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| **World Meteorological Organization**  **JOINT WMO/IOC TECHNICAL COMMISSION FOR OCEANOGRAPHY AND MARINE METEOROLOGY (JCOMM)**  **EXPERT TEAM ON SEA ICE (ETSI)**  **Sixth Session**  **STEERING GROUP FOR THE PROJECT GLOBAL DIGITAL SEA ICE DATA BANK (GDSIDB)**  **Fourteenth Session** Helsinki, 28 February to 3 March 2017 | **Intergovernmental Oceanographic Commission (of UNESCO)**  **ETSI-6/GDSIDB-14/Doc. 2.2**  Submitted by:  ETSI  24.II.2017  **DRAFT** |

**REport of ETSI chair**

***(Submitted by ETSI Chair)***

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| Summary and Purpose of Document This document contains the report of the Chairperson of the Expert Team on Sea Ice (ETSI) to the Sixth session of the Expert Team. It outlines the status of the ETSI activities since its last session (ETSI-V, Ottawa, Canada, March 2014). |

The Team is invited to:

1. Note and comment on the information contained in this document, as appropriate;
2. Review the current list of SFSPA projects with ETSI involved as a leader and contributor;
3. Provide guidance and recommendations for further development of ETSI activities for the next intersessional period (2017-2019), together with the overall SFSPA Work Plan.

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**References:** ETSI-V/GDSIDB-XIII final report, JCOMM Meeting Report No.114

JCOMM 4th session final report, WMO-IOC/JCOMM-4/3, WMO-No. 1093

## Appendices:

## 1. ETSI Terms of Reference (Resolution 5, JCOMM-4)

2. Terms of Reference of the Task Group on ENC Ice Objects

3. ETSI Work Plan for Intersessional Period 2014-2017

4. List of SFSPA projects for 2014 – 2017

5. Recommendations of the 5th Ice Analysts Workshop, U.S. National Ice Center, 16-20 May 2016

**DISCUSSION**

1. The Expert Team on Sea Ice (ETSI) was formally constituted at the First Session of JCOMM (JCOMM-I, Akureyri, Iceland, June 2001), re-established at the 2nd (JCOMM-II, Halifax, Nova Scotia, Canada, September 2005) as a part of the JCOMM Services Programme Area (SPA) and at the JCOMM 3rd and 4th Sessions (JCOMM-III, Marrakesh, Morocco, November 2009 and JCOMM-IV, Yeosu, Republic of Korea, May 2012), now as a part of the JCOMM Services and Forecasting Systems Programme Area (SFSPA).

2. Since JCOMM-IV, May 2012, the Members of the ETSI include the Chairperson – Dr Vasily Smolyanitsky (representing also Russian Federation), eleven experts representing the national services related to sea ice and the ice-covered regions from Argentina, Canada, Chile, China, Denmark, Finland, Germany (vice-chair), Iceland, Japan, Norway and USA and invited representatives of regional and international sea ice bodies, in particular, the Global Digital Sea Ice Data Bank (GDSIDB) Project, the Baltic Sea Ice Meeting (BSIM) and the International Ice Charting Working Group (IICWG). The Group’s current Terms of Reference are provided in the Appendix 1 to this document.

3. The current ETSI membership is as follows:

Alvaro SCARDILLI (Argentina)

Darlene LANGLOIS (Canada)

Gonzalo CONCHA (Chile)

Sihai LI (China)

Keld QVISTGAARD (Denmark)

Antti KANGAS (Finland)

Jurgen HOLFORT (Germany), vice-chair

Keiji HAMADA (Japan)

Nicholas HUGHES (Norway)

Vasily Smolyanitsky (Russian Federation), chair

Caryn PANOWICZ (United States of America)

4. Part of the Team is the Task Group on Electronic Navigational Chart Ice Objects (TG ENCIO) 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)”, formally constituted at ETSI 3rd session in March 2007. From 2013 the Task Team is lead by Juergen Holfort (prior to 2013 – by John Falkingham). TG ENCIO terms of reference are provided in the Appendix 2 to this document.

5. The past work plan for the ETSI was developed at ETSI-V (March 2014) on the basis, and following priorities, of the JCOMM intersessional work programme for 2012-2017 by JCOMM-IV (May 2012) and 7th Session of the Services Coordination Group (Tokyo, Japan March 2013). Recommendations from the 4th Sessions of the Expert Team on Maritime Safety Services (ETMSS-IV, Tokyo, Japan, February 2013) were also used in the past intersessional work.

6. A significant impulse for the current ETSI work is from the 5th Ice Analysts Workshop (IAW-5) carried out jointly by the Team and IICWG with support from the ESA, in May 2016, US National Ice Center. That includes new recommendations and decisions related to the Southern Ocean collaborative sea ice and icebergs analysis, coding and presentations on sea ice charts and GMDSS SafetyNet bulletins. List of IAW-5 actions is reproduced as Appendix 5.

7. Key issue of the Team’s intersessional activity included response to a new level of requirements for sea ice products and services for the efficiency and safety of ice navigation, and, as a part of that – 1) support for provision of sea-ice information in ENC/ECDIS, 2) support for extending formats for exchange and archival of sea ice and icebergs information and 3) support for full operational capability (since July 2011) of the new Arctic METAREAS XVII-XXI and collaborative sea ice and icebergs analysis within the METAREAs of the Southern Ocean.

8. Overall Team’s activities encompassed coordination and advice of the Members’ ice services to support navigation and sea ice monitoring, interaction with the ETMSS on sea ice Marine Safety Information (MSI), development and revision of sea ice technical guidance material and standards, support for CB including training in sea ice analysis, interaction with the Expert Team on Marine Climatology (ETMC) on a guidance of the Global Digital Sea Ice Data Bank (GDSIDB) or sea ice climatology, and linkages with other relevant bodies, in particular IHO TSMAD, WMO GCW and regional and international sea ice projects and alliances including IICWG, BSIM and CliC.

9. ETSI completed most of the parts of its past work plan, included as Appendix 3 and containing notes for achieved tasks.

10. 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, served as an active and vital advisory body to the Team and contributed to completion to the most of the activities during the intersessional work.

11. Among the highlights of the achievements are:

***(#13) Support Capacity Development workshops***

12. In June 2014 (FMI, Helsinki) the Team in cooperation with the IICWG successfully conducted the 4th “Ice Analysts Workshop” (IAW). Main themes of the workshop included cases studies for sea ice analysis during occurrence of dynamic processes and in transition periods (melt, freeze-up), Southern Ocean sea ice analysis and production of the GMDSS reports. For the first time procedures and software initially developed for the Arctic Ocean METAREAs were tested for the Antarctic waters.

13. The next IAW-5 held in May 2016 (NIC, Washington DC) very successfully contributed to the training in the Southern Ocean sea ice and icebergs analysis , construction of the GMDSS SafetyNet bulletins using open-source Bifrost GIS developed by NIS and developing new specifications for icebergs in GMDSS and SIGRID-3 format. Other training accomplishment includes conclusion of the development of a new COMET sea ice module by USA National Ice Centre in 2015.

***(#26) Support and enhance the Polar components of GMDSS***

14. Consolidated input for the new 558 edition developed by ETSI-5 was further cross-checked In October 2015 – January 2017 with corrections provided to ETMSS. Harmonization of the ice in SavetyNET bulletins is now regularly examined for the Arctic METAREAs by ETSI and IICWG. Extension of experience to the SO METAREA as well as other METAREAs with sea ice presence is from 2014 a regular agenda item for ETSI/IICWG meetings. Content of the bulletins as shape-files is available at <http://gmdss.aari.ru>. Standards for the iceberg presentation in SIGRID-3 and in the GMDSS bulletins were developed and are proposed for discussion by ETSI-6.

15. From December 2014, based on ETSI and IICWG decisions and outcomes of the 4th Ice Analysts workshop (June 2014, FMI), Russia, the United States and Norway commenced cooperative production of weekly Antarctic ice charts (<http://ice.aari.aq>), which initially they had been doing separately, in an effort to standardize and ensure the continuing year-round availability of these essential ice information products. Additionally 2015, the Argentine Naval Hydrographic Service commenced regular ice chart production.

16. The ETSI in tight collaboration with IICWG, led by David Jackson of the Canadian Ice Service, has followed the development of the Mandatory Polar Code at the International Maritime Organization (IMO) and provided consolidated and harmonized view of the national ice services on the matter to IMO in 2014-2016, including Polar Code requirements for ice information, Ice Navigator training and POLARIS decision making system for ice navigation.

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

17. The next version 5.2 of the “*Ice Object Catalogue*” (JCOMM-TR-080) was developed and adopted by ETSI in May 2014. The final version 1.1.0 “*S-411 Ice Information Product Specification*” (JCOMM-TR-081) produced by BSH as part of JCOMM/ETSI, was further checked and adopted by ETSI in June 2014. In accordance with the S-100 standard, the S-411 includes specifications for encoding the sea ice for navigational purpose as well as portrayal for polygon, linear and point ice classes, all fully compliant with the WMO Sea-Ice Nomenclature, Vol.III.

18. Interactions with ENCS manufactures on S-411 support in corresponding SDKs were initiated in August 2014, including Canada, Germany and Russia. ETSI progressive reports on S-411 and Ice Objects Catalogue were submitted to IHO HSSC in Nov 2014 and Nov 2015. Based on IICWG discussions further extensions to S-411 are proposed for discussion at ETSI6 including universal colour portrayal for ice classes and additional symbology to icebergs related iced features.

19. The BSH is managing software and is carrying out conversion of the Arctic and Antarctic ice charting material in SIGRID-3 exchange format from the national ice services to S-411. As a recommendation for further work consolidation of activities on catalogues and S-41x and reporting to IHO is recommended.

**(#28) Maintain and update sea ice technical documentation**

20. The WMO-No.259 Sea-Ice Nomenclature Vol. I was updated by ETSI-V in March 2014 with 27 new terms, 2 terms amended. The new terms included definitions for lake ice thus answering request from the Cryonet for a comprehensive ice format.

21. The next version 3 of the SIGRID-3 exchange format was developed and adopted by the ETSI in May 2014. The SIGRID-3.3 format now states for “*Sea-Ice Georeferenced Information and Data*”, is fully harmonized with the “*Ice Objects Catalogue*”, supports coding and exchange both the sea and fresh-water ice analysis and ice observation material, thus aiming to be more flexible and practical format for cryosphere activities. The format is presently undergoing testing for observational purposes within the IceWatch project. The next version 1.1 of the Ice Chart Color standard was developed and adopted by ETSI-V in March 2014.

22. Further additions to SIGRID 3.3, Ice Chart Color standard and the WMO Sea-Ice Nomenclature Vol.III will be discussed during ETSI6 relating to new colour portrayal and additional symbology for icebergs and ice edge/limit related ice features. Developing guides for observations and analysis is still underway, possibly some of this activity will be carried out under the GCW. A [consolidated section](http://jcomm.info/index.php?option=com_oe&task=viewDoclistRecord&doclistID=160) for sea ice regulatory documents is now maintained at JCOMM publication site and at the GCW portal.

**(#29) Support for sea ice climatology and ice information systems**

23. Global Digital Sea Ice Data Bank (GDSIDB) depositories at AARI and NSIDC are regularly updated with the routine sea ice charting material from the national ice services (5-7 days charts) and now contains material spanning period 1933-2016. The blended sea-ice climatology is now accepted by the ETSI-5 (March 2014) and further by ETMC-5 (June 2015) as a practical approach to present sea ice charting material for scientific community. Reports on the sea ice climatology were provided to ETSI, ETMC, GCW and IICWG in 2014-2016. The ETMC-5 agreed on reinforcement of the GDSIDB by integration with the Marine Climate Data System (MCDS) as a CMOC, accomplishment of that is a critical task the team for next years. Most likely availability of the historical sea ice charting material in WIS will be achieved through integrating GDSIDB and GCW portal resources.

24. The Team and the Meeting is proposed to follow this template for the next intersessional period taking into account the Team’s, the SFSPA and cross-cutting priorities developed by JCOMM-IV.

25. Based on the above, following major themes are proposed for the 6th ETSI / 14th GDSIDB projects sessions:

1. Update on global and regional ice services and best practices including improvement in the Southern Ocean including a year 2017 new edition of the WMO-574)
2. GMDSS polar components, jointly with ETMSS with a final check of WMO-558 & 471 including coding of icebergs information
3. Updates to the WMO Sea Ice standards - SIGRID-3, Colour Standard and Sea Ice Nomenclature, including
   1. Harmonization across the standards
   2. Improvement/extension of topology
4. Sea ice in ECDIS (additions Ice objects Catalogue, S-411, S-412)
   1. mandatory/non-mandatory classes/presentation schemas
   2. upscaling-downscaling
   3. interaction with manufactures, etc
5. Polar code and future concept of the ice services related to implications of Polar Code/ e-navigation
   1. Ice navigation portfolios and predefined packages
6. Sea ice climatology and sea ice in Marine Climate Data System (future for GDSIDB)
7. Support for GCW (WIGOS and CryoNet), YOPP, Arctic PRCC-network, GEBCO
8. Presentation for JCOMM-V

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**Appendix 1**

**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:

1. 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;
2. Provide advice to ETMSS on all aspects of impacts of sea ice relevant to maritime safety, marine pollution response and search and rescue services;
3. Maintain linkages with Expert Team on Operational Ocean Forecasting Systems on the relevant sea ice modelling and forecasting techniques;
4. 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;
5. 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;
6. 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;
7. Maintain and develop formats, nomenclatures and procedures for sea ice data and information exchange as well as relevant terminology, coding and mapping standards;
8. 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.

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**Appendix 2**

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.

**Appendix 3**

**STATUS OF WORKPLAN FOR ETSI DURING THE PAST INTERSESSIONAL PERIOD**

(Excerpt from ETSI-5, March 2014)

| **Item** | **Action** | **By whom** | **When/target** |
| --- | --- | --- | --- |
| 2.1.5  3.1.4 | 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  Done |
| 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  Done |
| 2.3.1.2 | Update WMO-No.574 with input through national reports | V. Smolyanitsky | 31 August 2014 and yearly  Done |
| 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  pending |
| 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  Done |
| 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  Done |
| 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  excluded |
| 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  Done |
| 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  Done |
| 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  Done |
| 3.4.5 | Canadian Ice Service to contact authorities to see how ice services can support the 2014 Search-and-Rescue Exercise (SAREX-2014) | CIS | August 2014  Done |
| 3.5.12 | Develop amendments to Polar Code resolving remaining inconsistencies with national and Arctic METAREAs practices | ETSI members | August 2014  Done |
| 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  Done |
| 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  Done |
| 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  Done |
| 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  pending |
| 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  Pending, possible will be passed to a project under CliC |
| 4.2.14 | Ensure maintenance of metadata for GDSIDB datasets | AARI, NSIDC | On-going |
| 4.2.15 | Consider assigning doi to GDSIDB datasets | ETSI chair, NIC  NSIDC | On-going |
| 4.4.3 | Adopt the ‘blended climatology’ as a common approach for sea ice climatology, provide its regular updates | AARI | On-going |
| 4.5.3 | Prioritize collecting and archiving iceberg position reports, and make them available through the GDSIDB | CIS | As soon as possible  passed to IICWG Icebergs Sub-committee |
| 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 | 15 April 2014  Done |
| 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  Done |
| 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  Done |
| 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  Done |
| 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  Done |
| 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  Done |
| 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  Done |
| 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  Done |
| 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  Done |
| 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  Done |
| 5.2.2.2 | Assign the JCOMM TD number to “Ice in ECDIS” S-411 | WMO Secretariat | 1 April 2014  Done |
| 5.2.2.3 | Report to IHO TSMAD on adoption of the “Ice in ECDIS” S-411 | Juergen Holfort | 1 April 2014  Done |
| 5.2.2.3 | Interact with NSIDC on testing of the format | Juergen Holfort  Peter Pulsifer | 31 October 2014  Pending, possibly should be dropped |
| 5.2.3.2 | Develop revised contents for Ice Chart Color Standard, including additional colours for residual ice and compact ice | ETSI chair | 2015  Done |
| 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  Done |
| 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  Done |
| 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  pending |
| 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  pending |
| 5.4.2 | Extend WMO –No.574, Part I, section 4 with information on Arctic Ocean METAREAs | Caryn Panowicz | 30 June 2014  Done |
| 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  Done |
| 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  pending |
| 5.4.3 | Collect amendments and finalize WMO –No.574 update 2014 | ETSI chair | 31 July 2014  Done as year 2015 and 2017 updates |
| 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 |
| 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  pending |
| 5.6.1 | Finalize license agreement for the publication of “Old ice in summer” document as a WMO publication | Canada  WMO Secretariat | ASAP  Pending, possibly should be dropped |
| 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  Pending, possibly should be dropped |
| 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  Passed to IICWG |
| 10.1 | Develop description a project on SAR in Polar Regions | C.Panowicz, ETSI members | October 2014  Done |
| 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  done |

**Appendix 4**

**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)

**Appendix 5**

**5th Ice Analysts Workshop, U.S. National Ice Center, 16-20 May 2016**

Recommendations

(updates by IICWG-17 are underlined by yellow color)

|  |  |  |  |
| --- | --- | --- | --- |
| No | Recommendation | By whom | When / target |
| ***Sea ice and icebergs in GMDSS*** | | | |
| A1 | Use the existing rules for content of sea ice information and description of ice edge in GMDSS SafetyNET for the Southern Ocean METAREAs | ETSI, ETMSS | 03.2017 |
| A2 | Recommend to extend rules for icebergs description in GMDSS SafetyNET bulletins in the WMO-No.558 by the following specifications  (a) information on icebergs shall be either in in METAREA and NAVAREA messages exactly in the same manner and shall be prepared by the specialized Service (national ice service in most cases)  (b) Iceberg analysis for SafetyNET should be done daily  (c) Iceberg information in SafetyNET should include following 4 sections (parts)  Mandatory   * “EXTREME ICEBERGS LIMIT” (using the WMO-558 specifications for ice edge) * “POSITION OF ICEBERGS GREATER THAN 10 NM” (accepted naming conventions are based on four 90° longitude quadrants developed by the U.S National Ice Center) – agreed   Optional   * “POSITION OF ICEBERGS SMALLER THAN 10 NM” (if observed, in enumerated manner) * “POSITION OF ICEBERGS ZONES” (clusters or zones of certain number of icebergs or concentration) using limited number of latitude-longitude pairs (recommended number - 4 pairs)   (c) Naming conventions for the Arctic need to be developed  Clear text before **Dec 10 2016** (Gabriele, Darlene, Keld) to ETSI | ETSI, ETMSS | 03.2017 |
| A3 | Investigate the influence of financial restrictions on amount of sea ice and icebergs MSI in SafetyNET bulletins | IICWG, ETSI | 03.2017 |
| A4 | Recommend that information on ice edge and icebergs in METAREA/NAVAREA SafetyNET shall be strictly in accordance with specifications in the WMO-No.558 so that its backward conversion into S-411 GML or SIGRID-3 shapefile formats be possible as a way forward for depicting content of GMDSS in ENCs; further discussions will be in March in relation to SafetyNet 2.0 | ETSI | 03.2017 |
| A5 | Consider appropriate both automatic (Bifrost - NMI) and manual (Bifrost - NMI, SIPAS - NIC, ArcGIS - AARI, other national ice services GIS) generation of ice edge in SafetyNET, in the first case manual QC is critical; develop recommendations for appropriate guides (e.g. Sea Ice Information Services in World, WMO-No.471); NIS will consider providing information for 471 before Dec 25 2016 | IICWG,ETSI | 03.2017 |
| ***Sea ice regulatory documentation*** | | | |
| B1 | Agree on the new universal Arctic/Antarctic icebergs size and form coding tables using alpha-numerical coding; develop updates including notes for usage for the corresponding documentation (Sea Ice Nomenclature vol.III, SIGRID-3, Ice Objects Catalogue)  **Table is in final form, should be sent to ETSI after IICWG-17** | IICWG, ETSI | 03.2017 |
| B2 | Agree on proposals for additional attributes for the icebergs polygone and point classes (non-ice S-57 attributes, iceberg concentration, maximum length and width of above water part); develop update for the corresponding documentation (SIGRID-3, Ice Objects Catalogue); ETSI Chair to provide the text for SIGRID-3, Ice Obs Cat, include Darlene’s proposal for an estimated icebergs number for Icebergs Sub, and then to ETSI + plus IAW-5 present – Nov 5 for further iteration; milestone mid Feb | IICWG, ETSI | 03.2017 |
| B3 | Agree on proposals for the new symbols and color coding for the areas and boundaries of the areas of particular form/ size/ number / concentration of icebergs; harmonize proposals, in particular in terminology, with those discussed by ETSI-V; test proposals in operational practice and develop updates for the corresponding documentation (Sea Ice Nomenclature vol.I and III, Color Standard, S-411); ETSI Chair to prepare starting material– Nov 5 for further iteration; milestone mid Feb | nat’l ice services  IICWG, ETSI | 2016-2017  03.2017 |
| B4 | Consider harmonization of sea ice and icebergs symbology in Sea Ice Nomenclature vol.III and S-411 presentation library; agree on a need for a single JCOMM / WMO / IHO depository for all sea ice symbology; develop updates for the corresponding documentation – make a decision by mid Feb. | IICWG, ETSI | 03.2017 |
| B5 | Consider harmonization of common ice shelf practices; propose common practice | IICWG, ETSI | 03.2017 |
| B6 | Consider clarification of wording in SIGRID-3 concerning using and mixing 2 and 6 letters identifiers; develop updates for the corresponding documentation (SIGRID-3); general issue – mid Feb | IICWG  ETSI | 10.2016 03.2017 |
| ***Sea ice and icebergs climatology and observations*** | | | |
| C1 | Agree on developing a comprehensive database of Antarctic icebergs using U.S. National Ice Center naming conventions.  Consider necessity of keeping individual databases for Arctic and Antarctic icebergs; SO – most likely BYU, BSH; Arctic – possible way forward – agreement between IIP, nat’l ice services on a common WKT format, ask BSH to manage DB | nat’l ice services, BYU | 2016-2017 |
| C2 | Consider developing a proposal on depicting available historical observations from 18th – 19th – early 20th log-books on the modern time Antarctic sea ice and icebergs propagation; the action needs further development and contacts with NPI and BAS | BAS  ETSI  ETMC | 2016-2017 |
| C3 | Specify date and time of observation and sensor when providing information on known icebergs and hazard area; need further development to define how to implement it. | nat’l ice services , BYU | 2016-2017 |
| C4 | Address use of BYU database to provide indication of area of hazard only pertaining to large icebergs | nat’l ice services  BYU | 2016-2017 |
| C5 | Address restoration of IPAB configuration and encourage better coordination with other institutes with regular buoy deployment to make data open source. – Pablo C.-C. / NIC | ETSI for JCOMM obs | 2016-2017 |
| C6 | IABP/IPAB meeting in Hobart, May 2017. Establish representation from IICWG members and they will provide any relevant information to the IICWG group - Pablo C.-C. / NIC | ETSI for JCOMM obs | May 2017 |
| C7 | Include iceberg parameters (e.g. length, area, type..etc) in ice observations; minimum is position, time, size (length), shape | nat’l ice services  BYU | 2016-2017 |
| C8 | Establish a minimum set of ice observations that should be taken to provide recommendations for research vessels and others. Development of system that converts ice observations from each vessel (or protocol used by each service) into a standard ice observation format that can be converted into Sigrid-3; harmonize national manuals like MANICE with SIGRID-3 as the master format | ETSI, IICWG  GCW, nat’l ice services | 2016-2017 |
| ***Capacity building*** | | | |
| D1 | Endorse development of the ‘Bifrost’ open-source GIS for ice charting and preparation of GMDSS bulletins by the Norwegian Meteorological Institute; recommend further development of the system collaboratively by the interested national ice services  A IICWG letter to NMI; reference Bifrost in JCOMM-5 docs | nat’l ice services  IICWG, ETSI | 2016-2017 |
| D2 | Consider developing minimum criteria and best practice system for en-route sea ice observations aboard different classes of vessels (VOS, expeditionary, scientific, under Polar Code) using existing ASPeCT, Argentian etc practices ; See C7 | nat’l ice services  IICWG, ETSI | 2016-2017 |
| D3 | Consider developing criteria for Ice Services certification and Ice Services quality control; Proposal before ETSI-6 | IICWG  ETSI | 10.2016 03.2017 |
| D4 | Develop feedback to SCAR, IHO and GEBCO on updates of Antarctic coastline and shelf based on Antarctic sea-ice AARI-NIC-NMI collaborative project; Include information from IAW-5 into report to GEBCO | AARI, NIC, NMI | 2016-2017 |
| D5 | Develop scripts/software for backward conversion of ice edge and iceberg information in SafetyNET onto S-411 GML and SIGRID-3 shapefile formats as a possible way of making content of GMDSS available in ENC; Action for NIS and BSH | BSH, nat’l ice services | 2016-2017 |
| D6 | Consider producing continuously updated SIGRID-3 file for the icebergs including standard attributes for names (using U.S. naming conventions for icebergs greater than 10 nm and UKXXX for smaller ones), dimensions, and optionally source of information and link to satellite image within the Antarctic sea-ice AARI-NIC-NMI collaborative project; Action for AARI, action for NIS | AARI, NIC, NMI | 2016-2017 |
| D7 | Consider developing a JCOMM “Guide to Antarctic iceberg analysis” ; Agree, need to define editorial board | nat’l ice services | 2016-2017 |
| D8 | Develop sea ice chart training to provide minimum basic level information and certification for new analysts. Sea Ice Analysts handbook can be created out of this training program (example is Johnston and Timco, 2008 training manual for old ice in the Arctic); Agree, need to define editorial board | nat’l ice services | 2016-2017 |
| D9 | Create general wikipage of data download link accessible to all ice charting agencies; Agree | Ice logistics Portal (BSH)  IICWG | 2016-2017 |
|  | ***Data Assimilation*** |  |  |
| E1 | Look into the use of MASIE and MASAM2 for data assimilation techniques applied to Antarctic sea ice models; Action for NIC | NIC, IICWG | 2016-2017 |
| E2 | Compile information on how ice service products are assimilated and used into output for models; TBD | FMI, DTU, Met Norway, and OSI SAF | 2016-2017 |
| E3 | Forge better link with data assimilation IICWG group and ice services in Europe and the US. For future DA meetings and topics stress the need for validation component against REAL observations; TBD | IICWG | 2016-2017 |