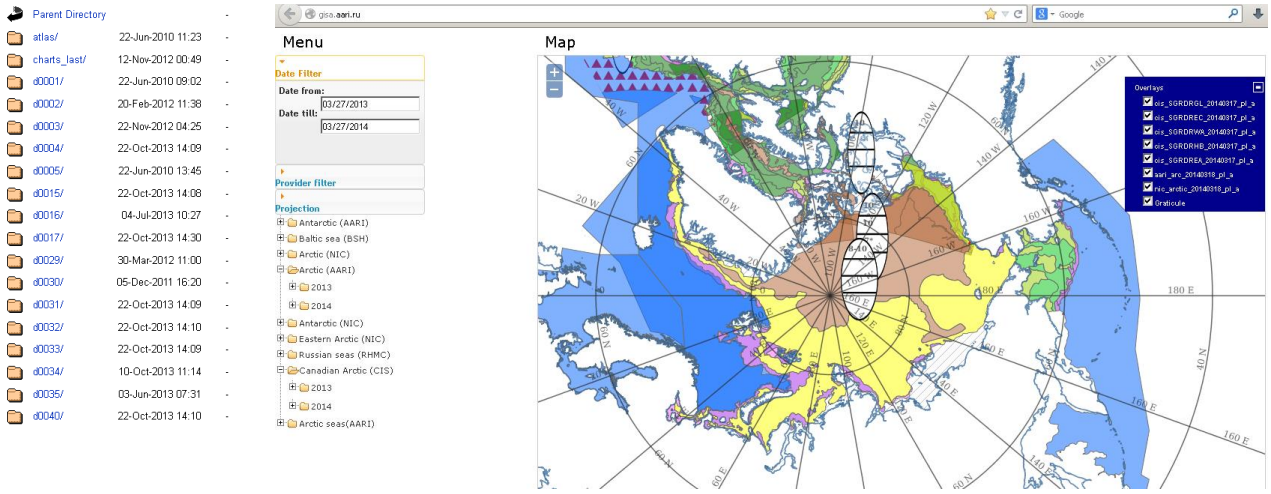


DMI – Danish Meteorological Institute, Met.no – Norwegian Meteorological Institute, AARI – Arctic and Antarctic Research Institute(St.Petersburg, Russia), NIC – USA National Ice Center, CIS – Canadian Ice Service, BSIM – Baltic Sea Ice Meeting, HMC Moscow – Hydrometeorological Centre, Moscow, JMA – Japan Meteorological Agency; Regions: N. – Northern, SO – Southern Ocean, AS – Azov Sea, CS – Caspian Sea, WS – White Sea.

4.2.6. WDCSI provides both a 'simple' and a 'full' interfaces to ice charting collections with unrestricted (at most of the cases) access. Sample view of the interfaces is shown on a figure below. The 'simple' access to data collection is provided at http://wdc.aari.ru/datasets with ice charts collections and climatological material arranged by formats, agencies, regions in separate indexed directories (e.g. d0001 – SIGRID-1, 2 and Baltic Code). Further steps will include generation of static replicas for all charts in graphic formats (using WMO/Td-No.1215), implementation of OpeNDAP or similar as well as extensive documentation of all data collections.

4.2.7. The 'full' interface is based on a provision of Web Map Services (WMS) for ice material. The server part is implemented on a basis of Geoserver open-source software and SLD-styling for egg-code symbology and colour coding in accordance with the WMO-No.259 and WMO/Td-No.1215. Implementation of the 'full' interface requires post-processing of ice charts that is calculation of value-add data tags and publication at geoserver. User-interface is implemented on a basis of open-source OpenLayers software, presently available as a "Prototype AARI Ice Portal" at http://gisa.aari.ru and supports:

- Access to ice chart collections in vector SIGRID-3
- Search by agencies/time
- 6 fixed projections (Northern and Southern Polar)



National Snow and Ice Data Center

4.2.8. Further the Team considered a summary update of activities of the National Snow and Ice Data Center (NSIDC) that are relevant to the GDSIDB, provided by Florence Fetterer.

4.2.9. The Team noted that the majority of NSIDCs budget is supported by NASA (about 85%) for operation of the Distributed Active Archive Center (DAAC). The DAAC handles remote sensing data. In recent years, NASA has supported development of outreach and information products like Arctic Sea Ice News and Analysis (http://nsidc.org/arcticseaicenews/) and Satellite Observations of Arctic Change (http://nsidc.org/soac). Sea ice thickness estimates from IceBridge (http://nsidc.org/data/icebridge/) can be used to provide a crosscheck with estimates of ice thickness from operational sources. Funding from NOAA (about 3% of NSIDCs budget) supports NOAA@NSIDC (http://nsidc.org/noaa/). NOAA@NSIDC is the program under which GDSIDB data sets at NSIDC are maintained. This program supports the work described in this report, with the exception of the NSF-supported sea ice ontology research project. NOAA@NSIDC is affiliated with the NOAA National Geophysical Data Center (NGDC). In 2014, NGDC was forced to pass along a 7% cut in the budget for NOAA@NSIDC.

4.2.10. The reduction in funding means that NSIDC cannot be as actively involved in the GDSIDB as it has been in years past. However, the NSIDC remains committed to continuing to work with operational services to archive digital sea ice charts and to promote the use of these by researchers. This work is high priority for NOAA@NSIDC. That also includes support the International Ice Charting Working Group (IICWG) by hosting the Web site (https://nsidc.org/noaa/iicwg/) and by reviewing proposed changes to digital chart archive formats.

4.2.11. The National Ice Center Arctic Sea Ice Charts and Climatologies in Gridded Format continues to have high usage statistics, although it has not been updated since 2007. While not a GDSIDB data set, the Multisensor Analyzed Sea Ice Extent – Northern Hemisphere (MASIE-NH) data product is one example of how operational products (in this case the NIC IMS product) can be made more accessible for research.

4.2.12. Two papers from the Environmental Working Group (EWG) Joint U.S.-Russian Arctic Sea Ice Atlas published in 2000 have been re-published as NSIDC Special Reports.

The first paper, Data on the Geographical Distribution of Sea Ice by R.G. Barry, has been published as NSIDC Special Report #15 and provides a historical review of sea ice data measurements from the mid 1800s to 2000. The second paper, Sea Ice In the Climate System: A Russian View by V. F. Zakharov, has been published as NSIDC Special Report #16 and provides an overview of sea ice and its role in the climate system as it was known in 2000. To access these papers, see the NSIDC Special Reports page: http://nsidc.org/pubs/special/.

4.2.13. The table below includes those data that are part of or particularly relevant to GDSIDB. Note the publication year in the citation.

URL	Data set title	Citation	Format(s) and/or file type
http://nsidc.org/data/g02176.html	Sea Ice Charts of the Russian Arctic in Gridded Format, 1933-2006	Arctic and Antarctic Research Institute. 2007. Sea ice charts of the Russian Arctic in gridded format, 1933-2006. Edited and compiled by V. Smolyanitsky, V. Borodachev, A. Mahoney, F. Fetterer, and R. Barry. Boulder, Colorado USA: National Snow and Ice Data Center. Digital media.	EASE-Grid (binary), SIGRID (ASCII), and browse (PNG) files
http://nsidc.org/data/g02172.html	National Ice Center Arctic Sea Ice Charts and Climatologies in Gridded Format	National Ice Center. 2006, updated 2009. National Ice Center Arctic sea ice charts and climatologies in gridded format. Edited and compiled by F. Fetterer and C. Fowler. Boulder, Colorado USA: National Snow and Ice Data Center. Digital media.	EASE-Grid (binary),GIS-compatible (.shp) and browse (GIF) files
http://nsidc.org/data/g02171.html	Canadian Ice Service Arctic Regional Sea Ice Charts in SIGRID-3 Format	Canadian Ice Service. 2009. Canadian Ice Service Arctic regional sea ice charts in SIGRID-3 format. Boulder, Colorado USA: National Snow and Ice Data Center. Digital media.	Shapefiles (.shp) encoded in SIGRID-3 format.
http://nsidc.org/data/g02169.html	March through August Ice Edge Positions in the Nordic Seas, 1750-2002	Divine, D. V., and C. Dick. 2007. March through August ice edge positions in the Nordic Seas, 1750-2002. Boulder, Colorado USA: National Snow and Ice Data Center. Digital	ASCII, JPEG, and shapefile forma
http://nsidc.org/data/g01962.html	Environmental Working Group Joint U.S.- Russian Arctic Sea Ice Atlas	Arctic Climatology Project. 2000. Environmental Working Group joint U.S.- Russian sea ice atlas. Edited by F. Tanis and V. Smolyanitsky. Ann Arbor, MI: Environmental Research Institute of Michigan in association with the National Snow and Ice Data Center. CD- ROM	See URL, documentation, and FAQ
http://nsidc.org/data/g02182	Sea Ice Edge Location and Extent in the Russian Arctic, 1933-2006	Mahoney, A. 2008. Sea ice edge location and extent in the Russian Arctic, 19332006. Boulder, Colorado USA: National Snow and Ice Data Center. http://dx.doi.org/10.7265/N5W37T8Z	Comma delimited ASCII text files
http://nsidc.org/data/g01111.html	The Dehn Collection of Arctic Sea Ice Charts, 19531986	NSIDC/WDC for Glaciology, Boulder, compiler. 2005. The Dehn collection of Arctic sea ice charts, 1953-1986.	PNG and TIFF images of primarily

		Boulder, CO : National Snow and Ice Data Center/World Data Center for Glaciology. Digital media.	Alaska region ice charts. Not WMO format.
http://nsidc.org/data/docs/noaa/g10006-unified-sea-ice/	Unified Sea Ice Thickness Climate Data Record Collection Spanning 19472012	Lindsay, R. W. 2013. Unified Sea Ice Thickness Climate Data Record, 1975-2012. Boulder, Colorado USA: National Snow and Ice Data Center. http://dx.doi.org/10.7265/N 5D50JXV.	ASCII text
http://nsidc.org/data/docs/noaa/g02203-dmi/	Arctic Sea Ice Charts from Danish Meteorological Institute, 1893 - 1956	Danish Meteorological Institute (DMI) and NSIDC. 2012. Arctic Sea Ice Charts from the Danish Meteorological Institute, 1893 - 1956. Compiled by V. Underhill and F. Fetterer. Boulder, Colorado USA: National Snow and Ice Data Center. http://dx.doi.org/10.7265/N 56D5QXC	JPEG image files (.jpg)
http://nsidc.org/data/ docs/noaa/g10007-dmi-seaice/	Arctic Sea Ice Concentration and Extent from Danish Meteorological Institute Sea Ice Charts, 1901-1956	Underhill, V., F. Fetterer, and C. Petersen. 2014. Arctic Sea Ice Concentration and Extent from Danish Meteorological Institute Sea Ice Charts, 1901-1956. Boulder, Colorado USA: National Snow and Ice Data Center. http://dx.doi.org/10.7265/N5MP517M.	JPEG, Shapefiles

4.2.14. The Team noted that collecting and maintaining metadata is a key for successful implementation/development of sea ice climatology, as well as ensuring the visibility of historical ice charting material, and commended the AARI and NSIDC for its continuing effort in this regard.

4.2.15. The Team considered that the GDSIDB could be referenced with a Digital Object Identifier (DOI), The Team requested the Dr Smolyanitsky and Dr Panowicz to investigate the feasibility for assigning the DOI for each database ***(Action; by V.Smolyanitsky and C.Panowiz; Ongoing).*** The Team also noted that, in a longer term, a copyright issue should be clarified for information developed within the GDSIDB project.

4.2.16. The Team noted that the ongoing effort of GDSIDB could be reinforced through the integration with the JCOMM-IODE MCDS, and proposed to continue exploring potential roles and opportunities (see also agenda item 4.1).

4.3. Review of the WMO sea ice guidance material related to sea ice climatology

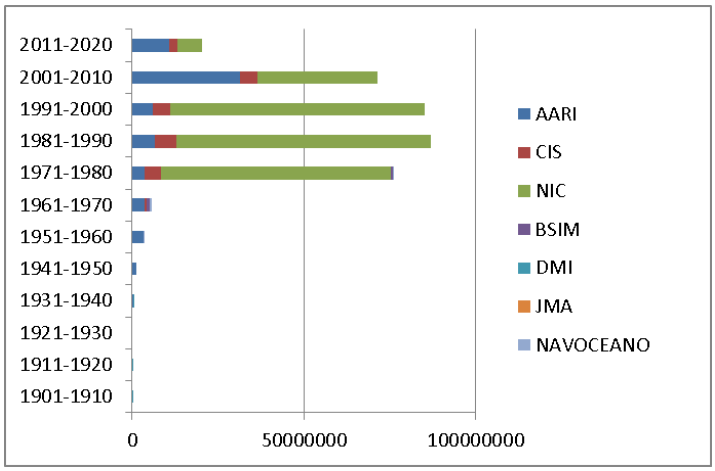
4.3.1. This was discussed together with agenda items 5.1 and 5.3, and in relation to quality management under agenda item 4.1.

4.4. Practices of sea ice historical data processing

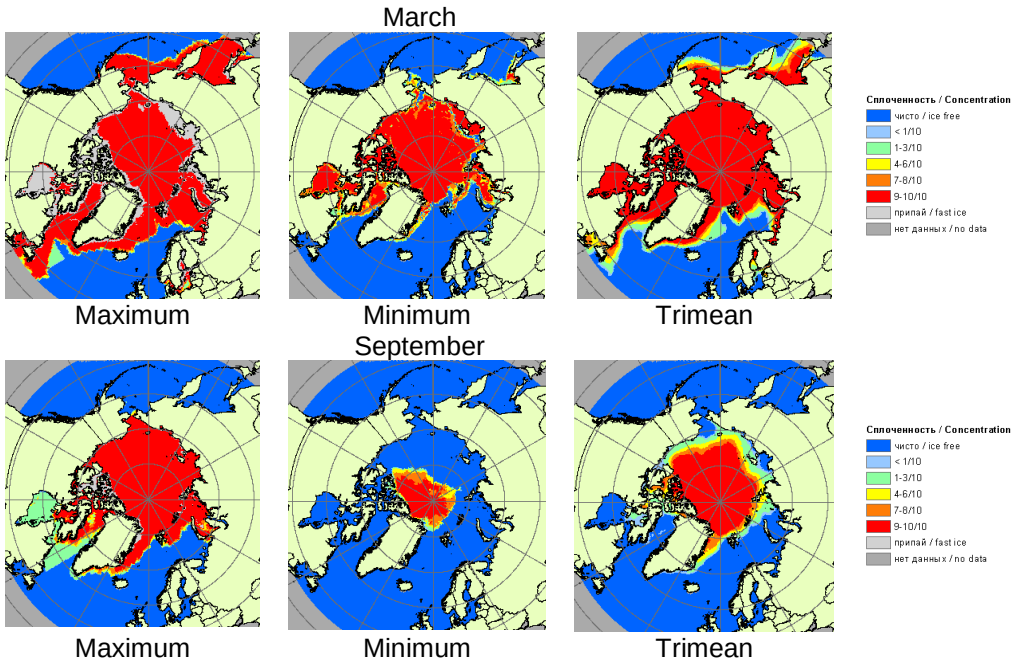
4.4.1. Dr Vasily Smolyanitsky provided a report on developing sea ice processing technique related to blending historical ice charting material. The Team noted that the previous version of sea ice blended technique was developed in AARI during 2002-2007 for the Northern Hemisphere GDSIDB charts in raster SIGRID format. Output dataset included monthly total concentration values on 0.25°by 0.25° grid for the period of 1933 – 2004 on a basis of five GDSIDB (AARI, BSIM, CIS, JMA, NIC) ice-charting collections and was provided for testing and intercomparison purposes to the UK Met Office Hadley Centre.

4.4.2. Advances in GIS capabilities allowed revisiting this subject in 2012 – 2013. A new technique was developed under a joint project with International Arctic Research Centre

(IARC), grant UAF 12-0063 «International collaboration within ACE to improve predictive capabilities for Arctic Sea Ice» for the whole collection of sea ice charting material in raster SIGRID (1,2) and vector SIGRID-3 format spanning period up to 2013. Resulting blended dataset contains gridded CT values (monthly means, minimums, maximums, medians) and supplementary information (number of cases, origin) on a hemispheric (90°N…45°N 0°….360°) geographical 0.25°by 0.25° grid with monthly interval. Proportions of material from individual services by decades and Northern hemisphere sea ice total concentration values for the periods of maximum (March) and minimum (September) ice extent are shown on figures given below.



Summary number of points by decades by originating centers for 1901 – 2013



Northern hemisphere sea ice total concentration statistics for the periods of maximum (March) and minimum (September) ice extent based on blended ice charting for 1901-2013

4.4.3. The Team recommended that the “blended climatology” should be used as common approach for sea ice climatology, as soon as digital charts become available in national centres (***Decision & Recommendation***).

4.5. Review of sea ice and icebergs products based on GDSIDB data

4.5.1. Ms Darlene Langlois presented the case for the Canadian Ice Service (CIS), regarding the maintenance of a digital archive for ice records in a variety of formats; including sea ice, lake ice and iceberg charts, aircraft and ship reconnaissance charts, bulletins and iceberg reports.

4.5.2. The Team noted that the focus has been given on sea ice charts, since few requests have been identified for iceberg data. The Team took note of the current status of the data availability as follows:

Available online at the CIS web site:

- Regional scale charts. Frequency has gradually increased from Monthly to weekly. Northern charts (Western and Eastern Arctic and Hudson Bay charts are done weekly year round. Southern charts (Great Lakes, East Coast) are started the week before we expect ice to form and end the week after we expect the last ice to leave. In this way, we hope to catch early and late freeze up events.

- Daily iceberg distribution chart showing the estimated numbers of icebergs in each degree latitude/longitude square as well as the Limit of All Known Ice (done in partnership with the International Ice Patrol)

- Daily charts. These charts are now produced in areas where there is marine activity. In the past they focused on where the Canadian Coast Guard ships were operating.

Other data available through manual extraction:

- Ship-board or aircraft ice reconnaissance charts

- Daily ice bulletins – text messages including warnings of hazardous ice conditions present or developing within the next 36 hours

- 30-Day Forecasts – text forecasts issued about the 1st and 15th of every month describing expected changes in ice conditions over the next 30 days

- Seasonal Outlooks – text and graphical products issued about December 1st to provide an outlook for the freeze-up and development of the ice season in southern Canadian waters, and about June 1 to provide an outlook for the break-up and development of the navigation season in northern Canadian waters

- Seasonal Summaries – text and graphical products issued at the end of each season (summer and winter) summarizing the recently completed ice season as a brief climatological record.

Data that was held but not practically available for distribution:

- Iceberg position reports. The iceberg reports are contained in a variety of formats, including paper and documents within emails. We currently lack the expertise to manage this collection.

- Daily charts produced before 1999. The Canadian Ice Service is in the process of making available ice charts produced before 1999. The work involves doing a quality

check of the data and naming each chart. We are focusing on charts over the Beaufort in the Western Arctic but hope to expand to other areas. The goal is to make available more detailed ice information, over a longer time period than currently available.

- Photos of ice conditions. The photo collection is not organized in any fashion. We hope to organize the photos by location or other system but have not begun to work on this.

4.5.3. The Team agreed that the iceberg data should be part of the GDSIDB, and recommended the CIS to prioritize collecting and archiving iceberg position reports, and eventually making them available through the GDSIDB ***(Action; by CIS; as soon as possible)***. It also requested the AARI to share experience and existing data for iceberg climatology ***(Action: by AARI; continuous)***.

4.6. Proposals for new contributions to the GDSIDB from Member States

4.6.1. The Team appreciated the value of continuous implementation/management of the GDSIDB, and recommended all sea ice centres to provide available data to AARI and NSIDE using the SIGRID-3 format (Recommendation). The Team agreed to follow the same approach for new contributions to GDSIDB as developed at the previous session of ETSI ***(Action; by ETSI Chair with input from ETSI members; by April 2013)***.

5. WMO SEA ICE GUIDANCE MATERIAL

5.1. Review of SIGRID-3 version 3 (WMO/TD-No.1214)

5.1.1. The Team recalled that "SIGRID-3: A Vector Archive Format for Sea Ice Chart" was formally adopted as JCOMM Technical Report No. 23, as well as WMO Technical Document No. 1214, and currently maintained by the ETSI. It has become increasingly used a means of exchanging ice chart data between ice services and with user applications.

5.1.2. Mr John Falkingham recalled that the previous version of SIGRID-3 (Version 2) includes support for polygon features only although it does provide for the future addition of line and point features. He presented a proposed amendment (Version 3.0) to add support for the line and point features included in the JCOMM ENCS Ice Objects Catalogue (Version 5.2).

5.1.3. The Team reviewed and approved the revision 3 of SIGRID-3 as standard/recommended practices for sea ice data/charting ***(Decision),*** agreed to provide further comments to Mr Falkingham, if any, on any inconsistency within the document and with other reference material ***(Action; by all ETSI members; by April 2014)***. The Team also agreed to modify the title of the format as "SIGRID-3: A Vector Archive Format for Sea Ice GeoReferenced Information and Data" (instead of "Sea Ice Gridded Data") which reflects the true application of the standard nowadays. The final version of SIGRID-3 revision 3 would be delivered to the WMO Secretariat and other appropriate bodies, for publication and reference ***(Action; by J. Falkingham; by 15 May 2014)***.

5.2. Review of sea ice in Electronic Navigational Charts (ENC) standards

5.2.1. "Ice Objects Catalogue" version 5.2

5.2.1.1. The Team recalled that the Version 4.0 of the Electronic Navigation Charts (ENC) Ice Objects Catalogue was approved by the ETSI in 2007, which was the first version to

explicitly attempt to harmonize the Ice Objects Catalogue with the WMO Sea-Ice Nomenclature and International System of Sea-Ice Symbols and with SIGRID-3. The Version 5.0 of the Catalogue was approved at the ETSI-4 meeting in March 2010, containing many new objects proposed by the Arctic and Antarctic Research Institute to support work it had done with Transas, an ECDIS manufacturer.

5.2.1.2. The Team received the updated Catalogue, Version 5.2, prepared by Mr John Falkingham. The Team requested further clarification on the definitions for 1) "concentration of hills", in consistency with the WMO Sea-Ice Nomenclature, and; 2) "stage of melting". ***(Action; by V.Smolyanitsky; by April 2014)***. The Team rejected the proposal to combine "compacting strength" and :diverging strength" together in one ice attribute (ICECST) and asked Mr Falkingham to develop a proposal to combine "convergence" and "divergence" in one attribute and keep "compacting strength" separate. The "compacting strength" attribute should include provision for a scale of ice pressure as proposed by Mr Antti Kangas. Mr Falkingham proposed to circulate this proposal for approval by the Team, by email ***(Action; by J.Falkingham; by 15 April).***

5.2.1.3. With those clarifications, the Team adopted the Ice Objects Catalogue version 5.2 ***(Decision),*** and requested all members to review the document on possible inconsistences and provide comments to the Task Group on Electronic Navigation Chart Ice Objects (TG-ENCIO, through J.Falkingham). ***(Action; by all members; by April 2014)***. The Team then requested Mr Falkingham to prepare the final version of "Ice Objects Catalogue" version 5.2, and submit it to the WMO Secretariat for publication and to other appropriate bodies to inform a new major revision of the format ***(Action; by J.Falkingham; 15 May 2014***).

5.2.2. "Ice in ECDIS" (S-411) specification

5.2.2.1. This relevant discussion is recorded under agenda item 3.2.

5.2.2.2. The Team adopted the proposed "Ice in ECDIS" S-411 document version 1.0 ***(Decision)***, and agreed to check the document for possible inconsistencies and provide comments to TG-ENCIO ***(Action; by all Members; April 2014)***. The Team also requested the WMO Secretariat to publish this document as JCOMM Technical Document series ***(Action; by WMO Secretariat; April 2014)***.

5.2.2.3. The Team requested Dr Jürgen Holfort to report the IHO TSMAD on the adoption of the "Ice in ECDIS" S-411, and interact with the NSIDC on testing of the format ***(Action; by J.Holfort; by October 2014)***.

5.2.3. Ice Chart Color Standard (WMO/TD-No.1215, JCOMM Technical Report No.24)

5.2.3.1. The Team reviewed the version 1 of the "Ice Chart Color Standard" (WMO/TD-No.1215, JCOMM Technical Report No.24), and agreed on the following modification and updates ***(Decision)***:

- Add a light-blue colour with iceberg symbols in red or black colour for bergy water as a new row number 2 to Table 1 "Total Concentration Colour Code Standard"

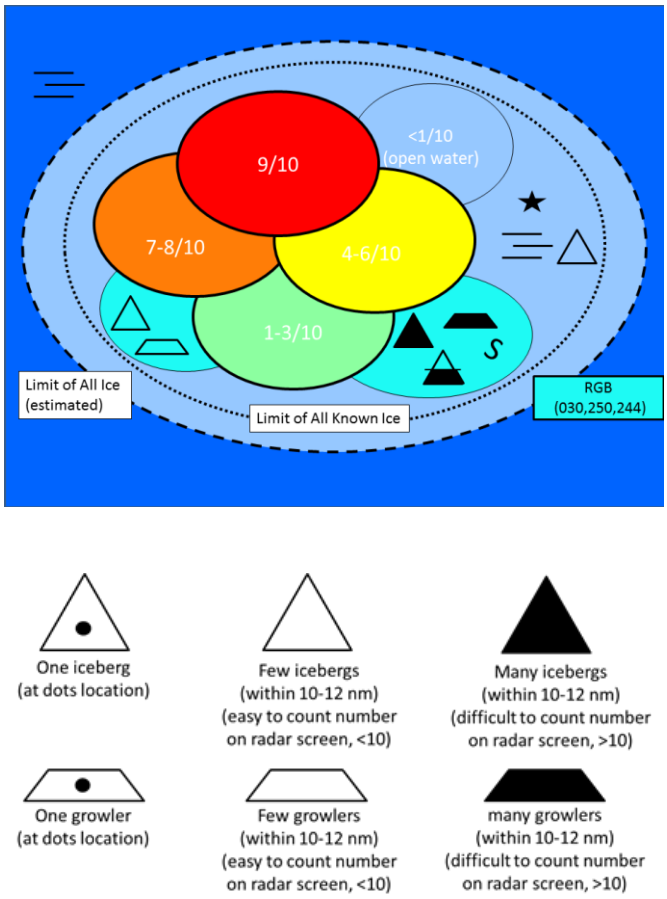
- Add a dark-red colour (RBG 145-000-000) for total concentration interval 10/10 compact floating ice

- Add another use of the existing dark-green colour (RGB 000-120-000) to include residual ice. Add 6* for the egg code symbol.

5.2.3.2. The Team also agreed to further develop the revised contents and to agree on additional colours for residual ice and compact ice ***(Action; by V. Smolyanitsky; by May 2014)***.

5.2.3.3. The Team agreed that, once the modification described above are review and agreed, the Revision 1 of the "Ice chart colour standard" should replace the version 1 of the publication at the WMO and JCOMM web-sites ***(Decision)***. The Team agreed that this publication should be continuously reviewed simultaneously with the Sea Ice Nomenclature (WMO-No.259) for consistency ***(Decision)***. The further update of this document should also take into account the use of hatching above the colour and ensure further revisions of the document, when required ***(Action; ETSI Chair; continuous)***.

5.2.3.4. The Team agreed to explore better ways to include the refined iceberg information, including an additional layer and/or/additional attributes and portrayals for areas with clusters of icebergs. The goal would be to differentiate areas of many icebergs, through the proposed greenish-cyan colour scheme (030-250-244) ***(Action; by K.Quistgaard and D.Langlois; by 2015)***.



5.3. Review of "Sea ice nomenclature", vol. I, II, III (WMO-No. 259)

5.3.1. The ETSI Chair provided information on the current status of the WMO Sea Ice Nomenclature (WMO-No. 259, volume I – Terminology and Codes, Volume II – Illustrated Glossary and III – International System of Sea-Ice Symbols), which is a top level WMO sea-ice standard.

5.3.2. The Team noted that the latest amendments to terminology and codes were introduced by ETSI-4 (St.Petersburg, 2010, JCOMM Meeting report No.74) to resolve internal inconsistencies in the standards or between standards (SIGRID-3 format, "Ice objects catalogue") and national practices and included 27 new terms, 2 terms amended and corresponding enumeration of terms. By March 2014 Volume I contains 220 terms and definition in 13 sections in 4 WMO languages (EN/FR/RU/ES). However, there is a possible growing duplication between the sections 4.3.7 (iceberg as a part of forms of floating ice) and 10.4.2 (iceberg as a part of ice of land origin) so that the Team is invited to regroup the terms and improve the content of the document for the noted sections. Following recommendations from BSIM-23 the ETSI chair received the Baltic sea-ice terminology (85 terms and definitions) in English, Finnish, Swedish, Estonian, Russian and Polish languages. These terms and definitions are now linked with the Volume I as a subset of terms and definitions by this ensuring correspondence and simultaneous update of all terms and definitions.

- The following three(3) new definitions for the ice limit, as below were presented to be added, after term 4.4.8.3 "Limit of ice". The Team is requested to present recommendations for Line symbology. **(Action; by all Members; May 2014)**.

    - **Limit of All Known Ice**: The demarcation at any given time between ice-free waters and waters in which sea ice or glacial is confirmed present.

    - **Limit of All Significant Ice:** The demarcation at any given time between waters which are either defined as ice free, open water, bergy water, *and*, waters which are defined as few or many icebergs or concentrations of sea ice or glacial ice.

    - **Limit of All Ice (estimate):** The demarcation at any given time between ice-free waters and waters in which sea ice or glacial is confirmed or expected present. (the limit may be identical to the limit of all known ice but a safety/practical approach due the satellite resolution cut-off could be the "Limit of All Known Ice + 30 nm")

- In addition, the following 4 definitions of kinds of bergy waters was proposed. The Team is requested to revise the terms for possible inconsistencies and insert them as sub-terms in bergy-water term section **(Action; by all Members; May 2014)**.

    Bergy water: An area containing less than 1/10 of sea ice as well as infrequent glacial ice known or expected to be present (4.2.7)
    (Note: "downgraded" to include less glacial ice)

    Iceberg risk: An area containing 1/10 or more of sea ice as well as infrequent glacial ice known or expected to be present.

    Few Icebergs: An area containing glacial ice (in amounts or numbers) that require occasional manoeuvring. The area could contain any amount of sea ice.

    Many icebergs: An area containing glacial ice in numbers that require constant manoeuvring. The area could contain any amount of sea ice.

5.3.3. By March 2014 the illustrated glossary contains 179 photos which are mostly black and white with low quality and based on experience from aircraft reconnaissance. There is definitely a need for its amendment by modern color photos with higher resolution and possibly complementing the ground photos by corresponding simultaneous satellite imagery. ETSI-III and IV discussed and noted possible sources for such update. No activity on updating the Glossary was carried out since the previous ETSI-IV session in 2010, though technical mechanisms for amending the Glossary are now fully developed.

5.3.4. The International System of Sea-Ice Symbols is a 14-pages document with latest revisions introduced as far as in in 1989. In 2013 the ETSI chair completed creation of its electronic version in EN/FR/RU/ES. As the new ice charting and ice coding standards ("SIGRID-3", "Colour Standard for Ice Charts" and "Ice Objects Catalogue") are now on hand, the document obviously needs thorough revision – e.g. sections 4 – 15 with symbols as well as coding tables.

5.3.5. All three Volumes of the publication are formally managed as electronic database with content and interface available in EN/FR/RU/ES http://www.aari.ru/gdsidb/XML/wmo_259.php. Technically, Volumes I and II are stored in MySQL database in UTF-8 coding with backup as a master CSV-format file and self-contained SQL dumps. Web-interface provides possibility of a) captions in English, French, Russian and Spanish, b) sorting by subject and alphabet and c) search for output as .html. MySQL database is presently hosted by the AARI GDSIDB center and supervised by the ETSI chair.

5.3.6. The Team noted that the WMO Sea Ice Nomenclature (WMO-No. 259, volume 1 – Terminology and Codes, Volume II – Illustrated Glossary and III – International System of Sea-Ice Symbols) was formally provided to the WMO Secretariat to become a part of the WMO terminology database METEOTERM (http://www.wmo.int/pages/prog/lsp/meteoterm_wmo_en.htm).

5.3.7. The Team further noted a presentation by Dr Peter Pulsifer, NSIDC, on the on-going project on sea ice ontologies within the Semantic Sea Ice Interoperability Initiative (SSIII). SSIII is a National Science Foundation (NSF)-funded effort to enhance the interoperability of sea ice data to establish a network of practitioners working to enhance semantic interoperability of all Arctic data. SSIII is a collaborative project between NSIDC and the Rensselaer Polytechnic Institute (RPI) Tetherless World Constellation project.

5.3.8. In the last years the SSIII succeeded in starting collaborating with ETSI as well as interviewing the operational service analysts about the meaning of sea ice charting terms, and providing description of the their work. The SSIII seeks to build on the work initiated under the International Polar Year (IPY) and to create a community of practice working to improve interoperability within the Polar Information Commons (PIC), the Sustained Arctic Observing Network (SAON), and broader global systems. The SSIII present material is available at http://nsidc.org/ssiii/.

5.3.9. The Team agreed on the following actions for further regular review and revision of WMO-No.259:

- Collaborate with NSIDC on ontology project and to ensure linkages between the WMO "Sea-Ice Nomenclature" vol.I and other existing glossaries ***(Action; by V. Smolyanitsky and P.Pulsifer; continuous)***

- Revisit terminology related to the shape, size of icebergs and try to rationalize it including the codes ***(Action; Canada and Argentina; by December 2014)***

- Provide pattern for description of photos of the "Illustrated Glossary" ***(Action; V. Smolyanitsky; by April 2014)***

- Provide updates to "Illustrated Glossary" ***(Action; by all members; continuous)***

- Provide regular updates of the master electronic version of the "Sea-ice

Nomenclature" vol. I-III, provide updated versions to WMO Secretariat for regular update of the METEOTERM publication ***(Action; by ETSI Chair and WMO Secretariat; continuous)***

5.4. Update to "Sea ice services in the World" (WMO-No. 574)

5.4.1. The Team recalled that the WMO publication 'Sea Ice Services in the World' (WMO-No. 574) is intended to provide mariners and other users with the latest snapshot of the sea ice services available world-wide, effectively extending the WMO publication No. 9, Volume D – Information for Shipping.

5.4.2. The Team reviewed the current version of the publication, and agreed on the following revision:

- Extend Part I, section 4 with information on Arctic Ocean METAREAs ***(Action; by C. Panowicz; by June 2014)***;

- Extend Part I, section 4 with clear definition of sea ice products and check Part II of publication for possible inconsistencies ***(Action; by D. Langloois with input from ETSI members; by June 2014)***;

- Add a new Appendix showing maximum and minimum propagation of sea ice in the Arctic and Antarctic based on ice charting ***(Action; by V.Smolynitsky; by June 2014)***.

5.4.3. The Team agreed to collect amendments and finalize WMO–No.574 update 2014, with input from all members (see also paragraph 2.3.1.2) and ensure that the online publication of / linkages to the updated document at appropriate sites (WMO, JCOMM, IICWG, etc) ***(Action; by ETSI Chair; by July 2014 and continuous)***.

5.5. Review of coding tables related to sea ice in WMO Manual on Codes (WMO–No.306)

5.5.1. The Team noted that the WMO Manual on Codes (WMO-No.306), particularly those parts for BUFR/CREX and GRIB formats included sea-ice related information that might be cross-referenced with the WMO-No.259 "Sea-Ice Nomenclature" and WMO/TD-No. 1214 "Sea-Ice Georeferenced Information and Data".

5.5.2. The Team considered that the sea ice practitioners are generally not familiar with the use of BUFR and GRIB codes, therefore agreed that a dialogue should be carried out with the WMO Commission for Instruments and Methods of Observation (CIMO) and the WMO Commission for Basic Systems (CBS), before deciding on any further action. As the first step, the Team requested the ETSI Chair and the WMO Secretariat to investigate the status of sea ice data intake through BUFR/CREX and GRIB ***(Action; by ETSI Chair and WMO Sec.; by July 2014)***. In case the Team positively consider further review of the code, actions should be taken in collaboration with the JCOMM Data Management Programme Area (DMPA) to identify appropriate techniques and channels for advice.

5.6. New publications ("Old ice in summer", "Manual for sea-ice observers", etc)

5.6.1. The Team recalled a publication of "Old Ice in Summer", produced by the Canadian Hydraulic Centre of the National Research Council. Considering potential merit of reference for visual observation, it was agreed to adopt this publication as WMO publication, and the WMO Secretariat was in discussion with the Government of Canada for associated license

agreement. The Team encouraged the Government of Canada to finalize the agreement so that the publication would soon be recognized as WMO guidance document. ***(Action; by Canada and WMO Secretariat; as soon as possible)***.

5.6.2. The Team recognized the value of Manuals on Sea Ice Observations, currently available in several countries. The Team agreed to develop a global manual on Sea Ice Observations, based on the existing manuals for Russian Federation and other countries. The Team requested all members including those in Southern Hemisphere, to send the ETSI Chair national manuals and/or documents on observation practices ***(Action; all members; by 2015),*** and agreed to review contents of the existing manuals to ensure consistency of national practices. ***(Action; led by C.Panowicz with input from members; by 2015).*** This publication would consider the following structure:

- Volume 1: observational practices
- Volume 2: climatology
- Volume 3: history and education

5.7. Harmonization and management issues

5.7.1. Continued from the previous session, the Team agreed on the need to streamline the publication of reference documents as well as on the online information provision, and on the need to continuous monitoring of the consistency among them.

6. SEA ICE INFORMATION SYSTEMS AND PRODUCT DELIVERY

6.1. Status and perspectives of the Ice integrating portals

6.1.1. The Team recalled that the Ice logistics portal (http://www.bsis-ice.de/IcePortal/index.html) was created as a joint initiative of the International Ice Charting Working Group, the JCOMM Expert Team on Sea Ice for the International Polar Year. It serves as a single web-gate to operational sea-ice information from the national ice services since 2007, and has provided users location-specific information on ice, upon query. The Team noted with appreciation the usefulness of the portal, and endorsed the related activities.

6.2. Sea ice in WIS

6.2.1. The Team received brief introduction of the WMO Information System, providing background information for the discussion. Related discussion is recorded under agenda item 4.1.

6.3. Assimilation of ice products in NWP

6.3.1. Mr Antti Kangas provided an overview of ice product assimilation into the NWP, from the modellers' point of view. The most common sea ice assimilation to the NWP models is initializing the NWP model with gridded sea ice concentration. Ice models use more parameters such as ice thickness. In coupled air-sea models more sophisticated assimilation methods are used.

6.3.2. The Chair, noting that several countries have been practicing ice data assimilation to NWP, requested other ice services to share information and experience from their activities in sea ice modeling systems and assimilation into numerical weather prediction models ***(Action; all members; continuous).*** Countries may consider sharing information

on; 1) data types (work being done, data priority, retrievals versus direct assimilation, data/product access, areas for future research and collaboration); 2) assimilation techniques (work being done, advantages & disadvantages for sea ice applications); 3) models in practice (work being done, simple versus complex, importance of ocean dynamics and thermodynamics, atmospheric coupling/effects), and; 4) operational systems (summary of work being done, verification, usage). The Team noted that the associated discussion should be carried out in collaboration with the IICWG working group on data assimilation.

6.4. Vision and strategy for inter-operability and integration

6.4.1. The Team agreed that a vision and strategy for inter-operability and integration of sea ice products should be developed further improvement in interoperability ***(Action; by C.Panowicz; by 2015)***. An outline of the strategy could be discussed at the IICWG meeting in October 2014.

7. SEA ICE TRAINING AND CB

7.0 The Team recalled the JCOMM Capacity Development Principles agreed at JCOMM-4 (2012), stating that the JCOMM Capacity Development (CD) should be implemented by the respective Programme Areas (PAs) and included in their respective workplans.

7.1. Ice Analyst Workshop (IAW)

Themes and outline of the 4th Ice analyst Workshop

7.1.1. The Team noted that the 4th Ice Analyst Workshop (IAW-4: http://www.jcomm.info/IAW-4) was planned in Helsinki, Finland, from 9 to 13 June 2014, at the kind invitation by the Finnish Meteorological Institute (FMI). This workshop has been organized by the Finnish Meteorological Institute (FMI) and Russian Arctic and Antarctic Research Institute (AARI), in co-operation with International Ice Charting Working Group (IICWG) and the JCOMM Expert Team on Sea Ice (ETSI).

7.1.2. The Team reviewed and agreed on the themes and outline of the Workshop, as reproduced in ***ANNEX VIII (Decision)***.

7.2. Training material (COMET, etc.)

7.2.1. The Team noted that the US National Ice Center has implemented a project to develop a COMET module that will overview the NIC, products and services available to clients and including introductions to egg code interpretation, seasonal climatology, ice formation/ablation and iceberg types and identification. The Team appreciated the value of this tool, which is extensively used for distant training, as well as a tool to implement a competence framework.

7.2.2. The Team noted with concern that no sufficient funding had been identified to further develop COMET modules, and suggest to explore possible ways to continue developing distant-learning material through the CD effort in JCOMM, etc.

8. REQUIREMENTS FOR SEA ICE INFORMATION

8.1. Updates for sea ice in the WMO Rolling Requirements Review

8.1.1. The Team noted that the WMO Commission for Basic Systems (CBS) established the Inter-Programme Expert Team on the Observing System Design and Evolution (IPET-OSDE) as successor of the Expert Team on Evolution of the Global Observing Systems (ET-EGOS), in charge of the WMO Rolling Review of Requirements (RRR).

8.1.2. The RRR routinely manage the operational observations requirements for marine services and forecasting systems, as well as ocean observations requirements for other applications areas. JCOMM has been directly contributing to the process, through a responsible member in the JCOMM Management Committee (designated as JCOMM Point of Contact for the CBS/RRR on Ocean Applications). Currently, Dr Guimei Liu (China, member of the JCOMM Expert Team on Operational Ocean Forecasting Systems) is taking this responsibility on behalf of the former MAN member, Mr Ali Mafimbo.

8.1.3. The Team noted that the WMO RRR database (http://www.wmo-sat.info/oscar/observingrequirements) identified requirements for sea ice variables:

- Sea-ice cover
- Sea-ice type
- Sea-ice surface temperature
- Sea-ice surface characteristics
- Sea-ice motion
- Sea-ice elevation

8.1.4. The Team noted and consented that a large part of the sea ice requirements were introduced from the IGOS Cryosphere and the ongoing process of the GCW. The Team noted that, meanwhile, the terms and general requirements for sea ice in the RRR process are somewhat inconsistent with the sea ice reference documents, and suggested that the IPET-OSDE should make reference to the WMO Sea Ice Nomenclature (WMO-No.259) in the RRR process ***(Recommendation)***.

8.2. JCOMM Questionnaire and user feedback

8.2.1. Dr Boram Lee introduced the regular JCOMM Marine Meteorological Monitoring Survey (MMMS), conducted through technical advice by the Expert Team on Maritime Safety Services (ETMSS). The primary purpose of this survey is to obtain direct interaction and feedback from the marine users, for future improvement in the work of the Issuing Services of the meteorological Maritime Safety Information (MSI), in each METAREA. For the 2011 survey, the WMO Secretariat developed an online version of the MMMS (http://www.jcomm.info/MMMS), followed by a new servey for the period of March – June 2014, at: http://www.jcomm.info/MMMS2014. This new means enabled the dissemination of surveys more frequently to assess the level of satisfaction of end-users. The preliminary analysis of the survey can be found at the above-mentioned web page.

8.2.2. The Team noted that recent surveys included specific questions about the degree of user satisfaction on various type of meteorological MSI, including sea ice and icebergs information. Over 75% of respondents who used the services rated it as “Good”. Overall, with responses to specific questions on “clarity” and “terminology” being around 78%. A large number of vessels obtain sea ice information (such as ice charts) via internet (e.g. Polar Views/US National Ice Center, BALTICE.ORG, ILMATIETEENLAITOS.Fi).

9. COLLABORATION AND PARTNERSHIP

9.1. Relations to IICWG and JCOMM bodies

9.1.1. Based on the discussion under agenda items 2 to 8, the Team identified the following Teams/Groups and issues to be considered for the intersessional activities:

- JCOMM Expert Team on Maritime Safety Services (ETMSS), in the implementation of the Arctic METAREA services for meteorological and sea ice MSI, as well as the review of associated manuals, guides and reference documents. See agenda items 3 and 5;

- JCOMM Expert Team on Marine Climatology (ETMC) on the implementation and integration of sea ice climatology to a wider framework. See agenda item 4;

- JCOMM Observations Programme Area (OPA), Data Buoy Cooperation Panel (DBCP) in particular, on potential interaction with the International Arctic Buoy Programme (IABP) and the International Programme for Antarctic Buoys (IPAB). IABP and IPAB are action groups of the DBCP.

9.2. Polar Initiative activities (EC-PORS, GCW, Cryonet, SAON)

WMO Executive Council Panel of Experts on Polar Observations, Research, and Services

9.2.1. Mr Bruce Angle provided a briefing on the WMO Executive Council Panel of Experts on Polar Observations, Research, and Services (EC-PORS). Since its first meeting in October 2009, EC PORS has helped to focus the attention of WMO Members and partners on Polar matters. Of late, there is growing recognition that changes in the cryosphere have a distinct and measureable impact on the Earth system affected weather and climate at all latitudes. Our understanding of these changes, including on water resources for a larger percentage of the world's population.

9.2.2. EC PORS is a mechanism for coordination amongst WMO programmes and to outreach to partner organizations such as, inter alia, the Arctic Council, ATCM, SCAR and IASC. Some of the key initiatives supported by PORS include; i) assumption of the responsibilities of the Working Group on Antarctic Meteorology; ii) establishing the Polar Space Task Group as a legacy of the IPY; iii) development of the Global Cryosphere Watch (GCW) iv) focused attention on the 3rd Pole region (Tibetan Plateau Himalaya-Karakorum-Pamir) and other High Mountain Regions; v) advocate for the Global Integrated Polar Prediction System (GIPPS), and; vi) help frame the International Polar Partnership Initiative (IPPI).

9.2.3. He stressed the importance of sea ice data toward initiatives such as the GCW and the two components of the GIPPS, the World Weather Research Programme Polar Prediction Project (WWRP-PPP) and the World Climate Research Programme Polar Predictability Initiative (WCRP-PCPI) were highlighted. Better assimilation of sea ice data into coupled models is crucial to improved prediction; this presents a strong case for Members to invest in ETSI's work.

9.2.4. He noted that the EC PORS Services team employed the Sea Ice Downstream Services for Arctic and Antarctic Users and Stakeholders (SIDARUS) to define user requirements for cryospheric services including sea ice services. The PORS team continues to seek input on service requirements over various time and spatial scales for transportation, Search and Rescue and pollution prevention. PORS is investigating how to launch a Polar Region Climate Centre and Polar Region Outlook Forum as means to engage many

communities in support the implementation of the Global Framework for Climate Services noting the relatively small number of climate products and services that are yet available, PORS welcomed the assistance of the ETSI which represent ice services world-wide, to assist with defining the content of the outlook forums and the architecture of a centre.

Global Cryosphere Watch

9.2.5. Mr Barry Goodison gave an update on the Global Cryosphere Watch, emphasizing the synergies between the work of GCW and ETSI. He provided the GCW Implementation Plan (V1.4), which participants were invited to review; feedback and comments were welcomed. ETSI, through its chair, has been active in the ongoing development and implementation of GCW and this contribution has been very valuable for GCW. GCW will rely on ETSI as the lead contributor for its component on operational ice monitoring, and will use its manual on ice observation in defining GCW observation practices and guidelines. The efforts of ETSI that include lake ice observing would be a contribution to GCW's development of its lake/river ice component. Further discussion on what, how and who could extract relevant information needs further consultation between GCW and ETSI. GCW also includes ETSI's nomenclature in its glossary, and GCW would like to work with ETSI and NSIDC as terminology and ontologies are developed. GCW will be pleased to include ETSI observation and observational products requirements in its observation requirements, which includes the IGOS Cryosphere document's stated requirements and those cryosphere requirements currently included in WMO's RRR.

9.2.6. The GCW website (http://globalcryospherewatch.org) was demonstrated and discussed. GCW would welcome specific suggestions on what and how to include operational sea ice products and those of large lakes. The Great Lakes ice products would be an excellent addition to the "Cryosphere Now" section. These additions would provide the ice services and ETSI with further exposure to the broader cryosphere community. The contact for the website is GCW Lead, Dr Jeff Key (NOAA/NESDIS). The portal was also demonstrated (http://gcw.met.no); the portal is currently interoperable with NSIDC and it aims to link with other data sites in the cryosphere community. The ETSI chair has been in discussion with Mr Oystein Godoy (lead of the portal team) on establishing interoperability with AARI, which would expose even more ice products. Links with other ice service centres, including the ice logistics portal, was encouraged.

9.3. Relations to other WMO/IOC and International programmes

9.3.1. Based on the discussion under agenda items 2 to 8, the following agencies and projects were identified, while not excluding other global and national initiatives, as having direct links with the Team's work during the intersessional period:

- The International Ice Charting Working Group (IICWG), which brings the national ice services together with their partners and clients to address issues of common concern. Since 1999, the IICWG has served as an active advisory body to the JCOMM Expert Team on Sea Ice;

- WMO Commission for Basic System (CBS), on the relevant matters to the implementation of WMO Information System (WIS), such as ensuring compliance of the Ice Logistics Portal with the WIS, and review/update of the WMO-No.9, Volume D;

- Inter Programme Expert Team on the Observing System Design and Evolution (IPET-OSDE), under CBS, for the Team's input and advice to the WMO Rolling Review of Requirements (RRR);

- WMO Education and Training Programme, regarding the development of e-learning modules, and coordination for training/education events;

- The International Hydrographic Organization (IHO), intergovernmental consultative and technical organization that was established in 1921 to support the safety in navigation and the protection of the marine environment. The ETSI relationship with the IHO concerns the development of sea ice information for Electronic Navigation Charts. In this context, the Team's primary interaction is made with the Transfer Standard Maintenance and Application Development Working Group (TSMAD), a working group of the IHO Hydrographic Service and Standards Committee (HSSC), regarding the S-57 and S-100 standards.

- The Team's input is also expected through the JCOMM ETMSS in the work of the World-Wide Navigational Warning Service Sub-Committee (WWNWS) that is responsible to monitor and guide the navgaional warning service as well as to regularly conduct the review of Joint IMO/IHO/WMO Manual on MSI.

10. FUTURE ACTIVITIES AND WORKING PLAN FOR THE CURRENT INTERSESSIONAL PERIOD

10.1. The Team reviewed its "projects" that are recognized within the intersessional workplan for JCOMM SFSPA for 201 – 2017, and revised the description where necessary based on the discussion and agreements made during the session. The Team felt appropriate to consider a new project to deal with SAR in Polar Regions with Ms Caryn Panowicz, NIC, agreed to develop its description (***Action; Caryn Panowicz, October 2014***). The revised set of ETSI workplan (Projects 13, 20, 26, 27, 28, 29 and 31 of the JCOMM SFSPA workplan) is reproduced in ***ANNEX IX***. The Team requested the WMO Secretariat to update the JCOMM SFSPA workplan (http://www.jcomm.info/SFSPAWP) accordingly. ***(Action; WMO Secretariat; April 2014).***

10.2. The specific actions agreed during the sessional discussion is summarized in ***ANNEX X***.

11. DATE AND PLACE OF THE NEXT SESSION

11.1. The Team recalled that, in principle, all JCOMM Expert Team were expected to hold their regular session once in an intersessional period, and with no financial implication to WMO and IOC.

11.2. The Team considered that, while a face-to-face meeting would bring values to ensure successful and timely implementation of the workplan and review of achievements, alternative means for discussion (e.g. videoconferences) should be fully utilized for continuous discussion on critical issues. The Team also noted that the related plans for sea ice services, such as the Ice Analysts Workshops and IICWG meeting could be considered to seek opportunities for ad hoc meetings of the Team, if required. The Team encouraged that the ETSI members would be actively engaged in these groups and initiatives, when/if directly relevant discussion or activities are anticipated ***(Recommendation)***.

11.3. The Team noted that, considering the emerging issues like arctic transportation and development of Polar Code would require focused effort of the Team to provide technical advice and to implement new activities (e.g. proposed pilot project on integrated ice service

in Southern Ocean) during the current intersessional period. In this regard, the Team requested the immediate attention of the WMO Secretariat to explore feasibilities to provide additional support for Team's activities during this period,

12. OTHER ISSUES

JCOMM Web Pages relevant to ETSI

12.1. The Team noted that all information on activities of the JCOMM SFSPA are provided through the JCOMM web pages at http://www.jcomm.info/SFSPA, primarily to the JCOMM community. The Team noted that the ETSI page under the JCOMM could provide a set of linkages/addresses to those key information portals for operational sea ice services, as well as the latest versions of the Manuals, Guidelines and reference documents for national sea ice services. The Team agreed to submit the WMO Secretariat a set of direct links to such information, to be added on the web page ***(Action; by ETSI Chair; by Aril 2014).***

13. CLOSURE OF THE SESSION

13.1. The Team reviewed and approved the draft final report, including actions and recommendations as recorded in this Report.

13.2. In closing the meeting, the ETSI chairperson, Dr Vasily Smolyanitsky, expressed his appreciation to all members for their active participation and contribution to the intersessional implementation. He also thanked Canadian Ice Service nd Environment Canada for providing effective and inspiring conditions for the meeting, and the WMO Secretariat for professionalism.

13.3. The fifth session of the Expert Team on Sea Ice (ETSI-5) closed at 1700 hours on Friday 28 March 2014.

_____

Annex I

LIST OF PARTICIPANTS

Members

Mr Keiji HAMADA
Japan Meteorological Agency, Tokyo
1-3-4 Otemachi Chiyoda-ku
100-8122 Tokyo
Japan
Email: kei-hamada@met.kishou.go.jp

Dr. Jürgen HOLFORT
Bundesamt fuer Seeschifffahrt und Hydrographie (Federal Maritime and Hydrographic Agency)
Neptunallee 5
18057 Rostock
Germany
Tel: +49 (0) 381 4563-782
Fax: +49 (0) 381 4563-949
Email: juergen.holfort@bsh.de

Nick HUGHES
Norwegian Ice Service
Norwegian Meteorological Institute (met.no)
Forecasting Center for Northern Norway
P.O. Box 6314, NO-9012 Tromso
Norway
Email: nick.hughes@met.no

Mr Antti KANGAS
Finnish Meteorological Institute
Erik Palménin aukio 1
P.O. BOX 503
FIN-00101 Helsinki 56
Finland
Tel: +358 40 8678838
Fax: +358 9 1929 3303
Email: antti.kangas@fmi.fi

Ms Darlene LANGLOIS
Environment Canada - Canadian Ice Service
373 Sussex Drive
Block E, Third Floor
Ottawa K1A 0H3
Ontario
Canada
Email: Darlene.Langlois@ec.gc.ca

Caryn PANOWICZ
US National Ice Center
4251 Suitland Road
Washington, DC 20395 USA
Washington DC 20395
United States
Tel: +1 301-817-3942
Fax: +1 301 817-3200
Email: caryn.panowicz@noaa.gov

Keld QUISTGAARD
Danish Meteorological Institute
Lyngbyvej 100
DK-2100 Copenhagen
Denmark
Email: kqh@dmi.dk

Dr Vasily SMOLYANITSKY
Head, Laboratory of sea ice climate manuals
Arctic and Antarctic Research Institute
38 Bering Street
St Petersburg
Russian Federation 199397
Tel: +7 812 337 3149
Fax: +7 812 337 3241
Email: vms@aari.aq

Invited Experts

Mr. Bruce ANGLE
Environment Canada - Atlantic
Canada
Tel: (1 819) 997 98 44
Fax: (1 819) 994 88 54
Email: bruce.angle@ec.gc.ca

Mr. John FALKINGHAM
International Ice Charting Working Group
IICWG Secretariat
120 Sherway Drive
Ottawa K2J 1P1
Ontario
Canada
Tel: +1 613-355-4552
Email: John.Falkingham@rogers.com

Dr Barry GOODISON
Ontario
Canada
Tel: +1 613 716 6241
Email: barrygo@rogers.com

Mr John PARKER
Meteorological Service of Canada
Environment Canada
16th Floor, Queen Square,
45 Alderney Drive,
Darmounth NS B2Y 2N6
Canada
Tel: +1 902 426 3836
Fax: +1 902 490 0259
Email: john.k.parker@ec.gc.ca

Dr. Peter PULSIFER
University of Colorado at Boulder
449 UCB
Boulder Colorado 80309
United States
Tel: +1 613 620 7195
Email: pulsifer@nsidc.org

Secretariat

Dr Boram LEE
World Meteorological Organization
7bis, avenue de la Paix
Case Postale 2300
1211 Geneva
Switzerland
Tel: +41 22 730 8273
Fax: +41 22 730 8128
Email: blee@wmo.int

Annex II

AGENDA

(as agreed at ETI-5, 25-28 March 2014, Ottawa, Canada)

1 OPENING OF THE SESSION

1.1 Opening
1.2 Adoptation of the agenda
1.3 Working arrangements

2 Reports

2.1 Guidance and Requirements from JCOMM and WMO-IOC
2.2 Report by the Chairperson of the ETSI
2.3 Reports on national and regional practices
  2.3.1 Reports by the Members of the ETSI
  2.3.2 Regional Reports (BSIM, EIS, NAIS, IICWG)

3 Marine Safety Information (MSI) related to sea ice

3.1 Report by the ETMSS chairperson including the Arctic METAREAs: coordinators reports and exchange issues
3.2 IHO Report on the use of S100/S101 within the sea ice information / e-Navigation
3.3 Sea Ice MSI in the sub- and non-Arctic METAREAs and Antarctic
3.4 Role of ice services in Search and Rescue (SAR)
3.5 Report on Polar Code development
3.6 Guidelines for sea ice MSI in WMO manuals and guides
  3.6.1 Review and update of requirements for sea ice MSI
  3.6.2 Review of WMO-No. 471 and WMO-No. 558.

4 Sea ice climatology (13th session of the Steering Group for the GDSIDB project)

4.1 Sea-Ice Climatology in the context of the new JCOMM-IODE Marine Climate Data System (MCDS)
4.2 Reports of the GDSIDB centers (AARI and NSIDC) and the ice services
4.2 Review of the WMO sea ice guidance material related to sea ice climatology
4.3 Practices of sea ice historical data processing
4.4 Review of sea ice and icebergs products based on GDSIDB data
4.5 Proposals for new contributions to the GDSIDB from Member States

5 WMO sea ice guidance material

5.1 Review of SIGRID-3 version 3 (WMO/TD-No.1214)
5.2 Review of sea ice in Electronic Navigational Charts (ENC) standards
  5.2.1 “Ice Objects Catalogue” version 5.2
  5.2.2 “Ice in ECDIS” (S-411) specification
  5.2.3 “Ice chart color standard” (WMO/TD-No.1215)
5.3 Review of “Sea ice nomenclature”, vol. I, II, III (WMO-No. 259)
5.4 Update to “Sea ice services in the World” (WMO-No. 574)
5.5 Review of coding tables related to sea ice in WMO Manual on Codes (WMO–No.306)
5.6 New publications (“Old ice in summer”, “Manual for sea-ice observers”, etc)
5.7 Harmonization and management issues

6 Sea ice information systems and product delivery

6.1 Status and perspectives of the Ice integrating portals (Ice Logistics Portal, Polarview, etc)

6.2 Sea ice in WIS

6.3 Assimilation of ice products in NWP

6.4 Vision and strategy for inter-operability and integration

7 SEA ICE TRAINING AND CB

7.1 Ice analyst workshop

7.2 Training material (COMET, etc)

8 REQUIREMENTS FOR SEA ICE INFORMATION

8.1 Updates for sea ice in the WMO Rolling Requirements Review

8.2 JCOMM Questionnaire and user feedback

9 COLLABORATION AND PARTNERSHIP

9.1 Relations to IICWG and JCOMM bodies

9.2 Polar Initiative activities (EC-PORS, GCW, Cryonet, SAON)

9.3 Relations to other WMO/IOC and International programmes

10 FUTURE ACTIVITIES AND WORKING PLAN FOR THE CURRENT INTERSESSIONAL PERIOD

11 DATE AND PLACE OF THE NEXT SESSION

12 OTHER ISSUES

13 CLOSURE OF THE SESSION

_____

Annex III

TERMS OF REFERENCE: EXPERT TEAM ON SEA ICE

Excerpt from Resolution 5 (JCOMM-4): Service and Forecasting Systems Programme Area
Agreed at ETSI-5, March 2014

The Expert Team on Sea Ice shall:

(a) Coordinate and advise Members/Member States on products and services required by user communities in sea ice areas, to support navigation, coastal and off-shore activities, monitoring of the sea ice cover;

(b) Provide advice to ETMSS on all aspects of impacts of sea ice relevant to maritime safety, marine pollution response and search and rescue services;

(c) Maintain linkages with Expert Team on Operational Ocean Forecasting Systems on the relevant sea ice modelling and forecasting techniques;

(d) Maintain linkages with projects and programmes related to the role of sea ice in the global climate system, including through the World Climate Research Programme and the Global Cryosphere Watch;

(e) Develop technical advice and guidance material, software exchange, specialized training and other appropriate capacity development activities with regard to sea ice observations, analysis and services, and provide assistance to Members/Member States as required;

(f) Keep under review and provide guidance as appropriate on the operations of the Global Digital Sea Ice Data Bank, in collaboration with the Expert Team on Marine Climatology;

(g) Maintain and develop formats, nomenclatures and procedures for sea ice data and information exchange as well as relevant terminology, coding and mapping standards;

(h) Maintain linkages with relevant international organizations and programmes, in particular the Baltic Sea Ice Meeting, CLIC, European Ice Service, International Ice Charting Working Group, North American Ice Service, ASPeCt, Global Climate Observing System and the International Hydrographic Organization.

As a general principle, these terms of reference will be implemented through specific, defined, time-limited projects.

General Membership

Up to eight Members, including the chairperson, representative of a range of activities related to sea ice and the ice-covered regions within JCOMM, and to maintain an appropriate geographical representation. It is expected that, in general, the ETSI will be self-funding. ETSI representatives will also act as full members of ETMSS and ETMC.

Representatives of regional and international sea ice bodies in particular the Baltic Sea Ice Meeting, European Ice Service, International Ice Charting Working Group and North American Ice Service will also be invited to participate at their own expense.

Additional experts may be invited as appropriate, representative of the range of activities related to sea ice, on a self-funded basis, and in general with no resource implications to JCOMM.

_____

Annex IV

TERMS OF REFERENCE: ETSI TASK GROUP ON ELECTRONIC NAVIGATIONAL CHART ICE OBJECTS (TG ENCIO)

(Established at ETSI-3, March 2007; Reviewed and agreed at ETSI-5, March 2014)

1. Objective

To develop and to maintain an international standard for Ice Objects as a class of Marine Information Objects (MIO) that is based on the standards of the International Hydrographic Organisation (IHO) for Electronic Navigational Charts (ENC).

2. Guiding Principles

The framework for the Ice Objects standard includes:

- Use of **IHO S-57** including:
  - Object Catalogue;
  - MIO Product Specification;
  - MIO Encoding Guide.
- Establishment of an **Ice Objects Register** for additional real-world, ice features, attributes, and enumerations that are not already contained in IHO S-57 Edition 3.1 Object Catalogue.
- Use of the ***Open ECDIS Forum*** (OEF) as a means of communication and discussion for continuing development and maintenance of the Ice Objects Register.
- Alignment with the future **IHO S-100** Standard for Geospatial Data.

3. Authority

JCOMM ETSI is recognized as the competent international technical group on sea ice and icebergs by:

- World Meteorological Organization;
- Intergovernmental Oceanographic Commission;
- International Hydrographic Organization (IHO) – Committee on Hydrographic Requirements and Information Systems (CHRIS).

4. Participants

Register Owner:	WMO Secretariat
Register Manager:	WMO Secretariat
Register Users:	anyone interested in sea ice or iceberg MIOs
Control Body:	ETSI ENC Ice Objects Task Group
Submitting Organization:	WMO
Proposers:	ETSI Members from Canada, Germany, Russian Federation and USA

5. Composition

The Ice Objects Task Group will be composed of at least three standing ETSI Members appointed by the ETSI, in addition to the Register Manager. The Task Group Members shall serve until the subsequent intersessional meeting of the ETSI, at which time they may be re-appointed or replaced. The Task Group will elect a Chairperson from among them.

6. Meeting Schedule

The Task Group will meet on an as-required, as-agreed basis. Members will fund their own attendance at meetings. Much of the business of the Task Group will be conducted by e-mail and telephone.

7. Management of the Ice Objects Register

Any Member of the ETSI can submit a proposal to the Ice Objects Register but the proposal must:

- be in a format established by ETSI;
- describe how the new object (or feature) will be accommodated in the Ice Objects Encoding Guide.

The **Ice Objects Register Manager**:

- reviews the submitted proposal for completeness, and may request additional information/clarification from the Proposer. The proposal is also distributed to Ice Objects Task Group (Control Body) and other Register Managers for review/comment.
- officially posts the proposal on the Ice Objects ENC Register. It is initially flagged as **NOT-VALID**.
- places the proposal on the Ice Objects Discussion Forum (OEF website) for discussion.

Eight weeks after the proposal is placed on the Ice Objects Register:

- if a consensus is reached to accept, the proposal is then flagged as **VALID**.
- if no consensus is achieved, it remains flagged as **NOT-VALID**. In this case:
  - the submitter can decide to withdraw the proposal;
  - the proposal can be revised and re-submitted;
  - any participant of the ETSI can ask that the proposal be considered at the next meeting of the ETSI.
- the Register Manager announces the outcome on the Ice Objects Discussion Forum.

8. Regular ETSI Review

As owner of the Ice Objects Register, ETSI will carry as a standing agenda item on its meetings, a review of any outstanding recommendations from the Task Group.

Annex V

STATUS OF WORKPLAN FOR ETSI DURING THE PAST INTERSESSIONAL PERIOD
(Excerpt from ETSI-4, March 2010; Status reviewed at ETSI-5, March 2014)

Ref.	Action	By whom	When	Status at
2.2.11	Review ETSI Terms of Reference to ensure that they include appropriate reference to the work of the TG-ENCIO	TG-ENCIO	ETSI-V	Done, no changes proposed; planned for possible review at ETSI-V
2.4.1.21	Finalize and distribute report from 2nd Ice Analysis workshop	ETSI Chair	As soon as possible	Published as JCOMM-TR-049 WMO/TD-NO.1517
2.4.1.28	Chair of the BSIM to provide reports on behalf of the small Baltic countries	BSIM Chair	ETSI-V	Planned for ETSI-V
2.5.1.7	Identify a focal point to work with ETMSS to help develop the catalogue of Met-Ocean Object Classes and Attributes	ETSI Chair	May 2010	Timothy Rulon; title changed to "Weather Overlay Feature Catalog"; latest Phase 2 review proposed in Dec 2013 – Jan 2014
2.5.1.8	Organize sea ice information on Ice Logistics Portal by METAREAs	Holfort	June 2010	done
2.5.1.8	Make links from Ice Logistics Portal to GMDSS website and request a reciprocal link from GMDSS website	Holfort	June 2010	done
2.5.1.9	Review Terms of Reference of ETSI and of ETMSS to ensure they provide for appropriate interaction between Expert Teams; send comments to ETSI Chair	ETSI Members	Sep 2010	Done thrice - for ETMSS-III, JCOMM-4 and ETMSS-IV
2.5.2.10	Prepare summary of ice information available in the Antarctic and send to ETSI Chair for provision to METAREA coordinators in the Southern Ocean	Panowicz	Oct 2010	Ongoing; further actions planned for IAW-4 in June 2014
2.5.4.5	Update relevant IHO and WMO publications to define the "ice edge" as being delineated by a maximum of 10 points per sub-area	ETSI Chair	June 2010	Done; finalized during IAW-3 in June 2011
2.5.5.4	Determine what countries transmit ice charts by radiofax and advise WMO Secretariat to update Publication No. 9 accordingly	ETSI Chair / Members	June 2010	Done; information provided to ETMSS-III in Oct 2010
2.5.5.6	Review list of proposed NAVTEX abbreviations for completeness and consistency and provide comments to Chair of BSIM	ETSI Members	Jul 2010	Finalized during IAW-3 in June 2011
2.5.5.6	Produce final draft list of NAVTEX abbreviations for sea ice for approval by the ETSI; transmit to chair of ETMSS for inclusion in document	Chair of BSIM	Oct 2010	Done; provided to ETMSS-3 in Oct 2010; revised in spring 2012 for JCOMM-4
2.5.5.6	Propose a standard format for ice information in NAVTEX messages and circulate to ETSI members for comment	Chair of BSIM	Jul 2010	Done; provided to ETMSS-3 in Oct 2010; revised in spring 2012 for JCOMM-4

2.5.5.6	Adopt a standard format for ice information in NAVTEX messages; provide document to ETMSS Chair	ETSI Members; ETSI Chair	Oct 2010	Done; provided to ETMSS-3 in Oct 2010; revised in spring 2012 for JCOMM-4
2.5.5.8	Review the IMO/WMO Guidance Document for the World Wide Met-Ocean Information and Warning Service to determine whether other information pertaining to the provision of ocean information in the Polar Regions should be added and provide comments to Chairman of ETSI	ETSI Members	Jun 2010	Done; further actions anticipated after ETSI-V
2.5.5.8	Provide comments on the IMO/WMO Guidance Document for the World Wide Met-Ocean Information and Warning Service, including the addition of a reference to WMO No. 574 – Sea Ice Services in the World, to the Chair of the Expert Team on Marine Safety Services	ETSI Chair	Sep 2010	Done; information provided to ETMSS chair in October 2010
2.5.6.18	Determine a consistent definition of “ice edge” to be used in GMDSS broadcasts	Qvistgaard	May 2010	Done; revised and finalized during IAW-3 in June 2011
2.5.6.18	Establish operating procedures to coordinate ice information between adjacent Arctic METAREAs to ensure continuity of the edge at the METAREA boundary	ETSI Chair	Oct 2010	Done; revised and finalized during IAW-3 in June 2011
2.5.6.19	Provide sample Arctic METAREA ice bulletins to the Arctic METAREA coordinators as a means of verifying formats and coordination of information to ETSI Chair	ETSI Members for Denmark, Canada, Norway and Russia	May 2010	Done; revised and finalized during IAW-3
2.6.1.1	Translate additions to WMO No. 259 Sea Ice Nomenclature into Russian, French and Spanish, provide material to ETSI Chair for inclusion of these definitions to the on-line publication	CIS, Argentina, AARI, ETSI Chair	Jan 2011	Done; revised and finalized for ETSI-V
2.6.1.3	Review the SIGRID-3 code tables to determine if a single code could be used across all tables to indicate “Ice Free”	Falkingham	May 2010	Done; incorporated into SIGRID-3 rev.3
2.6.1.4	Revise the ENC Ice Objects Catalogue Version 4.1 to reflect the decisions of ETSI-IV	Falkingham	May 2010	Done
2.6.2	Revise WMO No 259 Sea Ice Nomenclature Volume I according to the decisions of ETSI-IV	ETSI Chair, BAS	Jun 2011	Done
2.6.2.4	Merge the Baltic Sea Ice Glossary into the Illustrated Glossary of WMO No 259 - Sea Ice Nomenclature	ETSI Chair, FMI	Dec 2011	Baltic Sea-Ice nomenclature provided to ETSI chair; common database created
2.6.2.7	Discuss the proposed terms “Hillocky Multiyear Ice” and “Concentration of Hills” and recommend whether they should be included in WMO No 259 - Sea Ice Nomenclature	ETSI Chair, AARI, CIS	Apr 2011	Postponed; will be revisited after ETSI-V

2.6.2.14	Submit new photos for the Illustrated Glossary of Sea Ice to the ETSI Chair	ETSI Members	On-going	Postponed; will be revisited after ETSI-V
2.6.2.14	Update the Illustrated Glossary with new photos as they become available	ETSI Chair	On-going	Postponed; will be revisited after ETSI-V
2.6.2.20	Ask WMO to consider adoption of the Canadian National Research Council document "Understanding and Identifying Old Ice in Summer"	Secretariat	Apr 2010	Pending action from CNR and Secretariat
2.6.2.21	Develop a new concept for the Sea Ice illustrated Glossary	ETSI Chair in discussion with Members	Jan 2012	Postponed; will be revisited after ETSI-V
2.6.2.21	Investigate whether the document "Understanding and Identifying Old Ice in Summer" is available in electronic format	Falkingham	Apr 2010	Done
2.6.2.22	Develop an electronic update of WMO No 259 Volume III- International System of Sea Ice Symbols (English version)	NIC + AARI, CIS & Argentina	Jan 2012	Done
2.6.3.4	Make suggestions for further revisions to WMO No 259 Sea Ice Services in the World	ETSI Members	On-going	Done
2.6.3.4	Publish WMO No 259 Sea Ice Services in the World on the JCOMM Services Website and announce availability of updates to NMS	ETSI Chair, Secretariat	May every year	Done in 2010 and 2013
2.6.3.5	Ensure that linkages are made to WMO No 259 Sea Ice Services in the World from WMO No. 9, Volume D – Information for Shipping	Secretariat	Oct 2010	Postponed; will be revisited after ETSI-V
2.6.3.5	Inform the National Ice Services and the sea ice community about the availability of the updated electronic version of WMO No 259 Sea Ice Services in the World by means of a mailing list and/or appropriate newsletter articles	Secretariat	June every year	Done partly via the IICWG; will be revisited after ETSI-V
2.6.4.20	Progress report on standards for Ice Charts in ENCs to Rostock Meeting	TG-ENCIO	May 2010	Done
2.6.4.20	Work with AARI/Transas and CIS/Caris to harmonize the standards for Ice Charts in ENCs	TG-ENCIO	End Summer 2010	Done
2.6.5.2	Implement the ENC Ice Objects Catalogue Version 5.0 in the IHO Database	TG-ENCIO	Mar 2011	Done
2.6.5.3	Develop a demonstration suite of Ice Objects in ENCs	TG-ENCIO	JCOMM-IV	Done
2.6.6.5	Discuss the proposed amendment to the Colour Code Standard for bergy water and advise the Chair whether this amendment should be consider again or dropped	DMI, NAIS	Oct 2010	A draft is available for ETSI-V
2.6.7.3	Develop a white paper on the "Vision and Strategy for the Standards for Sea Ice Coding and Presentation" for discussion at IICWG	ETSI Chair in consultation with Members	ETSI-V	Done; superseded by developing the revision 3 of SIGRID-3

2.6.8.3	Review the English language version of the "Manual for Ice Experts – Ice Observers" and identify any corrections or amendments that may be required; provide comments to ETSI Chair	ETSI Chair / ETSI Members	Feb 2012	Postponed for further decision by ETSI-V
2.6.8.3	After it is finalized, send the "Manual for Ice Experts – Ice Observers" to WMO with a recommendation that it be published as a WMO publication	ETSI Chair	May 2012	Postponed for further decision by ETSI-V
2.7.1.2	Work with WMO Secretariat to prepare the proceedings of the Ice Analysts Workshops as a formal technical publication	ETSI Chair	May 2012	Done
2.7.1.6	Develop the theme and agenda for the 3rd Ice Analysts Workshop to be held in June 2011	Qvistgaard, Gauthier, Hughes, Holfort, Smolyanitsky	Oct 2010	Done
2.7.1.8	Develop a longer term vision for the Ice Analysts workshop series	Qvistgaard, Gauthier, Hughes, Holfort, Smolyanitsky	May 2011	Done; a SFSPA project #13 developed
2.7.3.9	Prepare and submit reports on activities in sea ice modelling systems and assimilation into numerical weather prediction models to ETSI Chair	ETSI Members	Sep 2010	Done
2.7.3.10	Provide a brief update on sea ice modelling systems and data assimilation into NWP models for the Services Coordination Group meeting proposed for May 2010	Carrieres (CIS)	May 2010	Done
2.7.3.10	Prepare a presentation on sea ice modelling systems and data assimilation into NWP models for the information of the ETOOFS and participate in the ETOOFS meeting in Tokyo in October 2010	Carrieres (CIS)	Oct 2010	Additional actions needed
2.7.3.11	Continue cooperation with IICWG for the Modeling/Data Assimilation Workshops and provide feedback to ETSI and ETOOFS	ETSI Chair / ETSI Members	On-going	Done in interaction with IICWG; a letter prepared and sent to ETOOFS
2.8.1.4	Provide input to the WMO Rolling Requirements Review based on the IICWG Socio-Economic Benefits and Observations Requirements document	ETSI Chair	Apr every year	Done
2.8.1.5	Revise the "Statement of Guidance for Ocean Applications" to better reflect sea ice	ETSI Chair in consultation with ETSI Members	Apr 2010	Done
2.8.2.1	Contact IMO to determine the best method to distribute the JCOMM questionnaire to users, especially in the Arctic METAREAs	Secretariat	Mar 2010	?
2.9.5	Make a concerted effort to contribute ice charts in SIGRID-3 format to the NSIDC. Discuss with GDSIDB centres the best method of hosting these charts (in the context of the Polar Decade)	ETSI Members / ETSI Chair	On-going	Done

2.10.1.3	Report to ETMSS Chair on the results of ETSI-IV, including the creation of the sub-group of experts (Norway, Canada, Russia, Denmark)	ETSI Chair	May 2010	Done
2.10.1.7	Discuss with ETOOFS the need for expert on sea ice modelling	SFSPA Coordinator	May 2010	Done though additional actions are necessary
2.10.2.5	Circulate information on the content of the first COMET sea ice module to the ETSI	Panowicz	As soon as possible	Done
2.10.2.5	Provide proposals for content of the second COMET module to Caryn Panowicz	ETSI Members	Oct 2010	Done
2.10.2.8	Contact the COMET team to determine if joint collaboration is possible in the context of the Manual for Ice Experts – Ice Observers	AARI	June 2010	Done
3.2.3	Develop an inventory of projects that are digitizing ship log books and Ask ship log digitizing projects to extract sea ice information	Hughes	Oct 2010	?
3.4.7	Ask the IICWG task team working on NetCDF to also assess the appropriateness of GRIB for sea ice data in NWP	Hughes	Mar 2010	Done; superseded by activity with the latest SIGRID-3 rev.3
4.1.6	Canada to support John Falkingham as TG-ENCIO leader for the next few months after ETSI-IV to maintain close collaboration with IHO	Gauthier	Mar 2010	Done
4.1.8	ETSI to maintain a close collaboration with the WMO CBS with respect to the integration of the Ice Logistic Portal into the WIS	ETSI Chair	On-going	Interaction initiated in Jan 2014 for general sea ice information
4.1.9	Seek CBS advice and expertise concerning documentation standards when revising ETSI documentation	ETSI Chair	On-going	Done; regular interaction with related WMO Secretariat division
4.1.10	Liaise with the EC-PORS as appropriate in the context of the International Polar Decade	ETSI Chair	On-going	Activity changed to International Polar Partnership Initiative (IPPI); regular input
4.1.13	Request the WMO Secretariats to coordinate an ETSI presentation on historical sea ice data products at the next WCRP Joint Scientific Committee	WMO Secretariat / GDSIDB SG	Apr 2010	Need for a new action
5.1	Plan to hold ETSI-V in Ottawa in May 2012	Secretariat / Gauthier	Nov 2011	Date revised; done

Annex VI

VALID SPECIFICATIONS FOR THE SO ICE ANALYSIS AT NIC, NIS, AARI AND PROPOSED COOPERATIVE PRODUCT

(Reviewed at ETSI-5, March 2014)

Feature	NIC	NIS	AARI	Cooperative Product
CT	Ice free 1-3 2-4 4-6 6-8 8-10 10	Ice free 0-1 1-4 4-7 7-9 9-10 10	Ice free 1-3 4-6 7-8 9-10 10 occasionally 1-2, 2-3, 8-9, 9	Ice free 1-3 2-4 4-6 6-8 8-10 10
SoD	1 - New ice 3 - Young ice for ice thicker than 4, 5 (?) 7 - Thin first-year ice 6 - First-year ice for ice thicker than 7 7* - Old ice ^* - Iceberg	1 - New ice 6 - First-year ice 7* - Old ice ^* - Iceberg	1 - New ice 2 - Nilas 4 - Gray 5- Gray-white 3 - Young 7 - Thin first-year 6 - First-year 7* - Old ^* - Iceberg	1 - New ice 3 - Young ice for ice 7 - Thin first-year ice 6 - First-year ice for ice thicker than 7 7* - Old ice ^* - Iceberg
Color Code	Based on CT (blue, green, yellow, orange, red, gray)	Based on CT (blue, green, yellow, orange, red, gray)	Based on CT and SoD (varies in season)	Based on CT and SoD (varies in season)
Partial concentations	Only 7*	N/A	yes	Only 7*, to continue tracking the amount of old ice, which is the ice type vessels are most interested in.
Eggs/SIGRID	We currently produce online content which comes in both eggs and SIGRID code. As we analyze we use eggs, which I believe are easier to work with.	N/A	Online content as graphic come commonly with colour coding (based either on CT or SoD), optionally with an ice symbol either in Russian national or WMO egg-symbol. Digital version is coded in shp with DBF in AARI internal coding which is 1=1 convertible to SIGRID-3	Online content should be available in SIGRID-3 and in graphics with colour coding. Graphic replica with WMO egg-code is desirable but not critical.

Icebergs	We currently track icebergs >10NM. With a distributed workload and more manpower I would like to track more icebergs, however this would have to be approved internally and that is unlikely.	Use BYU database for tracking. Based on NIC data and OSCAT analyses. Where adequate imagery exists, icebergs are drawn as separate polygons.	Draws some of the largest icebergs as polygones.	Continue to analyze icebergs that exceed 10NM. They're usually not hard to find with MODIS (while daylight), or use previous analysis or our table to help find them. Many are grounded/fasted and do not move.
Product Dissemination	Our analyses are posted online at: http://www.natice.noaa.gov/Main_Products.htm We have a graphical, interactive "Products on Demand" version, as well as hemispheric shapefiles that are posted and downloadable.	Graphical chart is posted online at: http://polarview.met.no/antarctic/antarctic.jpg, and also sent out via e-mail.	Graphic chart are posted at: http://info.raexp.ru/report-ledobs1-arhiv2.html. SIGRID-3 files are availble at http://wdc.aari.ru/datasets/d0015/antarc/	Analyses to be posted on each organizations websites, as image files and SIGRID-3. Access to content should be in advance of 1 day before the time of analysis for any side. Access to a common sets of satellite imagery supporting sustained hemispheric analysis is critical.
Antarctic Shoreline Update	Suggestions to use NGA data, or use SAR images to re-draw shoreline.	Could we use the Antarctic Digital Database. http://www.add.scar.org/	Vladimir Bessonov proposes to test a common coastline which he redrawn on a basis of the latest MODIS imagery; I posted coastline at wdc.aari.ru/datasets/_topo/antarc/antarc_coastline_50S.zip	Test Vladimir Bessonov coastline at I posted coastline at wdc.aari.ru/datasets/_topo/antarc/antarc_coastline_50S.zip
Chart valid each week	Wednesdays. Thursdays if necessary. Iceberg table is valid Fridays.	Valid Mondays.	1st and 15th of each month; AARI is planning to switch to bi-weekly analysis (odd or even week, harmonized with NIC)	NIC/AARI charts should come opposite NIS charts in the week so that customers would see two products/week and work would not be duplicated. All charts should not be contradictory, in particur if products are for the -3/+3 days interval.

Annex VII

PROPOSED AMENDMENT TO THE MANUAL ON MARINE METEOROLOGICAL SERVICES (WMO-NO.558)
(Reviewed and agreed at ETSI-5, March 2014)

1. Amend Section 2.2.4.7

> "Warnings for other severe conditions such as poor visibility, severe sea states (swell), ice accretion and other ice conditions shall also be issued, as necessary."

to read:

> "Warnings for other severe conditions such as poor visibility, severe sea states (swell), ice accretion, strong ice pressure or other sea ice conditions shall also be issued, as necessary.

Strong ice pressure can prevent ships from navigating freely and may cause them to drift into hazardous conditions.

2. Amend Section 2.2.5.1

> "The synopses given in Part II of weather and sea bulletins shall have the following content and order of items:
> (a) Date and time of reference in UTC;
> (b) Synopsis of major features of the surface weather chart;
> (c) Direction and speed of movement of significant pressure systems and tropical disturbances;
> (d) Ice conditions where applicable."

to read:

> "The synopses given in Part II of weather and sea bulletins shall have the following content and order of items:
> (a) Date and time of reference in UTC;
> (b) Synopsis of major features of the surface weather chart;
> (c) Direction and speed of movement of significant pressure systems and tropical disturbances;
> (d) Limit of all known ice or iceberg coordinates where applicable."

This is the current practice followed by two of the three northern METAREA service providers.

3. Amend section 2.2.5.1.1

> "Significant characteristics of corresponding wave conditions (sea and swell) should be included in the synopsis whenever this information is available, as well as characteristics of other sea surface conditions (for example, drifting ice and currents)."

to read:

> "Significant characteristics of corresponding wave conditions (sea and swell) should be included in the synopsis whenever this information is available, as well as characteristics of other sea surface conditions (for example, ~~drifting ice and~~ currents)."

Hazardous drifting ice can be covered by warnings in the warning section and the ice edge in the synopsis section. Other ice information should be in the forecast section.

4. Amend section 2.2.5.4
"Concise descriptions of ice conditions should be included in the synopsis (for example, position of the ice edge, total concentration, stages of ice development)."

To read:
"Descriptions of the limit of all known ice or icebergs shall be given using latitude/longitude coordinates. The location of the ice or the icebergs shall be given relative to the limit.

5. Amend section 2.2.6.1

"The forecasts given in Part III of weather and sea bulletins shall have the following content and order of items:

(a) The valid period of forecast;
(b) The name or designation of forecast area or areas within the main MSI area;
(c) A description of:
(i) Wind speed or force, and direction;
(ii) Sea state (significant wave height, total sea);
(iii) Visibility when forecast is less than 6 nautical miles (10 kilometres);
(iv) Ice accretion, where applicable;
(v) Ice conditions, where applicable"

To read:
The forecasts given in Part III of weather and sea bulletins shall have the following content and order of items:

(a) The valid period of forecast;
(b) The name or designation of forecast area or areas within the main MSI area;
(c) A description of:
(i) Wind speed or force, and direction;
(ii) Sea state (significant wave height, total sea);
(iii) Visibility when forecast is less than 6 nautical miles (10 kilometres);
(iv) Ice accretion, where applicable;
(v) Ice conditions (total concentration, stage of development, icebergs, etc), where applicable.

6. Amend section 2.2.10 Issue of sea-ice information

Sea-ice terminology shall be in accordance with *WMO Sea-ice Nomenclature* (WMO-No. 259)

to read:
"Issue of ice information
Sea ice and iceberg terminology shall be in accordance with *WMO Sea-ice Nomenclature* (WMO-No. 259)"

Annex VIII

THEMES AND OUTLINE OF THE 4TH ICE ANALYST WORKSHOP
9 – 13 JUNE 2014, HELSINGKI, FINLAND
(As agreed at ETSI-5, March 2014)

The International Ice Charting Working Group (IICWG) and the JCOMM Expert Team on Sea Ice (ETSI) are organizing the 4th **Ice Analyst Workshop (IAW-4) which will be held in Helsinki, Finland 9th -13th June 2014**. The workshop is hosted by Finnish Meteorological Institute (FMI). As a part of the IAW-4, an Antarctic workshop will be held on 12th -13th of June. The Antarctic workshop is organized by Russian Arctic and Antarctic Research Institute (AARI), and it will also be held at FMI in Helsinki.

Main themes of the IAW-4 on 9th -11th of June:
- ✓ Sea Ice analysis during the melt-up and break-up season
- ✓ Ice deformation identification using satellite imagery
- ✓ Iceberg analysis
- ✓ Use of sea ice symbology
- ✓ Testing of SIGRID-3 rev. 3, "Ice object catalogue" ver. 5.2 and IHO S-411

Antarctic workshop on 12th -13th of June:
- ✓ Develop standard operating practice to jointly produce Antarctic ice analysis.
- ✓ Review regulations for preparation and information exchange for ice in GMDSS bulletins for the Southern Ocean (high seas and coastal waters)
- ✓ Produce ice edge for a GMDSS SafetyNET bulletin and document methods to disseminate information to area coordinators for use.

Particular attention will be for using multi-source satellite imagery (SAR / MODIS / NPP SUOMI imagery) and using open source GIS software. For Antarctic special attention will be paid for developing and testing common Antarctic coast and land masks and common operative sets of satellite imagery and regulations for their exchange and testing specifications for cooperative ice charting product. The goal will be to develop a process and schedule to collaboratively produce a weekly Antarctic Sea Ice Analysis.

Participants of the workshop will include 25 – 30 ice analysts and meteorologists from the leading national ice services including Canada, China, Denmark, Finland, Germany, Iceland, Japan, Norway, Russia, Sweden and USA.

There will be **technical excursion and no-host dinner** in the Wednesday 11th afternoon.

We kindly ask you to contribute on any of the theme sessions, especially in the iceberg analysis session.

For registration and workshop logistics information, please send email to ulla.aalto@fmi.fi. If you want to have additional information from the organizing committee, please contact Antti Kangas, antti.kangas@fmi.fi or mob. +358 40 867883 and Vasily Smolyanitsky, vms@aari.aq or +7 812 337-3149. Check for the workshop documentation at http://www.jcomm.info/IAW4 and http://gmdss.aari.ru/docs/iaw4/.

Report of the previous 3rd Ice Analyst Workshop (18-22 June 2011, Copenhagen, Denmark) is published as JCOMM Technical Report No.56 (JCOMM-TR-056) and is available from JCOMM publication web-site http://jcomm.info/?option=com_oe&task=viewDocumentRecord&docID=8518 with working material available at http://gmdss.aari.ru/docs/iaw3/.

Annex IX

EXCERPT OF 2012-2017 SFSPA PROJECTS AND WORK PLANS RELEVANT TO ETSI ACTIVITIES
(Review and agreed at ETSI-5, March 2014)

Project #13: Capacity Development

Project Leader(s): Boram Lee, Kevin Horsburgh, Caryn Panowicz, Gary Brassington, Henri Savina

Project Description:

Capacity Development (CD) remains a core activity at the heart of most JCOMM activities. All individual projects have some capacity development aspects, whether these be high level scientific and technical workshops, hands on training activities, or Guides, Manuals and other guidance and training materials, including online course material.

At its fourth Session of JCOMM in May 2012, it was decided that focused efforts should be made for preparation and management of technical guidance material in conjunction with the regular review and update of the Guides and Manuals (addressed within other SFSPA projects). In addition, Specific project related training and capacity development are described under the individual projects, particularly to serve for Members' / Member States' capacity development and technology transfer needs.

Opportunities for training and technology sharing include the joint workshops supported by JCOMM and the Tropical Cyclone Programme (TCP) – to provide hands on training on operational wind wave and storm surge forecasting, and to contribute to the ongoing development of the Storm Surge Watch Scheme (SSWS), as well as joint workshops on sea ice analysis.

- **Expected Outcomes:**
  - Support Capacity Development workshops
  - Publish and update the Guides on marine meterology and oceanography, including those on marine meteorological services, ocean forecast systems, waves and storm surge forecasting

- **Key Activities:**
  - Support JCOMM-TCP training workshops on wave and surge forecasting
  - support for "Ice Analysts Workshop" on regular scale (1-2 interval)
  - support for sea-ice training documentation and courses including COMET modules and manual for ice experts – ice observers.
  - Support METAREA Coordinators and Issuing Services for Maritime Safety Services

- **Timeline/milestones:**
  - 4th JCOMM "Ice Analysts Workshop" (Helsingki, Jun'14)
  - 8th JCOMM-TCP Training Workshop on Storm Surge and Wave Forecasting, for East Africa (Nairobi, Nov'12)
  - 9th & 10th JCOMM-TCP Training Workshops on Storm Surge and Wave Forecasting (TBD)
  - Maritime Safety Services Enhancement Workshop, for METAREA coordinators and Issuing Services, in conjunction with IHO/WWNWS session (Aug'14, NZ)

- **ETs, Other Organizations and participants:**
  - ETWCH, TCP, ETSI, ETOOFS, ETMSS, COMET

- **Implementation of JCOMM-4 decisions** (by paragraph number of JCOMM-4 report)
  - 8.1.11 (training)
  - 8.2.3 (continuing JCOMM-TCP workshop series)
  - 9.5 (workshop in Africa)
  - 9.9 (harmonized training responding to Members'/Member States' needs)

Project #20: Catalogue on Met-Ocean Object Class for ENC and e-Navigation

Project Leader(s): NOAA, ***Henri Savina***

Project Description:

Since 1999, ETMSS has been working on the implementation of graphical/numerical Maritime Safety Information (MSI) broadcast within the GMDSS. The WMO Executive Council, at its sixtieth session (Geneva, June 2008) re-emphasized the continuing importance to mariners in receiving graphical products via radio transmissions and requested JCOMM to continue researching methods for transmitting graphical products to marine users. On the other hand, the WMO Executive Council, at its sixty-first session (Geneva, June 2009), encouraged WMO Members to investigate low-cost options for on-demand approaches that are compatible with Electronic Navigation Charts (ENC). In addition, the imminent increase of ENC systems on SOLAS vessels as regulatory material and the emergence of the e-navigation concept within IMO should reinforce the priority given to this requirement and the need to find appropriate resources to develop a suitable service. Both the ETMSS and ETSI have been working on this issue and ETSI has already developed the *Sea Ice Objects Catalogue* in accordance with IHO standards. The ETMSS has initiated the development of a catalogue on *Met-Ocean Object Classes and Attributes*, which would be an essential tool to enable NMHSs to develop products specifically for Electronic Navigation Chart Systems, allowing the implementation of software to decode and display met-ocean information by the manufacturers of these systems, using the S-100 chart data exchange standards.

The IMO e-Navigation concept reinforce the need to go forward on this issue, to be able to finalize the catalogue on Met-Ocean Object Class for ENC and e-Navigation, especially for parameters included in MSI. A strong support and contribution from ETSI is expected, as the Team has already developed such catalogue for sea ice. WMO, through the Secretariat and ETMSS, need also to be proactive in dealings with IHO and IMO on e-navigation development, to ensure compatibility between e-navigation and future metocean services by Members.

- **Expected Outcomes:**
  - Met-Ocean object class for parameters included in MSI (wind, wave height, etc…) and additional met-ocean parameters (surface current,…), based on templates from the Ice Objects Catalogue.

- **Key Activities:**
  - Establish the first version of the catalogue for registration in IHO S-10x
  - Engage with IHO and TSMAD for the creation of a IHO Domain for a Met-Ocean Feature Catalogue

- **Timeline/milestones:**
  - Feb 2013: ETMSS-4
  - June 2014: Finalize the first version of met-ocean object class

- **ETs, Other Organizations and participants:**
  - NOAA (lead), ETMSS (H. Savina, B. Hackett, G. Coppini, J. Parker, N. Moodie), ETWS, ETSI (Jürgen Holfort), IHO, IMO

Project #26: Support and enhance the Polar components of GMDSS

Project Leader: Darlene Langlois,
Other project members: Nick Hughes, Vasily Smolyanitsky, Beatriz Lorenzo, all ETSI members

Project Description:

Polar components of the GMDSS as well as provision of MSI for areas with occurrence of floating ice differ in many aspects from mid-latitude or ice free areas of the World Ocean. Navigation near or within the ice needs appropriate ice information for safety and efficiency. The current standard for information is an ice edge in text format; however, graphic and electronic formats may also be used. In the high latitudes, there are challenges with the coverage of Inmarsat but HF can be used.

Since June 2011, ice information has been available for the 5 Arctic METAREAs via SafetyNET and NAVTEX bulletins. To promote a consistent ice edge, a special "ice" GMDSS server (http://gmdss.aari.ru) has been set up to support exchange of information between the Preparation Services.

The objective of the project will be for the ETSI to continue to work with IICWG, ETMSS, IMO and IHO to support and enhance the polar components of GMDSS including the Southern Ocean and under the agreed scheme for IMO e-Navigation including the Polar Code.

- **Expected Outcomes:**
  - Ensure ice information is available for mariners around the world.
  - Increase the availability of graphic products.
  - Ensure the Polar Code has appropriate recommendations related to navigation in ice-infested waters.

- **Key Activities:**
  - Support for operational exchange of information for consistent ice information within GMDSS
  - Harmonization of format of the bulletins,
  - Develop standards for provision of iceberg information.
  - Exchange and transition experience to all METAREAs and sub-AREAs / regions with ice or icebergs.
  - Hold regular workshops to improve consistency of products and increase knowledge on topics relevant to mariners.
  - Develop, test and implement updates to ice in SafetyNET and NAVTEX standards supporting graphic presentation of information as appropriate.
  - Support safe operations in ice infested waters by providing input on ice related to Polar Code development to IMO.

- **Timeline, Major milestones:**
  - May 2014 – provide input into the Polar Code.
  - June 2014 - 4th "Ice Analysts Workshop" to include session on METAREA bulletin ice information for the Southern hemisphere
  - MMSW-2 and Fall 2014 –METAREA preparation and issuing services to meet to discuss formats and standards; perhaps during IICWG-14
  - Oct 2014 – Report to IICWG (Chile)
  - March 2015 – ice information from issuing services available in shape format on ice server
  - June 2015 – workshop for exchange of information
  - Fall 2015 – provision of ice information METAREA bulletins for the southern hemisphere

- **Implementation of JCOMM-4 decisions** (by paragraph number of JCOMM-4 report):
  - 8.3.4 (Safety-related Marine Meteorological Services)
  - 8.3.10 (Safety-related Marine Meteorological Services)

Project #27: Support and enhance ENC/Electronic Chart Display Information System (ECDIS) for ice navigation

Project Leaders: Juergen Holfort (ETSI TG ENCIO and BSH), Vasily Smolyanitsky

Project Description:

Having developed the Ice Objects Catalogue and the S-411 sea ice specification within the IHO S-100 context, these documents need maintenance and updates depending on changes for sea ice information as defined by ETSI and also according to users' needs. It is also needed to foster the use of sea ice information on the Electronic Chart Display Information System (ECDIS), respective within the context of e-Navigation. Care must be given to overviewing and helping in the implementation of the standards in systems on the bridge.

The experience in implementing the catalogue and S-411 is also a valuable asset to help in the implementation of other metocean data into e-Navigation.

Key outcomes:

- Wide usage on ships of ice charts
- Capability at National Ice Services to produce ice in S-10x and S-57

Key activities:

- Formal management of Ice Objects Catalogue and S-411
- Interact with ENCS manufacturers and OGC to develop software to accept ice data
- Support National ice services to develop capability and to begin production of S-4xx data files
- Support implementation of MetOcean Catalogue as S-4xx

Timeline / Milestones:

- Draft S-411 and presentation to IICWG (Oct'2012)
- Preparation of a portrayal registry for parameters of the ice objects catalog (2013)
- Formalization of documentation and reports to ETSI-V (Mar'14), IICWG (Oct 2013 and 2014) and TSMAD (Jun 2013 and further)
- End 2014: increased availability of ice charts in S-411
- November 2014: report to IHO-HSSC

ETs, Other Organizations and participants:

- ETSI TG ENCIO, BSH, IICWG, TSMAD

Implementation of JCOMM-4 decisions (paragraph number of JCOMM-4 report)

- 8.3.4 (Safety-related Marine Meteorological Services)
- 8.3.10 (Safety-related Marine Meteorological Services)

Project #28: Maintain and update sea ice technical documentation

Project Leader: Keld Quistgaard, Darlene Langlois,

Project Description:

The WMO sea ice technical documentation is regulating the descriptive (nomenclature and glossaries), coding, exchange and presentation procedures for sea ice cover as well as existing sea ice best practices for observations and services on regional and world-wide scale.

In a broader sense, it would be favorable for observational, operational and research community if the same documentation will be is developed for all kinds of floating ice – sea, lake and river ice with all kinds of topology (point, linear, area, grid).

Following requirements from the end-users, in the framework of implementation of CryoNet as well as in connection with anticipated requested from the International Polar Partnership Initiative (IPPI), ETSI will maintain, update and extend as appropriate the WMO sea ice standards in interaction and cooperation with the .International Ice Charting Working Group (IICWG).

Expected outcomes:

- Harmonization and updates to WMO ice documentation following progress in ice in ECDIS standards
- Updates to WMO ice standards in parts of river/lake ice/point/linear/gridded objects
- Documentation on ice observations and best practices

Key activities:

- Updates to “Sea Ice Nomenclature” (WMO-No.259) catching harmonization (Vol I – “Terminoloy” and Vol III - “International system of sea-ice symbols”) and training issues (vol. II - “Illustrated Glossary”);
- Updates to sea ice exchange and presentation formats (“SIGRID-3: a vector archive format for sea ice charts”, WMO/TD-No. 1214 and “Ice Chart colour code standard” WMO/TD-No. 1215);
- Developing “Understanding and Identifying Old Ice in Summer”, “Manual for Ice Experts – Ice Observers” and others docs (e.g. Canadian MANICE) as the new WMO sea publications for sea ice observations and analysis;
- Provide harmonization across the sea ice standards arising from adopted additions

Timeline / Milestones:

- Finalize additions arising from the “Ice Objects Catalogue” version 5.1” (ETSI-5, Mar’14)
- Finalize additions on ice objects arising from end-users, Cryonet and ice observations requirements (ETSI-5, Mar’14; IICWG,2014)

ETs, Other Organizations and participants:

- ETSI, IICWG, CryoNet team

Implementation of JCOMM-4 decisions (by paragraph number of JCOMM-4 report)

- 8.3.4 (Safety-related Marine Meteorological Services)
- 8.5 (Future priorities for the services and forecasting system programme)

Project #29 Support for sea ice climatology and ice information systems

Project Leader: Vasily Smolyanitsky, Caryn Panowicz,

Project Description:

In 1989 the WMO CMM initiated the "Global Digital Sea Ice Data Bank" (GDSIDB) project to support development of the sea ice climatology based on the ice charting with 2 archival centers – AARI, Russia and NSIDC, USA. Since 2001 the JCOMM Expert Team on Sea Ice in cooperation with the International Ice Charting Working Group (IICWG) is supervising the project and cooperates with JCOMM ETMC.

Since 1990s most of the ice services including BSIS, Canada, Japan, Russia, USA, are contributing to the project. Presently most of the ice charting data prior to 2000s is stored in a 0.25°x0.25° raster SIGRID, SIGRID-2 (WMO, 1989 and 1994) or Ease-grid formats, while after 2000s the data is stored in a more flexible vector SIGRID-3 format (WMO, 2004) and are available either via the AARI (http://wdc.aari.ru/datasets) or NSIDC (http://nsidc.org). The project will concentrate on a) reprocessing and update of the sea ice 'blended' climatology and assessment of uncertainties and b) availability of the sea ice charting metadata and material in information systems and formats required by end-users community (CryoNet, WIS, NetCDF).

Expected Outcomes:

- Updated semicentennial and longer sea ice 'blended' climatology and uncertainties
- Availability of sea ice operational and historical metadata and material in WIS, Cryonet, CMOC framework and other information systems and as geoservices
- Identification/referencing datasets by assigning DOI

Key Activities:

- Regular (weekly – monthly - annual) input to GDSIDB ice charting archive in standard WMO formats from contributing ice services / centers
- Annual reprocessing of data, update of climatology, assessment of uncertainties and comparison with passive microwave
- Coordination of development of protocols and procedures for sea ice charting metadata/material availability in WIS, Cryonet, static NetCDF, geoservices, etc and supporting documentation

Timeline/milestones:

- Report to IICWG (October 2013, 2014 / regular)
- Report to Cryonet (regular)
- Report to ETSI, ETMC and decision on information systems and access (ETSI-5, March 2014 / regular)

ETs, Other Organizations and participants:

- ETSI, ETMC, IICWG, CryoNet team

Implementation of JCOMM-4 decisions (noted by paragraph number of JCOMM-4 report

- 5.4.3 (Polar Met-Ocean and sea ice information services)
- 8.3.4 (Safety-related Marine Meteorological Services)

Project #31 Enhancing the integrated ice services and forecasting

Project Leaders: Antti Kangas, Nick Hughes

Project Description:
Provision of services for the efficiency and safety of navigation and other operations in the ice-covered waters require an integrated approach in terms of the ice and sea state parameters and products to be regularly, timely, and in the binary formats, delivered to end-users (navigators, off-shore platforms, search and rescue, emergency support). Typical parameters should include concentration, stages of development or thickness, form, dynamic processes (ice drift, pressure) and ice surface state (ridges, melt processes, snow on ice) as well as several metocean parameters, while the products should include both ice analysis or charting, high and medium resolution satellite imagery, and short–term numerical ice forecasting. SAR and emergency support may require additional products like medium-range ice and metocean forecasting and prediction of oil spill dissemination. Possible changes to the concept of ice support towards greater demands for products beyond traditional ice charting are progressing.
The objective of the project will be for ETSI, in close collaboration with the International Ice Charting Working Group (IICWG), to coordinate the enhancement of integrated ice services by tracking and summarizing best practices and requirements to products and information, facilitating exchange of experience and resources in ice analysis, operational forecasting and numerical modeling of ice, and the relationship to ice parameters and harmonization of the services. This project should provide advice and input to corresponding projects led by JCOMM ETOOFS and TT on MPERSS (Maritime Pollution Emergency Response Support System).

Key outcomes:
- Enhanced ice services following on the user-requirements
- Increased usage of the ice products in the NWP
- Improved integrated ice product usage in users' digital systems
- Input to MPERSS implementation in Polar Regions

Key activities:
- Tracking and summarizing requirements to input data (current and perspective spaceborne information and ground observations) and products;
- Exchange and transition of experience in ice analysis, forecasting and harmonization of practices across the Services, training for developing Ice Services, including support for regular "Ice Analysts Workshops" and "Sea Ice Data Assimilation Workshops".
- Input to ETOOFS guide

Timeline / Milestones:
- 4th Ice Analysts Workshop (June 2014)
- Sea Ice Data Assimilation Workshop (September 2014)
-
- Reports to IICWG and ETSI meetings

ETs, Other Organizations and participants:
- ETSI, IICWG, met.no and AARI for oil spills detection and monitoring

Implementation of JCOMM-4 decisions (by paragraph number of JCOMM-4 report)
- 8.3.4 (Safety-related Marine Meteorological Services)
- 8.3.10 (Safety-related Marine Meteorological Services)

Annex X

LIST OF ACTIONS
(Review and agreed at ETSI-5, March 2014)

Item	Action	By whom	When/target
2.1.5 3.1.3	review and propose amendments for the WMO-No.558 and WMO-No.471 regarding sea ice services in parallel with the ongoing review/update of other sea-ice related guidance material (Note SFSPA Projects #28 and #31)	D. Langlois with input from ETSI members	Regularly
2.3.1.2	Provide updated national report for revision/update of WMO-No.574 (Sea ice services in the world)	National sea ice services	31 July 2014 and yearly
2.3.1.2	Update WMO-No.574 with input through national reports	V. Smolyanitsky	31 August 2014 and yearly
3.1.3	Provide a proposal for amendment for Joint IMO/IHO/WMO Manual on MSI	D. Langlois, WMO Sec.	Done
3.3.1	(Test/Validate then operate) Use polygones in SIGRID-3 format instead of linear objects for ice information in SafetyNET bulletins	Canada, Norway, ETSI chair	30 June 2014
3.3.2	Update schemes of the METAREAs XVII to XXI sub-Areas as shapefiles and provide revised versions to ETSI chair	Canada, Denmark, Norway, Russia / ETSI chair, WMO Sec.	30 June 2014
3.3.2	Submit summaries to ETSI Chair on currently missing ice information in northern hemisphere sub-Arctic METAREA bulletins	All ETSI members	31 July 2014
3.3.3	Investigate possibility to set a single joint sub-Area for North Pole, taking into account the consistency with the NAVAREA coordination.	ETSI chair in consultation with Canada, Norway, and Denmark	30 October 2014
3.3.4	Use the same single point access to SafetyNET bulletins for METAREAs XVII-XVIII as for METAREAs XIX-XXI	Canada, Russia	30 June 2014
3.3.5	Make inventory of the current knowledge between the Southern Ocean METAREAs Preparation Services of WMO/IHO requirements to SafetyNET bulletins for areas with occurrence of floating ice	Juergen Holfort	30 June 2014
3.3.6	Implement adopted specifications for sea ice in GMDSS for the Southern Ocean METAREAs (Annex VI)	ETSI members	continuous
3.3.6	Present gap analysis of the mandatory sea ice component in meteorological MSI delivered through GMDSS in the sub-Arctic and Southern Ocean Regions at the 2nd MSS Workshop, with a goal to develop a consensus and commitment on including this mandatory information.	ETSI Chair	August 2014
3.4.5	To explore ways that ice services support the 2014 Search-and-Rescue Exercise (SAREX-2014)	Canadian Ice Service	August 2014
3.5.12	Develop amendments to Polar Code resolving remaining inconsistencies with national and Arctic METAREAs practices	ETSI members	August 2014

Item	Action	By whom	When/target
3.6.1	Submit proposed amendments for sea ice related part in WMO-No.558, to the “fast-track: process by ETMSS	WMO Sec. ETMSS	2015
3.6.3	Submit proposed amendments for sea ice related part in Joint IMO/IHO/WMO Manual on MSI, to the joint document review process	WMO Sec. ETMSS	30 April 2014
3.6.4	Verify proposed amendments for manuals and guides relating to sea ice MSI, for possible inconsistencies / agreement with national practices, and provide feedback to Darlene Langlois	ETSI members	30 April 2014
4.1.4	Develop proper roles of the GDSIDB project, national ice services and ice charting material in MCDS data flow	ETSI chair, ETMC chair/vice-chair	31 October 2014
4.1.5	Develop an inventory of applicable/available quality control procedures for ice charting material, and an outline for ETSI members for future implementation	ETMC chair ETSI chair ETSI members	30 September 2014
4.2.15	Consider assigning doi to GDSIDB datasets	ETSI chair NSIDC	On-going
4.5.3	Prioritize collecting and archiving iceberg position reports, and make them available through the GDSIDB	CIS	As soon as possible
4.5.3	Share experience and existing data for iceberg climatology	AARI	Continuous
4.6.1	Develop table with new contributions to GDSIDB centers	ETSI chair ETSI members	4 April 2014
5.1.3	Adopt SIGRID-3 revision 3, check the document for possible inconsistencies and provide comments to John Falkingham	ETSI members	30 April 2014
5.1.3	Prepare final version of SIGRID-3 revision 3, inform the WMO Secretariat and other appropriate bodies on a new major revision of the format and publish the document at JCOMM publication section	J.Falkingham ETSI chair WMO Secretariat	15 May 2014
5.2.1.2	Provide clarified definitions for “concentration of hills” in consistency with the WMO Sea-Ice Nomenclature and refine “stage of melting” definition	V. Smolyanitsky	30 April 2014
5.2.1.2	review “Ice Objects Catalogue” version 5.2 for possible inconsistencies and provide comments to TG-ENCIO (John Falkingham)	ETSI members	30 April 2014
5.2.1.2	Develop a proposal to combine “convergence” and “divergence” in one attribute and keep “compacting strength” separate, and circulate this proposal for approval by the Team, by email	J.Falkingham	15 April 2014
5.2.1.2	Prepare final version of “Ice Objects Catalogue” version 5.2, and submit the WMO Secretariat for publication, and to other appropriate bodies on a new major revision of the format	J.Falkingham	15 April 2014
5.2.1.3	Review “Ice Objects Catalogue” version 5.2 on possible inconsistences and provide comments to TG-ENCIO through J.Falkingham	ETSI members	30 April 2014

Item	Action	By whom	When/target
5.2.1.3	Prepare the final version of “Ice Objects Catalogue” version 5.2, and submit it to the WMO Secretariat for publication and to other appropriate bodies to inform a new major revision of the format	J.Falkingham	15 May 2014
5.2.2.2	Adopt the proposed “Ice in ECDIS” S-411 document as version 1.0, check the document for possible inconsistencies, provide comments to TG-ENCIO	ETSI members	30 April 2014
5.2.2.2	Assign the JCOMM TD number to “Ice in ECDIS” S-411	WMO Secretariat	1 April 2014
5.2.2.3	Report to IHO TSMAD on adoption of the “Ice in ECDIS” S-411	Juergen Holfort	1 April 2014
5.2.2.3	Interact with NSIDC on testing of the format	Juergen Holfort Peter Pulsifer	31 October 2014
5.2.3.2	Develop revised contents for Ice Chart Color Standard, including additional colours for residual ice and compact ice	ETSI chair	2015
5.2.3.3	Consider further updates to “Ice chart Colour Standard” including use of hatching above the colour and ensure further revisions of the document when required	ETSI chair	On-going
5.2.3.4	Explore better ways to include the refined iceberg information, including an additional layer and/or additional attributes and portrayals for areas with clusters of icebergs	K.Quistgaard, D.Langlois	2015
5.3.2	Collaborate with NSIDC on ontology project and to ensure linkages between the WMO “Sea-Ice Nomenclature” vol.I and other existing glossaries	ETSI chair Peter Pulsifer	On-going
5.3.2	Revisit terminology related to the shape, size of icebergs and try to rationalize it including the codes	Canada, Argentina	31 December 2014
5.3.2	Provide pattern for description of photos of the “Illustrated Glossary”	ETSI chair	30 April 2014
5.3.2	Provide updates to “Illustrated Glossary”	ETSI members	On-going
5.3.2	Provide regular updates of the master electronic version of the “Sea-ice Nomenclature” vol. I-III, provide updated versions to WMO Secretariat for regular update of the METEOTERM publication	ETSI chair WMO Secretariat	On-going
5.4.2	Extend WMO –No.574, Part I, section 4 with information on Arctic Ocean METAREAs	Caryn Panowicz	30 June 2014
5.4.2	Extend WMO–No.574, Part I, section 4 with clear definition of sea ice products and check Part II of publication for possible inconsistencies	Darlene Langlois ETSI members	30 June 2014
5.4.2	Extend WMO –No.574 with a new Appendix showing maximum and minimum propagation of sea ice in the Arctic and Antarctic based on ice charting	ETSI chair	30 June 2014
5.4.3	Collect amendments and finalize WMO –No.574 update 2014	ETSI chair	31 July 2014
5.4.3	Organize and ensure regular update of WMO –No.574 and visibility of updates at appropriate sites (JCOMM, IICWG, etc)	Leader of project # ETSI chair	On-going

Item	Action	By whom	When/target
5.5.2	Make inquiry within the user communities on usage of code tables related to sea-ice from BUFR-CREX and GRIB	ETSI Chair, WMO Secretariat	31 July 2014
5.6.1	Finalize license agreement for the publication of “Old ice in summer” document as a WMO publication	Canada WMO Secretariat	ASAP
5.6.2	Review content of the proposed ”Manual for sea-ice observers” for consistency with national and regional ice practices and provide input to the leader	ETSI members	2015
6.3.2	Share best practices in data assimilation between the ice services	ETSI members	On-going
6.4.1	Develop vision and strategy for inter-operability and integration of sea ice products	C.Panowicz, ETSI members	2015
10.1	Develop a “project” description on SAR in Polar Regions, as part of the ETSI intersessional workplan	C.Panowicz, ETSI members	October 2014
12.1	submit the WMO Secretariat a set of direct links to such information, key information portals for operational sea ice services, as well as the latest versions of the Manuals, Guidelines and reference documents for national sea ice services	ETSI Chair	30 April 2014

Annex XI

ACRONYMS AND OTHER ABBREVIATIONS

AARI	Arctic and Antarctic Research Institute
AVHRR	Advanced Very High Resolution Radiometer
BAS	British Antarctic Survey
BSH	Bundesamt für Seeschiffahrt und Hydrographie (Germany)
BSIM	Baltic Sea Ice Meeting
CBS	Commission for Basic Systems (WMO)
CD	Capacity Development
CIS	Canadian Ice Service
CLIC	Climate and Cryosphere project
CMOC	WMO-IOC Centre for Marine-Meteorological and Oceanographic Climate Data
COADS	Comprehensive Ocean Atmosphere Data Set
COMSAR	Sub-Committee on Radio-communications, Search, and Rescue (IMO)
DAAC	Distributed Active Archive Center
DMI	Danish Meteorological Institute
DMPA	Data Management Programme Area (JCOMM)
DOI	Digital Object Identifier
DSMP	Defense Meteorological Satellite Program (USA)
EC	Executive Council (WMO)
EC-PORS	WMO Executive Council Panel of Experts on Polar Observations, Research and Services
ECDIS	Electronic Chart Display Information System
EIS	European Ice Services
ENC	Electronic Navigational Charts
ENCIO	Electronic Navigational Chart Ice Objects
ENVISAT	Environmental Satellite
ET	Expert Team
ETMC	Expert Team on Marine Climatology (JCOMM)
ETMSS	Expert Team on Maritime Safety Services (JCOMM)
ETSI	Expert Team on Sea Ice (JCOMM)
EU	European Union
EWG	Environmental Working Group
FIMR	Finnish Institute of Marine Research
FOC	Full Operational Capability
GCW	Global Cryosphere Watch
DAC	Data Acquisition Centre
GDAC	Global Data Assembly Centre (WMO/WIS)
GDSIDB	Global Digital Sea Ice Data Bank
GDPFS	Global Data-Processing and Forecasting System (WMO)
GFCS	Global Framework for Climate Services
GIPS	Global Integrated Polar Prediction System
GIS	Geographic Information System
GMDSS	Global Maritime Distress and Safety System
GML	Geography Markup Language
HSSC	Hydrographic Services and Standards Committee (IHO)

IABP	International Arctic Buoy Programme
IAW	Ice Analysts Workshop
ICOADS	International Comprehensive Ocean-Atmosphere Data Set
IHB	International Hydrographic Bureau
IHO	International Hydrographic Organization
IICWG	International Ice Charting Working Group
IIP	International Ice Patrol
IMO	International Maritime Organization
IOC	Intergovernmental Oceanographic Commission (of UNESCO)
IODE	International Oceaongraphic Data and Information Exchange (IOC)
IPAB	International Programme for Antarctic Buoys
IPET-OSDE	Inter Programme Expert Team on the Observing System Design and Evolution (WMO)
IPY	International Polar Year
JCOMM	Joint WMO-IOC Technical Commission for Oceanography and Marine Meteorology
JMA	Japan Meteorological Agency
MAROL	Convention for the Prevention of Pollution from Ships
MCDS	Marine Climate Data System (JCOMM)
MCSS	Marine Climatological Summaries Scheme
MEPC	Marine Environment Protection Committee (IMO)
MIO	Marine Information Object
MPERSS	Marine Pollution Emergency Response Support System
MSI	Maritime safety Information
NAIS	North American Ice Service
NIC	National Ice Center (USA)
NOAA	National Oceanographic and Atmospheric Administration (USA)
NODC	National Oceanographic Data Center
NSIDC	National Snow and Ice Data Center (USA)
PCPI	Polar Predictability Initiative (WCRP)
PPP	Polar Prediction Project (WWRP)
RADARSAT	Satellite from Canada
RRR	Rollign Review of Requirements(WJMO)
SIDARUS	Sea Ice Downstream Services for Arctic and Antarctic Users and Stakeholders
SCG	Services and Forecasting Systems Programme Area (SFSPA) Coordination Group (JCOMM)
SFSPA	Services and Forecasting Systems Programme Area (JCOMM)
SI	Sea Ice
SIGRID	Format for the archival and exchange of sea-ice data in digital form
SLD	Styled Layer Descriptor
SMHI	Swedish Meteorological and Hydrological Institute
SOLAS	International Convention for the Safety of Life at Sea
TG	Task Group
ToR	Terms of Reference
TSMAD	Transfer Standard Maintenance and Application Development (IHO)
TT	Task Team

TT-MCR	ad hoc JCOMM Task Team on Marine Competency Requirements
UNESCO	United Nations Educational, Scientific and Cultural Organization
WCRP	World Climate Research Programme
WDCSI	World Data Center Sea Ice
WIS	WMO Information System
WMO	World Meteorological Organization
WWMIWS	Worldwide Met-Ocean Information and Warning System (IMO-WMO)
WWNWS	Worldwide Navigational Warning Service (IMO-IHO)
WWRP	World Weather Research Programme (WMO)

_____