IMO/IHO HARMONIZATION GROUP ON DATA MODELLING Agenda item 5	HGDM 2/5/1/Rev.1 30 October 2018 ENGLISH ONLY

CONSIDERATION OF DESCRIPTIONS OF MARITIME SERVICES FROM DOMAIN COORDINATING BODIES

Draft descriptions for Maritime Services developed by WMO, IHO, IMPA and IALA

Submitted by WMO, IHO, IMPA and IALA

SUMMARY	
Executive summary:	This document provides draft descriptions for certain Maritime Services. The co-sponsors have provided this information to facilitate the development and consideration of MSPs by the HGDM
Action to be taken:	Paragraph 10
Related documents:	None

Introduction

1   Noting the progress made at the first meeting of the HGDM, and the decision of NCSR 5, the World Meteorological Organization (WMO), the International Hydrographic Organization (IHO), International Maritime Pilots Association (IMPA), and the International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA) wish to provide additional information, using the Template for Maritime Services, to assist the HGDM to complete its work of preparing guidance on the definition and harmonization of the format and structure of MSPs.

Discussion

2   IALA has prepared the following descriptions:

- Description for Maritime Service 1 – VTS Information Service;
- Description for Maritime Service 2 – Navigational Assistance Service; and
- Description for Maritime Service 3 – Traffic Organization Service.

3   IALA notes that resolution A.857(20) is under revision and VTS services might change as a result of this work.

4   IALA continues to work on draft IALA Guidelines for use by shore authorities and expects that these will be published in late 2019.

5   IHO has prepared the following descriptions:

- Description for Maritime Service 5 – Maritime Safety Information Service;
- Description for Maritime Service 11 – Nautical Chart Service;
- Description for Maritime Service 12 – Nautical Publications Service; and
- Description for Maritime Service 15 – Real Time Hydrographic and Environmental Information Service.

6   IMPA has prepared the following description:

- Description for Maritime Service 6 – Pilotage Service.

7   WMO has prepared the following descriptions:

- Description for Maritime Service 13 – Ice Navigation Service; and
- Description for Maritime Service 14 – Meteorological Information Service.

8   The descriptions listed above can be found in the annex and are proposed as components for the draft Guidance on the definition and harmonization of the format and structure of maritime services within the Maritime Service Portfolio (MSP).

9   It should be noted that, although an organization may have been identified as the lead for a particular Description, there is generally a need for multi-organizational input to the majority of Descriptions and, therefore, these submitted proposals may well require additional details or coverage of entire subject areas which fall under the general topic, but are not within the remit of the lead organization. For example MS 5, which requires input from three separate Organizations.

Action requested of the HGDM

10   The HGDM is invited to:

.1   consider the Descriptions provided in the annex, and incorporate them in its draft guidance as appropriate; and

.2   take any other actions, as deemed appropriate.

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ANNEX

MARITIME SERVICES DESCRIPTIONS

MS 1 - VTS Information Service (INS)

1.1 Submitting Organization

IALA

1.2 Description of the Maritime Service

IALA Guideline 1089 on Provision of Vessel Traffic Services (INS, TOS, NAS) gives guidance on the delivery of the three different types of services provided by a VTS: Information Service (INS), Traffic Organization Service (TOS) and Navigational Assistance Service (NAS).

An information service provided by a VTS is defined by IMO as "a service to ensure that essential information becomes available in time for on-board navigational decision-making."

"The *information service* is provided by broadcasting information at fixed times and intervals or when deemed necessary by the VTS or at the request of a vessel, and may include for example reports on the position, identity and intentions of other traffic, waterway conditions, weather, hazards, or any other factors that may influence the vessel's transit." (Resolution A.857(20)).

Table 1: Examples of the types of information that may be provided by the VTS operating an Information Service (IALA Guideline 1089)

Information related to:	Examples:
Navigational situations (including traffic and route information)	• Position, identity, destination of vessels and the intention of other traffic • Amendments and changes in promulgated information concerning the VTS area such as boundaries, procedures, radio frequencies, reporting points, the mandatory reporting of movements • Limited manoeuvrability that may impose restrictions on the navigation of other vessels, or any other potential hindrances • Suspension or change of routes, etc.
Navigational warnings	• Dangerous wrecks, obstacles not otherwise promulgated, diving operations, vessels not under command, etc.
Meteorology	• Information that will include the speed and direction of the prevailing wind, direction and height of the waves, visibility, atmospheric pressure, the formation of ice, etc.
Meteorological warnings	• Gale, storm, tsunami, restricted visibility, etc.
Hydrography	• Information that will include factors such as the stability of the seabed, sea depth, the accuracy of surveys, tidal ranges, tidal streams, prevailing currents and swell, etc.

Information related to:	Examples:
Electronic navigational aids	• The availability of electronic navigational aids such as GNSS, Loran, DGPS, AIS, RACON, etc.
Other information	• Port information, pilot or tug request, cargo information, health condition, PSC, ISPS, etc.

1.3 Purpose

The purpose of MS 1 is to provide data in a digital format to support VTS Information Service (INS) and to create the means to reduce administrative burden and information overload, reduce miscommunication due to external interference, simplify work procedures, promote sustainable shipping, and increase navigational safety.

Information provided in a digital format could complement and/or replace verbal/voice communication. The steps to achieve this transition to digital information exchange may vary in different areas and for different types of vessels. Details about digital information exchange should be published by the VTS authority.

1.4 Operational approach

The digitalisation of information will diversify the communication means between shore authorities and vessels and will affect VTS procedures regarding information provision.

Not all vessels are capable of receiving information in digital format; provisions should, therefore, be made to ensure that less capable vessels are receiving the information they require. VTS should remain the primary contact with vessels for urgent and important messages, and will ensure communications with mariners.

1.5 User needs

Resolution A.857(20) contains examples of information that can be provided to vessels. The use case below is based on the information from table 1.

1.5.1 Use case - Vessel arrival

[Before or upon arrival in the VTS area, a data collection system on board sends all details regarding the arrival via relevant infrastructure to the VTS. The VTS collects the vessel's data directly into its system and automatically updates the vessel's pre-registered data. Both vessel and VTS use chart systems as a graphic interface to present details that are of interest to the voyage.

The example is generic and intended for description purposes only. Actions and template categories may differ for different countries. Information exchange can be in real time instead of at specific times as indicated in the table. *Content in the column named "Template Info (technical)" is pending submissions from relevant stakeholders.*
The categories of services and the associated details are listed in Appendix 1, MS1 Information Service template.]

Time	Automated Vessel Action	Automated VTS Action	Info category in appendix
01:00	Provides pre-arrival info	Replying with information on weather	Environmental
02:00	Enters VTS Area, provides sailing route	Traffic information to vessel	Traffic and Route information
02:30	Passes reporting point line	Provides information on current, wave height, etc.	Hydrographical information
03:00	Requires port information	Provides quay details	Traffic and Route information
03:30	Passes second reporting point	Provides operational information on AtoNs	Navigation Hazards
04:00	Vessel along side	Gives information on wind speeds, visibility	Environmental

1.6 Information to be provided

[See Appendix 1, MS 1 VTS Information Service template.]

1.7 Associated technical services

Name	ID (MRN)	Description	Architect(s)	Standardization Body
Voyage Information Service	urn:mrn:stm:service:specification:sma:vis	The service supports exchange of voyage plans, text messages and area messages.		IEC
Weather Service				
ENSI Voyage Reporting Service	urn:mrn:mcp:service:specification:fta:ENSI-VRS	The Service provides route validation for ships and facilitates sharing of SRS reports and Voyage information to shore centres.		
Routing information	urn:mrn:iho:s127	S-127		IHO
Currents Service	urn:mrn:iho:s101	S-101		IHO
Wave height service				

Port information (harbour charting information)	urn:mrn:iho:s101	S-101		IHO
Port information (harbour services information)				IHMA
AtoN Information	urn:mrn:iala:aton			IALA

[To be filled later
NOTE! Appendix 1 could be complimented with required information regarding this table]

1.8   Relationship to other MSs

MS 1 has a relationship with other MSs where it affects the VTS:
Examples may be different depending on the coastal state arrangements.

Description	Examples of data that could be of interest for MS 1
MS 1 VTS INS	[See Appendix 1, MS 1, Information Service Template]
MS 2 VTS NAS	[See Appendix 2, MS 2, Navigation Assistance Service Template]
MS 3 VTS TOS	[See Appendix 3, MS 3, Traffic Organization Service Template]
MS 4 Local Port Service	Delays, obstruction, cargo operations, port availability and anchorage area in the port, ISPS state, Marsec level
MS 5 Maritime Safety Information	All information depending on structure of MSI
MS 6 Pilotage Service	Pilot orders and updates
MS 7 Tug Service	Tug order and updates
MS 8 Vessel Shore Reporting	Notification of arrival, dangerous cargo etc.
MS 9 Telemedical	Delays
MS 10 Maritime Assistance Service	Notifications, routing, places of refuge
MS 11 Nautical Chart Service	Local Area updates, chart updates
MS 12 Nautical Publication Service	Updates to publication
MS 13 Ice Navigation Service	Ice routes, ice conditions, ice breaking assistance
MS 14 Meteorological Service	
MS 15 Real-Time Hydrographic and Environmental Information Service	Horizontal and vertical Tidal information in VTS area, available water column
MS 16 Search and Rescue service	Search pattern and vessel of opportunity

MS 2 - VTS Navigational Assistance Service (NAS)

2.1   Submitting Organization

IALA

2.2   Description of the Maritime Service

IALA Guideline 1089 on Provision of Vessel Traffic Services (INS, TOS, NAS) gives guidance on the delivery of the three different types of services provided by a VTS Information Service (INS), Traffic Organization Service (TOS) and Navigational Assistance Service (NAS).

Navigational Assistance Service operated by VTS is defined by IMO as "a service to assist on-board navigational decision-making and to monitor its effects."

"The *navigational assistance service* is especially important in difficult navigational or meteorological circumstances or in case of defects or deficiencies. This service is normally rendered at the request of a vessel or by the VTS when deemed necessary." (Resolution A.857(20))

Table 1: Examples of the types of information that may be provided by a VTS operating a Navigational Assistance Service (IALA Guideline 1089)

Information related to NAS	Examples
Request and identification	- availability of NAS, start and end of NAS; - request for vessel identification such as position, course made good and speed over the ground; - status of vessel's equipment; etc.
Navigational information (including position and course information)	- Examples provided to an individual vessel: - provide range and bearing from fixed objects, fairway/channel or way-points; proximity to navigational hazards, etc. - provide information related to navigating into a channel/fairway/lane (i.e. track is parallel/diverging/converging with/from/to reference line); etc.
Advice (or instruction)	- advise (or instruct) a vessel to alter the course, speed; - advise (or instruct) to keep clear from area/position, close up/drop back on/from vessels; etc.
Warning	Diverging from the recommended track towards dangerous wrecks, obstacles not otherwise promulgated; diving operations; vessels not under command; etc.

2.3   Purpose

The purpose of MS 2 is to provide data in a digital format to support Navigational Assistance Service (NAS) and to create means to reduce administrative burden and information overload,

reduce the risk for miscommunication due to external interference, simplify work procedures, promote sustainable shipping, and increase navigational safety.

Information provided in a digital format could complement and/or replace verbal/voice communication. The steps to achieve this transition to digital information exchange may vary in different areas and for different types of vessels. Details about digital information exchange should be published by the VTS authority.

2.4   Operational approach

All information related to MS 2 Navigational Assistance Service should be delivered only by VTS authorities.

VTS should remain the primary contact with vessels for urgent and important messages necessary for the on board decision making.

Information provided digitally could complement voice communications in time-critical situations and in addition partly replace voice communications in non-time critical situations.

Note: Example of time critical situation:

- Risk of grounding/striking/collision. In addition to voice communications, the vessel can be provided with an electronic route recommendation.

Note: Example of non-time critical situation:

- Assist a vessel to an anchoring position by providing the vessel with an electronic route recommendation without voice communications.

The identity of the vessel receiving Navigational Assistance Service should be assured. Other items listed in the IALA Guideline 1089 On Provision of Vessel Traffic Service (Appendix B) should also be taken into consideration for digital transmission of information.

All information related to this service should be displayed in real time. Measures should be taken to ensure that the information is received and acknowledged.

2.5   User needs

The use case below are based on the information from table 2.

The use cases are generic and intended for description purposes only. Actions and template categories may differ for different countries. *Content in the column named "Template Info (technical)" is pending submissions from relevant stakeholders.*

For example:

- Recommended route can be send digitally to a vessel.
- Pre-arrival reporting can be done digitally without voice communication for update of route of voyage plan in order to avoid collisions, groundings and strikings and assist in safe navigation.

- The content of the voice communication can be provided digitally and be displayed as text in parallel / in addition to voice communication.

2.5.1 Use case vessel deviates from planned route

[Vessel approaches VTS area according to voyage plan sent to VTS. The route is displayed in the VTS application and vessels position is automatically compared to the planned route. The system alerts the VTS operator, who then confirms that the vessel has deviated from its route. The VTS operator informs, warns and if necessary instructs / advises the vessel to change course via voice communication. Navigational assistance information is also presented on the vessel's own navigation system. The VTS operator ensures that the vessel has changed course according to the solution. The VTS application continues to monitor the vessel's voyage. It will alert the VTS operator if new deviation occurs.

The categories of services and the associated details are listed in Appendix 2, MS2 Navigational Assistance Service template.

The example is generic and intended for description purposes only. Actions and template categories may differ for different countries. *Content in the column named "Template Info (technical)" is pending submissions from relevant stakeholders.*]

Time	Vessel Action	VTS Action	Info category in appendix
01:00	Approaches VTS area	Receive voyage plan and monitor vessels progress	Traffic and Route Information
01:30	Deviates from her route	Informs, warns and advises / instructs the vessel to change course/speed	Navigational advice
01:35	Changes course	Verifies that vessel has changed course and is no longer in danger	

2.5.2 Use case – assistance to a vessel to an anchoring position

[Vessel is inside VTS area and needs to stop for engine repair. Vessel asks for a safe anchorage position. VTS provides anchoring position. Vessel takes a direct course to the anchoring position, over a shallow area. VTS gives warning to the vessel and provides a safe route to anchorage position.

After the vessel has anchored, high winds develop causing the vessel to drag anchor. The VTS operator monitoring the anchorage receives an alarm and warns the vessel through automated digital alert and through voice communication.]

Time	Vessel Action	VTS Action	Info category in appendix
00:00	Ask for anchorage position	Provides position	Navigation Information
00:10	Takes course to the position	Warning: You are running into danger - shallow waters... Provides vessel safe route	Navigational warning / Advice
00:20	Follows route provided by VTS to the anchorage	Monitors	Navigational Information
05:00	Drags anchor	Warning: You are dragging anchor	Navigational warning
05:30	Repositions	Monitors	Navigational Information

2.6   information to be provided

[See Appendix 2, MS 2 Navigational Assistance Service template]

2.7   Associated technical services

Name	ID (MRN)	Description	Architect (s)	Standardisation Body
Voyage Information Service	urn:mrn:stm:service:specification:sma:vis	The service supports exchange of voyage plans, text messages and area messages.		IEC
Route information		S-421		IEC

2.8   Relationship to other MSs

MS 2 has a relationship to other MSs where it affects VTS:

Examples may be different depending on the coastal state arrangements.

Description	Examples of data that could be of interest for MS 2
MS 1 VTS INS	See Appendix 1, MS 1, Information Service Template
MS 2 VTS NAS	See Appendix 2, MS 2, Navigation Assistance Service Template
MS 3 VTS TOS	See Appendix 3, MS 3, Traffic Organization Service Template
MS 4 Local Port Service	Delays, obstruction, cargo operations, port availability and anchorage area in the port, ISPS state, Marsec level

MS 5 Maritime Safety Information	All information depending on structure of MSI
MS 6 Pilotage Service	Pilot orders and updates
MS 7 Tug Service	Tug order and updates
MS 8 Vessel Shore Reporting	Notification of arrival, dangerous cargo etc.
MS 9 Telemedical	Delays
MS 10 Maritime Assistance Service	Notifications, routing, places of refuge
MS 11 Nautical Chart Service	Local Area updates, chart updates
MS 12 Nautical Publication Service	Updates to publication
MS 13 Ice Navigation Service	Ice routes, ice conditions, ice breaking assistance
MS 14 Meteorological Service	Weather information
MS 15 Real-Time Hydrographic and Environmental Information Service	Horizontal and vertical tidal information in VTS area, available water column
MS 16 Search and Rescue service	Search pattern and vessels of opportunity

MS 3 - Traffic Organization Service (TOS)

3.1   Submitting Organization

IALA

3.2   Description of the Maritime Service

IALA Guideline 1089 on Provision of Vessel Traffic Services (INS, TOS, NAS) gives guidance on the delivery of the three different types of services provided by a VTS, Information Service (INS), Traffic Organization Service (TOS) and Navigational Assistance Service (NAS).

Traffic Organization Service operated by VTS is defined by IMO as "a service to prevent the development of dangerous maritime traffic situations and to provide for the safe and efficient movement of vessel traffic within the VTS area."

"The *traffic organization service* concerns the operational management of traffic and the forward planning of vessels movements to prevent congestion and dangerous situations, and is particularly relevant in times of high traffic density or when the movement of special transports may affect the flow of other traffic. The service may also include establishing and operating a system of traffic clearances or VTS sailing plans or both in relation to priority of movements, allocation of space, mandatory reporting of movements in the VTS area, routes to be followed, speed limits to be observed or other appropriate measures which are considered necessary by the VTS authority." (Resolution A.857(20))

Table 1: Examples of types of information that may be provided by the VTS within a Traffic Organization Service (IALA Guideline 1089)

Information related to:	Examples
Traffic clearance	Give authorization under conditional circumstances to a vessel when: prior to or entering a VTS area; • departing from a berth or an anchorage position within a VTS area; • entering into a fairway within a VTS area; or • prior to commencing a manoeuvre that may be detrimental to safe navigation. Examples of conditions: • a VTS sailing plan before entering a VTS area; • lock and bridge passage planning; • report position at determined reporting point/line/pilot station; • use a second fairway in case of bad visibility/weather; • use a tug boat in case of strong wind; • dredging or compass swing in confined waterway.
Anchorage	Examples of anchorage situations: • organizing the movements to/from an anchorage position/area; • assignment of an anchorage position; • assisting vessels into anchorage position.

Enforcement	Examples of enforcement:
	• speed limits;
	• adherence to rules regarding traffic routeing measures;
	• pilotage requirements;
	• other traffic regulations and possibly local by-laws
Waterway (sea, channels and fairway) management	Examples of management measures:
	• the use of one-way traffic as an alternative of two way traffic, depending on the dimensions of vessel or the weather conditions;
	• organizing other traffic when a vessel has passed point of no return;
	• slot management to allocate vessels in a time window;
	• organizing the traffic concerning vessel dimensions in comparison to fairway restrictions;
	• instruct vessels when overtaking is not permitted;
	• establish and organize vessel safety zones in case of particular operations;
	• establish and organize exclusion zones;
	• instruct vessels to keep clear from special areas/positions;
	• organizing the traffic with regards to meteorological, hydrographical or other restrictions such as visibility, wind speed, current, sea state and under keel clearance.

3.3   Purpose

The purpose of MS 3 is to provide data in a digital format to support Traffic Organization Service (TOS) and to create means to reduce administrative burden and information overload, reduce the risk for miscommunication due to external interference, simplify work procedures, promote sustainable shipping, and increase navigational safety.

Information provided in a digital format could complement and/or replace verbal/voice communication. The steps to achieve this transition to digital information exchange may vary in different areas and for different types of vessels. Details about digital information exchange should be published by the VTS authority.

3.4   Operational approach

A Traffic Organization Service should be responsible for separating traffic in the interest of safety and efficiency. This separation could be defined in space, time and/or distance.

Enforcement may also be carried out within a Traffic Organization Service where the VTS should monitor adherence to applicable rules and regulations and to take appropriate action where required and within the authority of the VTS (IALA Guideline 1089 On Provision of Vessel Traffic Services).

Digital communication may apply to elements of the Traffic Organization Service that are not time critical situations.

Examples:

- Slot management: provide vessels digitally with priority of arrival and distance between two vessels
- Traffic clearance: provide vessels digitally with permission to proceed, impose conditions or deny entry
- Route information: provide vessels digitally with recommended route information
- Traffic information: vessel provide VTS digitally their intentions, such as overtaking of another vessel
- Information regarding restricted or no-go area: the content (draft, closed fairway/port/quay etc.) can be provided digitally to vessels without using voice communication

All information provided digitally can complement and/or replace verbal/voice communication.

3.5   User needs

The use cases below are based on the information from table 3.

The use cases are generic and are intended for description purposes only. Actions and template categories may differ for different countries. *Content in the column named "Template Info (technical)" is pending submissions from relevant stakeholders.*

3.5.1   Use case – vessel leaves quay

[When the vessel is ready to sail it sends its planned time of departure digitally to VTS where it is presented in the VTS application. The application alerts operator on upcoming traffic conflicts and advises on a solution, which is assessed by VTS. The VTS operator takes action and instructs vessel digitally to delay planned departure by thirty minutes. The instructions are graphically displayed in applications, acknowledged by the vessel and VTS operator provides delayed departure information to other traffic via digital and/or verbal means for vessels not able to receive information digitally.

Detailed information can be found in Appendix 3, MS 3, Traffic Organization Service Template.]

Time	Vessel Action	VTS Action	Info category in appendix
00:00	Sends ETD to VTS and requests permission to leave quay (in some cases additional communication by voice could be required).	Deny clearance. Give permission to leave in thirty minutes	Waterway management
00:01	The vessel acknowledges revised ETD	VTS receives acknowledgement and informs other traffic of revised ETD	Waterway management
00:30	The vessel informs VTS of intended departure	VTS issues traffic clearance with any appropriate conditions attached	

3.5.2 Use case – vessel transiting protected area

[As a vessel is approaching a marine mammal protected area where a speed restriction may or may not be active depending on the presence of marine mammals. When marine mammals are present, vessels are advised digitally that a speed restriction is in effect. For example, the vessel receives a digital message and the extent of the area is displayed in the navigational systems.]

Time	Vessel Action	VTS Action	Info category in appendix
00:00	Sailing in the vicinity of marine mammal protected area	Receives information confirming presence of marine mammals and activates the speed restriction area.	Enforcement
00:30	Approaches a marine mammal protected area	Sends automated digital message regarding active speed restriction and the area (text and visual)	Waterway management
02:00	Entering the marine mammal protected area	Confirm that speed restrictions are in force	Waterway management
02:10	Exceeding speed limit	Send automated digital alert message requesting vessel conform to speed limit	Enforcement

3.6 Information to be provided

[See Appendix 3, MS 3, Traffic Organization Service template.]

3.7 Associated technical services

Name	ID (MRN)	Description	Architect(s)	Standardisation Body

3.8 Relation to other MSs

MS3 has a relationship with other MSs where it affects the VTS:

Examples may be different depending on the coastal state arrangements.

Description	Examples of data that could be of interest for MS 3
MS 1 VTS INS	See Appendix 1, MS 1, Information Service Template
MS 2 VTS NAS	See Appendix 2, MS 2, Navigation Assistance Service Template
MS 3 VTS TOS	See Appendix 3, MS 3, Traffic Organization Service Template
MS 4 Local Port Service	Delays, obstruction, cargo operations, port availability and anchorage area in the port, ISPS state, Marsec level
MS 5 Maritime Safety Information	All information depending on structure of MSI
MS 6 Pilotage Service	Pilot orders and updates
MS 7 Tug Service	Tug order and updates
MS 8 Vessel Shore Reporting	Notification of arrival, dangerous cargo etc.
MS 9 Telemedical	Delays
MS 10 Maritime Assistance Service	Notifications, routing, places of refuge
MS 11 Nautical Chart Service	Local Area updates, chart updates
MS 12 Nautical Publication Service	Updates to publication
MS 13 Ice Navigation Service	Ice routes, ice conditions, ice breaking assistance
MS 14 Meteorological Service	Weather information
MS 15 Real Time Hydrographic and Environmental Information Service	Horizontal and vertical Tidal information in VTS area, available water column
MS 16 Search and Rescue service	Search pattern and vessel of opportunity

MS 5 - Maritime Safety Information (MSI) Service (MSP/DMS 5)

5.1   Submitting Organization

IHO World-Wide Navigational Warning Service Sub Committee & WMO World-Wide Met-Ocean Information and Warning Service Committee

5.2   Description of the Maritime Service

The MSI Service describes the provision of navigational and meteorological warnings, meteorological forecasts and other urgent safety-related messages broadcast to ships. The MSI Service is the internationally and nationally coordinated network of broadcasts containing urgent information which is necessary for safe navigation, received in ships by equipment which automatically monitors the appropriate transmissions, displays information which is relevant to the ship and provides a print capability.

5.3   Purpose

The purpose of the MSI Service is to provide the mariner with information related to navigational and meteorological warnings, meteorological forecasts and other urgent safety-related messages.

The provision of MSI makes available to mariners, prior to and during voyages, information that improves their situational awareness and assists with safety of navigation.

The promulgation of MSI is defined in resolution A.705(17) and it is further defined by chapter IV to the International Convention for the Safety of Life at Sea, 1974 (SOLAS Convention), as amended, as part of the "The Global Maritime Distress and Safety System (GMDSS)".

SOLAS regulations V/4 through V/7 governs the contracting government's responsibilities with regards to providing MSI.

The Revised Joint IMO/IHO/WMO Manual on MSI, Publication S-53 (the Joint Manual on MSI) describes the provision of the service and the receiving methods in more detail.

The delivery methods have been described by the International SafetyNET Manual MSC.1/Circ. 1364.

The roles and responsibilities of a METAREA Coordinator are defined in resolution A.1051(27), and the provision of marine meteorological services is guided by WMO No.558 (Manual on Marine Meteorological Services) and WMO No.471 (Guide to Marine Meteorological Services).

Services that constitute the digital Maritime Services (MSPs) are currently provided in a fully electronic format and as such there is no requirement to transition from analogue to digital information provision. Additional analogue (voice) services do exist but there is no intent to transition these to digital services.

5.4   Operational approach

The MSI Service, as defined in resolution A.705(17), is "the internationally and nationally coordinated network of broadcasts containing information which is necessary for safe navigation,

received in ships by equipment which automatically monitors the appropriate transmissions, displays information which is relevant to the ship and provides a print capability. This concept is illustrated in figure below.
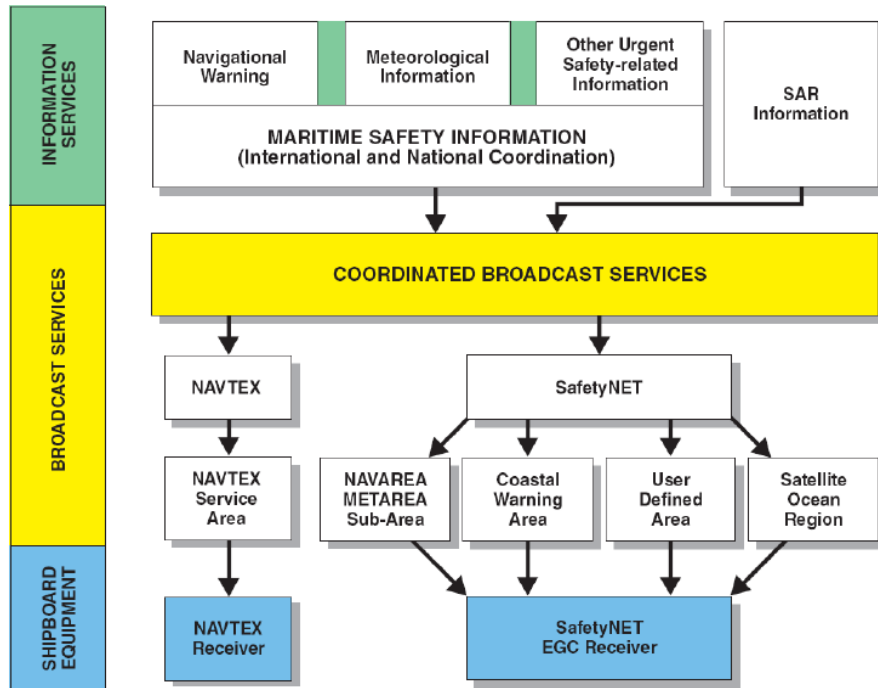

Figure 5-1 The maritime safety information service of the Global Maritime Distress and Safety System (Source: S-53)

Within GMDSS, Maritime Safety Information is promulgated to defined areas that are managed by area coordinators as illustrated in the figures below
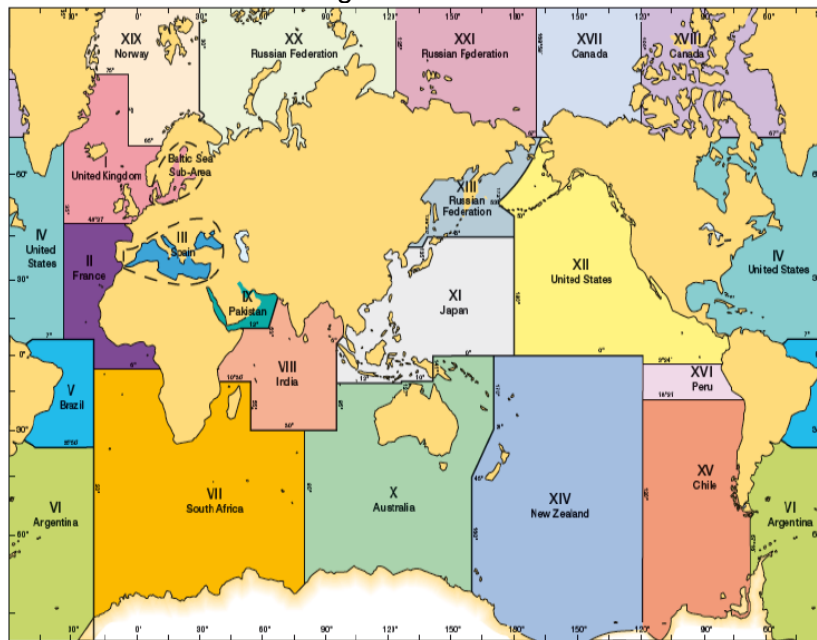

Figure 5-2 NAVAREAs for coordinating and promulgating navigational warnings under the World-Wide Navigational Warning Service (Source: S-53)

**Figure 5-3 METAREAs for coordinating and promulgating meteorological warnings and forecasts under the World-Wide Met-Ocean Information and Warnings Service
(Source: S-53)**

5.5   User needs

To meet the needs of GMDSS users, NAVAREA, METAREA and National MSI Coordinators promulgate MSI to their respective areas of responsibility via approved GMDSS methods as follows:

Typical MSI services and delivery:

Information	Area	Service Delivery
Navigation Warning	NAVAREA	EGC/HF NBDP
Navigation Warning	Coastal Warning Area	NAVTEX/EGC
Meteorological Warnings and Forecasts	METAREA	EGC/HF NBDP
Meteorological Warnings and Forecasts	Coastal Warning Area	NAVTEX/EGC

To meet the needs of non-GMDSS users, NAVAREA, METAREA and National MSI Coordinators may promulgate MSI to their respective areas of responsibility via other methods as follows:

Information	Area	Service Delivery
Navigation Warning	NAVAREA	HF Voice
Navigation Warning	Coastal Warning Area	VHF/ MF Voice
Meteorological Warnings and Forecasts	METAREA	HF Voice

Meteorological Warnings and Forecasts	Coastal Warning Area	VHF/ MF / HF Voice
Navigational Warning	NAVAREA and Coastal Warning Area	Web service
Meteorological Information	METAREA and Coastal Area	Web service

Potential Future Services/Delivery methods:

Navigation Warning	NAVAREA	VDES-SAT
	Coastal	VDES-TER AIS-SRM
Meteorological Warnings and Forecasts	NAVAREA	VDES-SAT
	Coastal	VDES-TER AIS-SRM (warnings) AIS-ASM (forecasts)?

5.6   Information to be provided

MSI Services, as listed in resolution A.706(17),as amended, for hazards to navigation, the Manual on Marine Meteorological Services, and in the Joint Manual on MSI for marine weather warnings and forecasts are listed below.

Information related to:	Examples[1]:
Hazards to Navigation	1. Casualties to lights, fog signals, buoys and other aids to navigation affecting main shipping lanes; 2. The presence of dangerous wrecks in or near main shipping lanes and, if relevant, their marking; 3. Establishment of major new aids to navigation or significant changes to existing ones, when such establishment or change might be misleading to shipping; 4. The presence of large unwieldy tows in congested waters; 5. Drifting hazards (including derelict ships, ice, mines, containers, other large items over 6 metres in length, etc.); 6. Areas where search and rescue (SAR) and anti-pollution operations are being carried out (for avoidance of such areas); 7. The presence of newly discovered rocks, shoals, reefs and wrecks likely to constitute a danger to shipping, and, if relevant, their marking; 8. Unexpected alteration or suspension of established routes; 9 Cable or pipe-laying activities, the towing of large submerged objects for research or exploration purposes, the employment of manned or unmanned submersibles, or other underwater operations constituting potential dangers in or near shipping lanes;

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[1]   Examples from resolution A.706(17) as revised Document Review Working Group 2018, and the Manual on Marine Meteorological Services.

Information related to:	Examples[1]:
	10. The establishment of research or scientific instruments in or near shipping lanes; 11. The establishment of offshore structures in or near shipping lanes; 12. Significant malfunctioning of radio navigation services and shore-based maritime safety information radio or satellite services; 13. information concerning events which might affect the safety of shipping, sometimes over wide areas, e.g. Naval exercises, missile firings, space missions, nuclear tests, ordnance dumping zones, etc. It is important that where the degree of hazard is known, this information is included in the relevant warning. Whenever possible such warnings should be originated not less than five days in advance of the scheduled event and reference may be made to relevant national publications in the warning; 14. Acts of piracy and armed robbery against ships; 15. Tsunamis and other natural phenomena, such as abnormal changes to sea level; 16. World Health Organization (WHO) health advisory information; and 17. Security-related requirements
Marine weather warnings and forecasts	**For high seas areas:** Forecasts shall include wind parameters, sea state and visibility, Warnings shall be provided for the following phenomena: • Wind warnings of gale force (Beaufort force 8) and above; • Ice accretion. **For coastal areas:** Forecasts shall include wind parameters, waves (sea and swell), and ice accretion where applicable. Warnings shall be given for the following phenomena: a) Winds of gale force (Beaufort 8) and above; b) Potentially hazardous ice accretion; c) Unusual and hazardous sea-ice conditions. Warnings should be given for the following phenomena: a) Near gales (Beaufort force 7); b) Severe thunderstorms/squall lines; c) Restricted visibility (one nautical mile or less); d) Storm-induced water-level changes; e) Tsunami

5.7   Associated technical services

Two principal methods are used for broadcasting MSI in accordance with the provisions of the SOLAS Convention, as amended, in the areas covered by these methods, as follows:

- • NAVTEX: broadcasts to coastal waters, or EGC where no NAVTEX services exist; and

- • Enhanced Group Call Services (EGC) (e.g. SafetyNET): broadcasts which cover all the waters of the globe except for Sea Area A4, as defined by resolution A.801(19), annex 3, as amended.

Additionally, HF NBDP may be used to promulgate MSI to Sea Area A4 (SOLAS regulation IV/7.1.5).

Ships are required to be capable of receiving MSI broadcasts for the area in which they operate in accordance with the provisions of the SOLAS Convention, as amended.

Method	ID (MRN)	Description	Architect(s)	Standardization body
EGC Services		Delivery of MSI via IMO Recognized Satellite Service		A1001.25
NAVTEX		Delivery of MSI via NAVTEX		ITU-R M.540
HF NBDP		Delivery of MSI via HF NBDP		ITU-R M.688 A.700(17),
Web platforms		Display of MSI and access to MSI data files	XML	
NAVDAT		Delivery of MSI via NAVDAT		ITU-R M.2010
AIS-T – ASM AIS-S – ASM AIS – VDES		Delivery of MSI via AIS: • Message 14 • Message 8 • Message 21 • Data via VDES		ITU 1371-5 SN. 1/Circ.289 IALA 124
Maritime Connectivity Platform	urn:mrn :mcl	Provision of MSI [to be described once developed]		IALA

S-100 format messaging will be used to pass MSI for display in ECDIS (Specifically S.124, S.411 & S.412 standards).

5.8   Relation to other Maritime Services

DMS5 has relationships with other services for the delivery of safety information:
Examples may be different depending on the coastal state arrangements.

DMS No	Identified Services	Identified Responsible Service Provider
1	VTS Information Service (INS)	VTS Authority
4	Local port Service (LPS)	Local Port/Harbour Authority
11	Nautical Chart Service	National Hydrographic Authority / Organization
13	Ice Service	National Competent Authority Organization
14	Meteorological information service	National Meteorological Authority Public Institutions
15	Real-time hydrographic and environmental information service	National Hydrographic and Meteorological Authorities
16	Search and Rescue Service	SAR Authorities
20	Anti-Piracy Information	TBC

MS 6 - Pilotage service

6.1   Submitting Organization

International Maritime Pilots Association

6.2   Description of digital Maritime Service

Ships proceeding or leaving a port or a specific area, should have easy access to information regarding the pilotage service provided. Information such as local regulations, contact, notices, means of boarding, boarding point, limitations or pilot booking procedure, could be accessible by electronic means, where available.
The information provided through this service is not piloting information as pilotage is a service physically performed onboard ships by duly qualified and certificated or licensed maritime pilots.

6.3   Purpose

This service is limited to information provided to ships regarding the pilotage service in a given geographic area. It does not address the act of piloting, which is provided by a pilot on the bridge of a ship. The purpose of MS6 is to provide information related to the pilotage service when planning an operation before the pilot boards the vessel, by using modern technology and common standards.

6.4   Operational approach

Pilot organizations providing pilotage service in an area could provide information to ships about the pilotage service in a digital and easy accessible way. The information could be, as an example, portrayed as a layer on the ECDIS or in a graphical display. This information could include, for inbound ships, the location of the pilot station(s) or boarding point(s) in latitude/longitude or distance and bearing from a location, or marked by an aid to navigation. In addition, the transmitted information could include the VHF channels to contact the pilot or pilot boat. Typically, the Pilotage Service information will not be provided by the pilot, but rather by the pilot organization, because the pilot must be engaged in the actual performance of his/her pilotage duties.

Examples of information can be:

Information related to:	Examples
General information	Examples of information: • Pilot requirements in the area • Local regulations • limitations • Requirements and procedures for ordering the pilot • Requirements and procedures for pilot boarding • Contact information to pilot station • Mandatory needs for tug assistance • Pilot boarding point

Operational information	Examples of information:
	• Contact to pilot boat, launch, helicopter
	• Position of pilot station, pilot boat
	• Required arrangements for pilot boarding
	• Boarding speed
	• Communication
	• Set up of ship's radar, ECDIS and other equipment as requested for the pilot's use.
	• Any other actions requested of the ship for the pilot's benefit

6.5   User needs

Ships are concerned by this service and need to know the pilot boarding position, the pilot request procedures, local and special regulations and the compulsory use of tugs.

6.6   Information to be provided

See in section 6.4

6.7   Associated technical services

Name	ID (MRN)	Description	Architect(s)	Standardisation body

6.8   Relation to other Maritime Services

MS 6 has relationships with other MSs where it affects the Pilot boarding operation and contribute to safe and efficient operations.

MS 11 - Nautical Chart Service

11.1   Submitting Organization

International Hydrographic Organization

11.2   Description of the Maritime Service

The purpose of Nautical Chart Services are to provide geospatial information (in digital and / or printed format) to support safe maritime navigation. The types of information depicted in nautical charts include the configuration of the shoreline and seafloor, water depths, locations of dangers to navigation, locations and characteristics of aids to navigation, anchorages, and other features relevant to maritime navigation. (SOLAS regulation V/2.2 *Nautical chart* or *nautical publication is a special-purpose map or book, or a specially compiled database from which such a map or book is derived, that is issued officially by or on the authority of a Government, authorized Hydrographic Office or other relevant government institution and is designed to meet the requirements of marine navigation*).

A Nautical Chart Service must include update functions to ensure that all navigational products and service are kept current. Update information must be delivered in a standardised format. Distribution networks should conform to standardised data authentication and distribution standards to ensure their safe and secure transmission and delivery.

11.3   Purpose

The primary purpose of the Nautical Chart Service is to provide information to be used for safe navigation. The information provided as part of a Nautical Chart Service must complement information provided as part of other services such as Nautical Publication Services and Real Time Hydrographic and Environmental Information Services. Nautical Chart Service should support functions such as; voyage planning, pilotage, collision avoidance, vessel traffic managements etc …

A Nautical Chart Service should include discovery metadata information that will enable users to determine what product and services are available within a given area of interest (both geographic and contextual).

11.4   Operational approach

The data model is based on the IHO S-100 Hydrographic Data Model and derived Product Specifications. It enables the information provision in a harmonised way. The products should take into account a harmonised display of navigational information. The portrayal of digital Nautical Chart Services should conform to IMO / IHO standards.

The provision of Nautical Chart Service should use distribution strategies, methods, and technologies which can adapt to serve vessels in locations or conditions that may be challenging for data transfer.

Digital chart distribution services should conform the S-100 authentication and encryption data standard. Mechanisms should also be included to accommodate new editions of the Chart Product Specification; including the issuing of new datasets, and associated feature and portrayal catalogues.

11.5   User needs

The primary users are mariners responsible for maritime navigation. Access to the information is required both onshore and at sea.

SOLAS regulation V/19, paragraph 2.1.4 describes the requirement for ships to carry '*nautical charts and nautical publications to plan and display the ship's route for the intended voyage and to plot and monitor positions throughout the voyage.'* Timely and simple access to uniform up-to-date nautical information for a particular sea area is essential for the conduct of safe voyages.

The Nautical Chart Service provide navigational information for safe navigation on open sea, for making landfall, and for navigation in confined waters.

11.6   Information to be provided

The appropriate resolutions and recommendations adopted by the International Hydrographic Organization provide the recommended set of information to be covered by the Nautical Chart Service.

Information related to:	Examples:
Geographical features	• Coastline • Inland topography • Bathymetry • Rivers
Transits and routeing	• Routes in constricted shipping lanes • Associated Vessel Traffic Service • Associated Ship Reporting System
Ports approaches and entry	• Hazards, directions, limiting conditions • Pilot service, outer anchorages • Navigational aids
Protected area information	• Locations of marine protected areas • Restrictions and regulations applicable within specific areas
Regulatory information	• Laws and regulations applicable in specific locations. • Laws and regulations applying to vessels of specific dimensions or carrying specified cargo • Local rules regarding use of specific pilot boarding places by vessels exceeding specified dimensions or carrying hazardous cargo
Navigation aids	• descriptions of Lights • descriptions of buoys
Planning	• Mariners' Routeing Guides
Controlled areas	• Vessel Traffic Service contact information

	• Ship Reporting System contact information • Exercise Area contact information
Metadata	• Update information • Projection / spheroid • Data bounding polygon

11.7   Associated technical services

Name	ID (MRN)	Description	Architect(s)	Standardization body
Nautical Publication Services	urn:mrn:iho			IHO (NIPWG)
Real-time hydrographic and environmental information services	urn:mrn:iho	Water level and surface current information		IHO (TWLWG)

The Service should include hard media and online delivery mechanisms. The delivery mechanism must make provision for data authentication and data encryption.

MS 12 - Nautical Publications Service

12.1   Submitting Organization

International Hydrographic Organization

12.2   Description of the Maritime Service

Nautical Publications Services deliver a set of nautical information available for a particular marine area. The aim of the Nautical Publications Service is to provide information as a support to the navigation process.   This comprises information to complement nautical charts, such as information on ports and sea areas as defined in paragraph 23 of MSC.1/Circ. 1595[2], as well as the contact information of authorities and services for a sea area or port. It further describes regulations, restrictions, recommendations and other nautical information applicable in these areas.

Nautical Publications Services include:

.1   the information traditionally provided within updated nautical publications such as sailing directions, lists of lights, notices to mariners, tide tables and all other nautical publications necessary for the intended voyage (SOLAS regulation V/27). The majority of the information can be delivered from shore to ship in a digital format. This will enhance the usability, increase the quality and update rate and give the navigator an opportunity to tailor made the information needed.

.2   a discovery service to allow users to determine what is available in their area of interest (geographic and context);

.3   an ordering service to allow users to order the information required from the service providers identified;

.4   a delivery service to allow the user to receive the information required.

12.3   Purpose

The purpose of the Nautical Publications Service is to electronically provide the mariner with information to complement ENCs/Nautical Charts for advance planning and to navigate a ship safely during the intended voyage.

The Nautical Publications Service provides information which is continuously updated and which is required for voyage planning and execution. It improves the situational awareness during the voyage.

SOLAS regulation V/2 allows the provision of nautical publication information in digital format as database and SOLAS regulation V/27 requires the carriage of nautical publications suitable for the intended voyage.   The combination of both is a digital provision of nautical information requested for navigation according to SOLAS chapter V.

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[2] E-navigation Strategy Implementation Plan – Update 1; 25 May 2018

The information covered in nautical publications is either provided as printed paper publications (NP1) or as digital publications based upon existing paper publications (NP2). The next evolutionary step is the provision of information in digital datasets based on internationally harmonised and appropriate data models (NP3). The datasets will be distributed by appropriate methods to electronic onboard equipment.

The anticipated steps in the transition to full digital delivery can be described only in general terms at this time:

> .1 Development of product specifications (including data models) for digital data products.
>
> .2 Conversion of appropriate parts of the content of existing NP1 and NP2 nautical publications to NP3 data products.
>
> .4 Integration of appropriate new sources of nautical publications information into the supply and production chain for NP3 data products.
>
> .5 Delivery infrastructure and methods – either the design and construction of new delivery infrastructure/methods, or the integration into existing or under-development delivery infrastructure/methods.
>
> .6 Application upgrades or new application development to make best use of the digital products.
>
> .7 Test-beds for the data products, delivery methods, and applications.

12.4 Operational approach

The data model is based on the IHO S-100 Hydrographic Data Model and derived Product Specifications. It enables the information provision in a harmonised way. The products are designed for a display based on Interim guidelines for the harmonized display of navigation information received via communication equipment (MSC.1/Circ.1593) and the data provision should take into account a harmonised display of navigational information. The used product specifications comprise rules for interoperation and harmonized graphical presentations of datasets that will be interacting one each other and with the ENC information when used by a navigation system such an ECDIS.

The provision of Nautical Publications Service should use distribution strategies, methods, and technologies which can adapt to serve vessels in locations or conditions that are highly challenging for information transfer.

The data provision follows the S-100 based data protection schema.

12.5 User needs

The primary users are mariners responsible for maritime navigation. Access to the information is required both onshore and at sea.

SOLAS regulation V/19, paragraph 2.1.4 describes the requirement for ships to carry '*nautical charts and nautical publications to plan and display the ship's route for the intended voyage and to plot and monitor positions throughout the voyage.'* Timely and simple access to uniform up-to-date nautical information for a particular sea area is essential for the conduct of safe voyages. The Nautical Publications Service provides navigational information for safe navigation on open sea, for making landfall, and for navigation in confined waters.

The Nautical Publications Service provides information on Maritime Services available and provides details to get access to responsible authorities and services provided by those authorities.

Secondary users such as Pilot Services, Defence, VTS Authorities or any individuals or organizations, onshore and at sea, require access to the information for reference.

12.6   Information to be provided

The appropriate resolutions and recommendations adopted by the International Hydrographic Organization provide the recommended set of information to be covered by the Nautical Publication Service.

Information related to:	Examples:
Transits and routeing	• Routes in constricted shipping lanes • Routeing measures, traffic separation schemes, and shipping lanes • Associated Vessel Traffic Service • The mandatory reporting of vessel traffic movements • Associated Ship Reporting System
Ports approaches and entry	• Hazards, directions, limiting conditions • Pilot service, outer anchorages • Traffic regulation, arrival procedure
Summary information about port facilities	• Function, port authority • Basins and berths • Depth alongside berths, and quay lengths • Cargo handling facilities at specified terminals and berths • Specific vessel parameters, such as length, draft, beam
Marine radio services	• Geographic availability of services • Frequencies and channels used and broadcast schedules • Purposes supported – Weather forecasts, MSI, telemedical assistance etc.
Protected area information	• Locations of marine protected areas • Restrictions and regulations applicable within specific areas
Prevailing natural conditions	• Seasonal hazardous conditions • Periodic (e.g., tide-related) or irregular hazardous conditions

Regulatory information	• Laws and regulations applicable in specific locations. • Laws and regulations applying to vessels of specific dimensions or carrying specified cargo • Local rules regarding use of specific pilot boarding places by vessels exceeding specified dimensions or carrying hazardous cargo
Port Services	• Waste disposal, collection of ship pollutants such as oily wastes • Repair, bunkering, • Availability of potable water • Issuing of Ship Sanitation Certificates • Pilot services contact information and notice times
Navigation aids	• descriptions of Lights • descriptions of buoys
Climatic Information, predictions	• Tide surge prediction tables and tidal stream atlases • Weather routeing, solar radiation and precipitation • Cold/hot durations and warnings • Air temperature, wind speed and direction • Cloudiness and barometric pressure • Ephemerides and nautical almanacs for celestial navigation
Planning	• Mariners' Routeing Guides
Controlled areas	• Vessel Traffic Service contact information • Ship Reporting System contact information • Exercise Area contact information
Chart catalogue	• Graphically display a chart catalogue[3]

The Nautical Publications Service provides up-to-date information pertaining to the area along the planned route.

Users should be enabled to report discrepancies between the real world and the information provided by the Nautical Publications Service with no or minimal human interference.

Corrections to Nautical Publications Service information should be provided as updates (either as updates of the whole dataset or as incremental updates) in a format which supports the automatic correction and the traceability of the corrections of the on-board datasets.

12.7 Associated technical services

Name	ID (MRN)	Description	Architect(s)	Standardization body
Nautical Chart Services	urn:mrn:iho			IHO (ENCWG)

The Service should be capable to work within multiple levels of bandwidth limitations. The Service should provide the data in various data packages according to the bandwidth capability.

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[3] To fulfil IEC61174 "in order to identify the date and origin of the ENC in use, the ECDIS shall include a graphical index of ENC data available, presented upon the mariner's request and providing access to the edition and date of each cell.",

12.8   Relation to other Maritime Services

Nautical Publications Service provides overviews of other Maritime Services. It summarises content information which is covered by other Maritime Services in more detail. Other Maritime Services may reuse information which is provided by Nautical Publications Service.

Maritime Service No.	Nautical Publications Services			
	provides overview	**summarizes information**	**supplements information**	**reuse of information**
1 VTS Information Service (INS))	• Area of responsibility	• Contact information	•	•
2 Navigational Assistance Service (NAS)	• Area of responsibility	• Contact information	•	•
3 Traffic Organization Service (TOS)	• Area of responsibility	• Contact information	•	•
4 Local Port Service (LPS)	• Area of responsibility	• Contact information	•	•
5 Maritime Safety Information Service (MSI)	• Area of responsibility	• Contact information	•	•
6 Pilotage service	• Area of responsibility	• Contact information	•	•
7 Tug service	• availability	• Contact information	•	•
8 Vessel Shore Reporting	• Area of responsibility	• Contact information	•	•
9 Telemedical Assistance Service (TMAS)	•	• Contact information	•	•
10 Maritime Assistance Service (MAS)	•	• Contact information	•	•
11 Nautical Chart Service	•	•	• charted information	•

13 Ice Navigation Service	•	• Climatic information	•	• radio services information
14 Meteorological Information Service	•	•	• Climatic information	•
15 Real-time hydrographic and environmental information Service	•	•	•	• radio services information
16 Search and Rescue Service	• Area responsibility of • Conduction of service	• Contact information	•	• Tide information and forecasts (for SAR planners)

Another way of providing the information above

Description	Examples of data that could be used by MS 12
MS 1 VTS IS	Area of the service, functions, contact information, communication, Local sensor information such as CCTV, Radar, AIS. Regulations. Other traffic. Information regarding regulations and special traffic
MS 2 VTS NAS	Recommended routes, directions, navigation advices
MS3 VTS TOS	Not relevant
MS 4 Local Port Service	Port security, facilitation and anchorage area, services related to the vessel, arrival procedure, contact information, communication
MS 5 Maritime Safety Information	Area of the service, contact information, communication, navigational warnings issued by the MSI service
MS 6 Pilotage Service	Applicability, Contact information for pilotage, Pilot assistance, Pilot request
MS 7 Tug Service	Availability, contact information, regulations
MS 8 Vessel Shore reporting	Applicability, information about the reporting formalities, local regulations, contact information
MS 9 Telemedical Assistance Service	Contact information
MS 10 MAS	Contact information
MS 11 Nautical Chart Service	Charted information, Notice to Mariners

MS 13 Ice Navigation Service	Ice routes, ice breaking assistance
MS 14 Meteorological Service	Local weather phenomena, climatic information, wave information
MS 15 Real Time Hydrographic and Environmental Information Service	Information about sensors in an area, radio services information
MS 16 Search and Rescue Service	Search and Rescue contact information, communication, SAR capacity, SAR areas of responsibility

MS 13 – Ice Navigation Service

13.1   Submitting Organization

World Meteorological Organization

13.2   Description of the Maritime Service

To provide ice navigation information to ships in and in the vicinity of possible ice infested regions.

13.3   Purpose

The World Meteorological Organization's Manual on Marine Meteorology (WMO No. 558) defines the procedures for marine meteorological information text bulletins involving ice-related components in High Seas areas, Coastal, Offshore and Local Waters, for decision making whether or not proceed with ice navigation.

SOLAS regulation V/5 outlines obligations for the provision of weather information suitable for shipping with forecasts including ice conditions and hazards.

The IMO Polar Code (MSC, MEPC) outlines the environmental information requirements for ships operating in polar waters. The IMO Polar Code reinforces operating guidelines for the hazard of Ice Accretion and Ice Waters (sea-ice conditions), and introduces new operating guidelines for hazards related to sea ice, icebergs, and Low Air Temperature, and defines the Polar Service Temperature for equipment performance.

The standards for the ice terminology and symbology, including sea ice, ice of land origin (icebergs) and lake ice are set by the WMO publication 259 "WMO Sea-Ice Nomenclature" (vol.I – Terminology, vol.III – International System of Sea-Ice Symbols) with JCOMM publications TR-080 "Electronic Chart Systems Ice Objects Catalogue" and TR-081 "S-411 Ice Information Product Specification" documenting coding and portrayal of ice conditions on Electronic Navigational Chart systems.

WMO publication 574 "Sea-Ice Information Services in the World" has comprehensive up-to-date information on National Ice Services. The resolution A.1051(27) outlines the functions of the Worldwide Met-Ocean Information and Warning Service. The Worldwide Met-Ocean Information and Warning Service (WWMIWS) provides met-ocean Maritime Safety Information (MSI) including sea-ice conditions and hazards to mariners.

13.4   Operational approach

Examples of Ice Navigation Services are listed in Table 1.

Table 1 – Ice Navigation Service

Information related to:	Examples:
Ice conditions (as an ice chart)	Near real-time and forecasts of: • Sea ice concentration • Sea ice stage of development (or thickness) • Form of sea ice • Ice dynamics (ridging, pressure, drift) • Location and orientation of leads, cracks • Icebergs location, concentration and drift • Limits of all known sea ice, iceberg risk and/or ice edge
Ice reports and bulletins	• Text summaries of ice conditions
Routeing aids	• Recommended routes • Ice pilotage • Icebreaker assistance
Navigation Planning	• Risk assessment • Application for navigation (from relevant bodies)

The most important features of sea ice which affect marine operations are:

.1   the amount of ice present, I.e. concentration usually measured as tenths of the sea surface covered by ice;

.2   ice thickness, referred to as stage of development which is related to ice age;

.3   form of ice, i.e. whether it is fast ice or drifting ice, floe size;

.4   ice dynamics including ridging, pressure, drift; and

.5   location and orientation of leads and cracks.

The position of icebergs at specified times are required with information about their estimated size, concentration or number within certain area; and speed and direction of movement.

13.4.1 Ice analysis and forecast

Some 20 nations around the world offer an ice information service. Services may provide analysis of ice conditions and numerical short-term ice forecasts in a form of ice charts once a day or less for a period of 24 to 144 hours. These are tactical forecasts and may provide advice on difficult ice conditions forming or dissipating, the general motion of the pack, opening and closing of leads, etc. They are strongly influenced by meteorological prediction and should always be used in concert with the weather forecast. Practically in all cases the ice charts are complemented by high and medium resolution satellite imagery – commonly optical and active microwave radar, with resolution and range dependant on the season, region, cloud conditions and type of support. Near coast operations may be complemented by shore-based ice radar imagery.

Other longer-range predictions – those covering periods from 7–10 days to 30 days and seasonal predictions – are based on numerical, climatological, analogue or statistical methods.

13.4.2 Vessel escort and ice breaking

Icebreaking and support services may be available to ships transiting ice-covered waters. Coast Guards or other national agencies may operate Ice Operations Centres. These Centres generally provide up-to-date ice information, suggest routes for ships to follow through or around ice, and co-ordinate icebreaker assistance to shipping. Ice Operations Centres are generally in contact with icebreakers at all times and monitor progress of shipping within their area of responsibility. Ice Operations Centres may also provide Recommended Ice Routing services, such as routing maps.

13.4.3 Ice navigation planning

Voyage in the ice-covered waters is commonly preceded by planning and acquisition of permission for ice navigation in contact with regulatory bodies and icebreaking services. Planning and application process is dependent on the assigned ice class, region and season of navigation and is done using the acting in the region of operation risk assessment or other regulatory criteria, including risk assessment for voyage planning especially in bergy water operations.

13.5   User needs

Activity based information requirements

Information related to	Examples
En-route or at sea	• Broad, area-based forecasts • Higher detail in complex waterways • Increased interest in synoptic features and movement • Longer forecast lead-time essential
Entering, transiting and exiting a port	• Point (small area) based forecasts, • High spatial and temporal detail • Real-time observations • Focus on short-term lead-times
At berth	• Forecasts of changes to ice conditions
Planning a trip	• Focus on short-term timeframes, as well as longer forecast lead-times • Forecasts and warnings • Specific details on timing of wind changes or hazardous weather leading to changes in ice conditions • Focus on forecast details for specific areas or routes
Vessel and equipment design	• Historical values of low air temperatures and water temperatures • Focus on ocean and sea routes

13.6 Formats

Ice information may be provided in a number of formats to meet user requirements. The following descriptions outline some of the benefits and constraints for each format:

- Map

    o   Map or ice chart (as it formally calls for ice parameters), displays highly detailed information across defined spatial domains, and if provided as a time sequence, a user can study the evolution of the weather, ice and ocean elements during specific time periods. Colours and hatching may be used to highlight hazards or important conditions to operations. Maps may be produced in a digital vector WMO SIGRID-3 or S-100 (S-411, S-412) formats, other WMO gridded formats, as an image, or provided as a web map service, for display by on-screen GIS or ENC software.

    o   Similar to a map, remotely sensed coastal ice radar, UAV and satellite high or medium resolution imagery displays highly detailed information on ice conditions. Annotations can be used to highlight particular ice features and recommended routes. Imagery may be provided with georeference (e.g. GeoTIFF, GeoJPEG, GeoJPEG2000) or without it, with animation for a sequence of images from the coastal ice radar and usually in compressed way to comply with restricted traffic bandwidths in high seas and latitudes, for further display by on-screen GIS or ENC software similar to ice charts.

- Text

    o   Text products provide short summaries and broader detail for a defined area and time period. These text products may be simpler to interpret for most users, and can be used for GMDSS satellite and marine radio broadcasts. Text products generally have a small file size for internet dissemination to mariners at sea.

- Voice

    o   Voice products may be transmitted as audio or by video accompanied by other formats.

- Table/Graphics

    o   Information displayed as a table is usually for a specific location, so a user will get the benefit of detailed information over a period of time for that location but may lose context of what is happening over nearby areas.

    o   Graphics that show temporal resolution.

- Grids

    o   Gridded information may be integrated into decision support systems and situational awareness tools, or interrogated to output customized information for the particular marine activity or operating risk threshold.
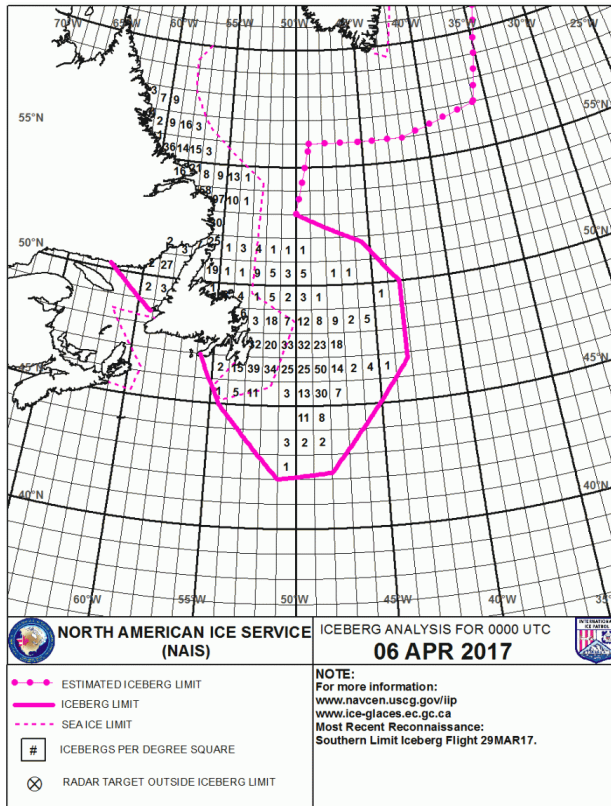
13.7   Examples

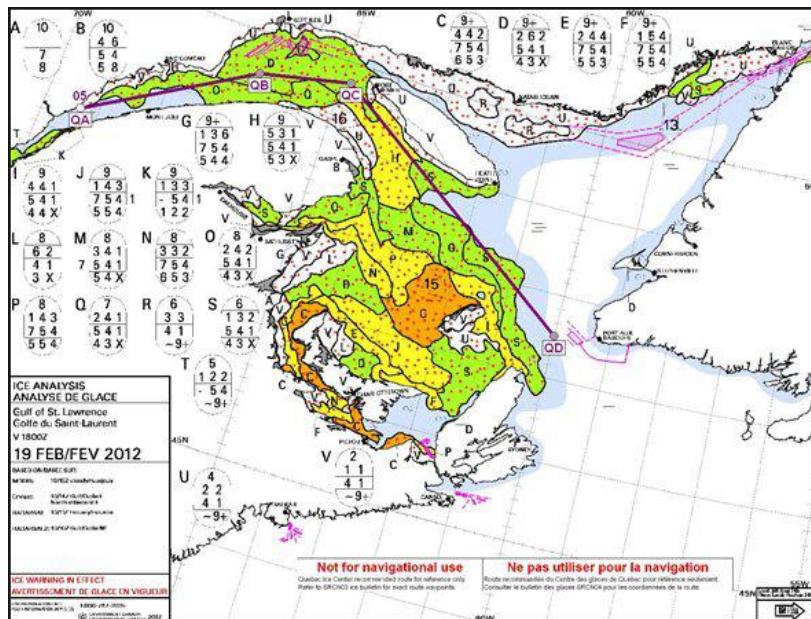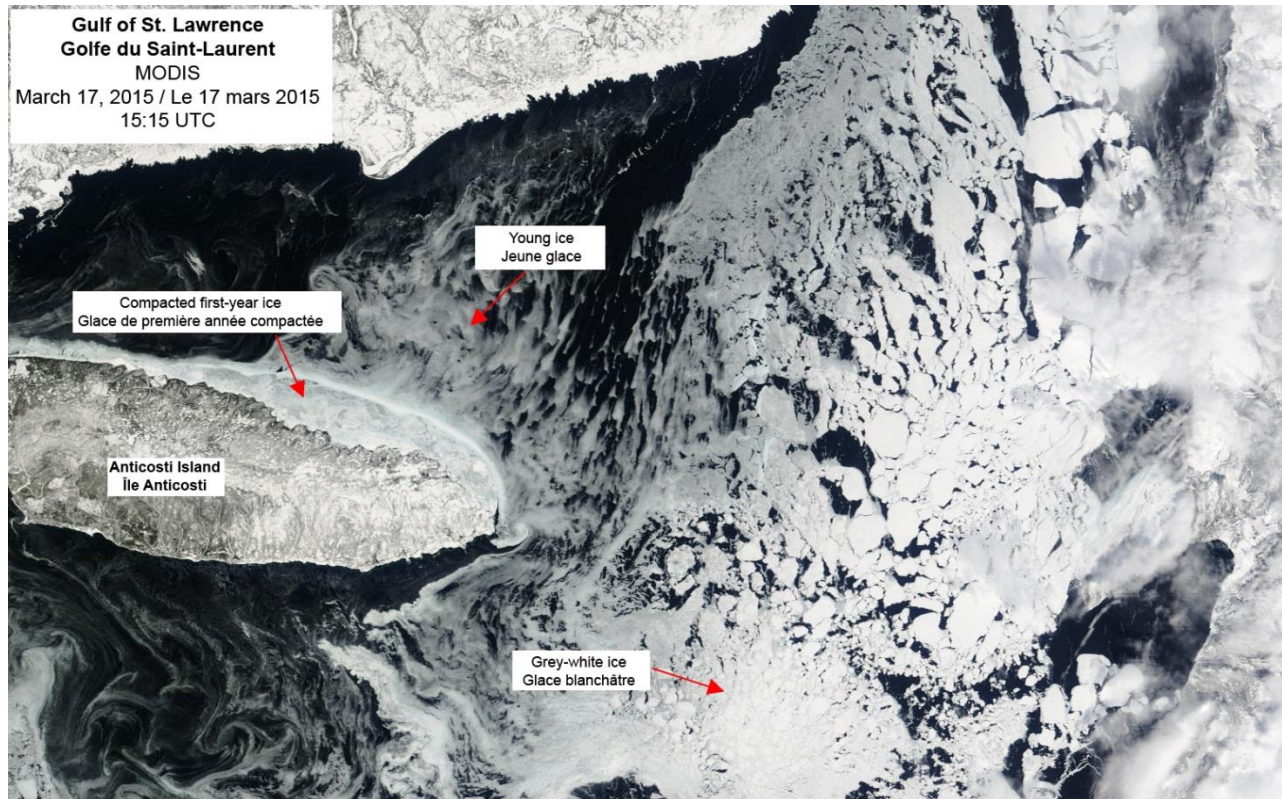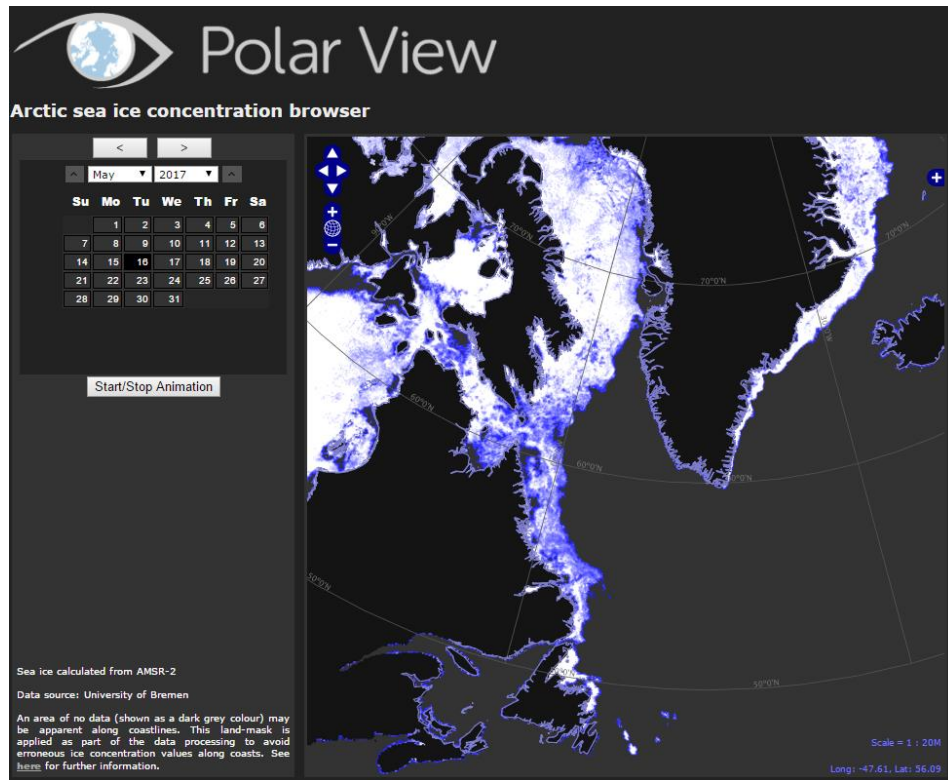

Figure 13-1: Example of iceberg analysis.

Figure 13-2: Example of a Recommended Ice Route in the Gulf of St. Lawrence (source "Ice Navigation in Canadian Waters" – Canadian Coast Guard)
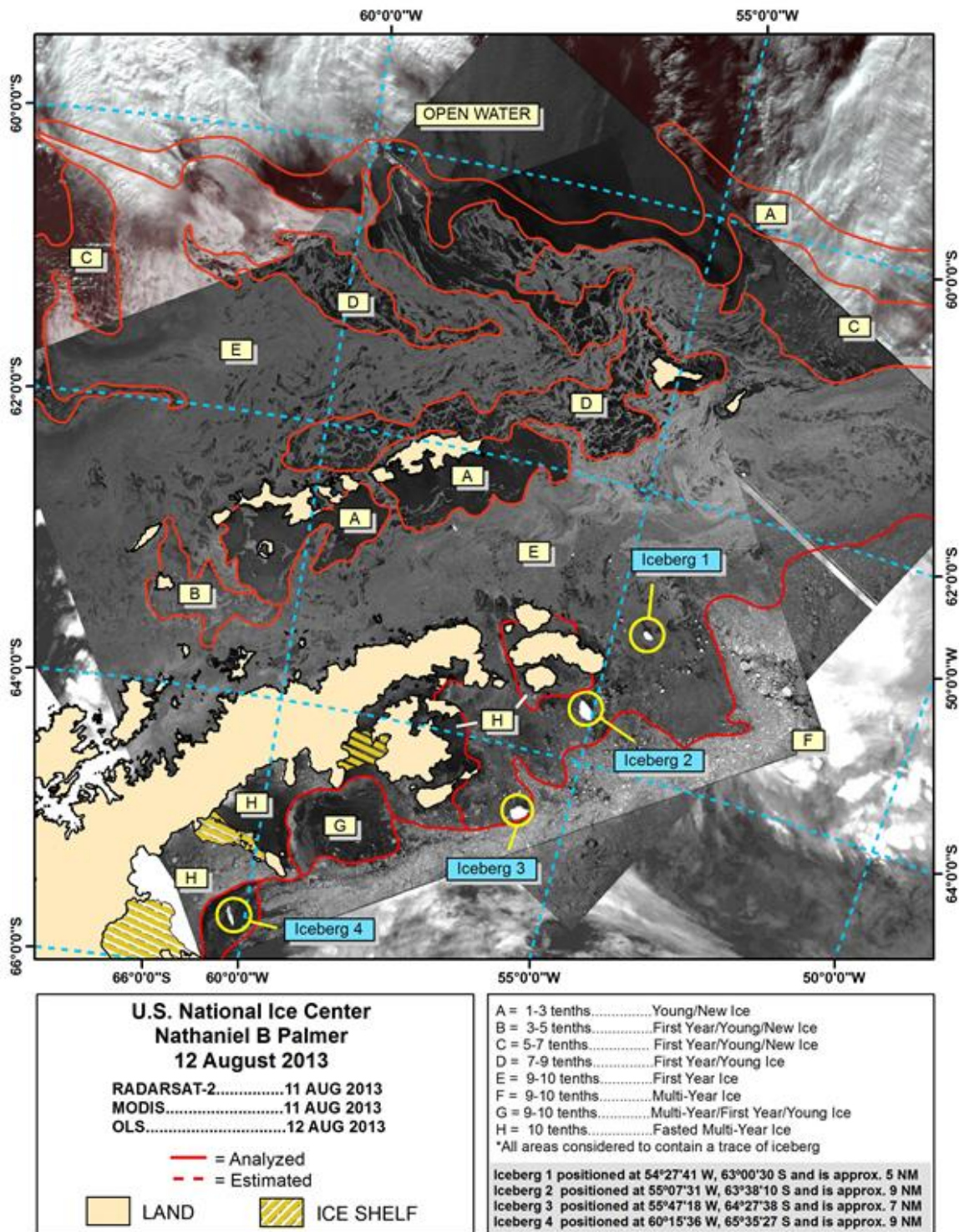
Figure 13.3: Example of a multi-source satellite annotated Imagery for the Antarctic peninsula area
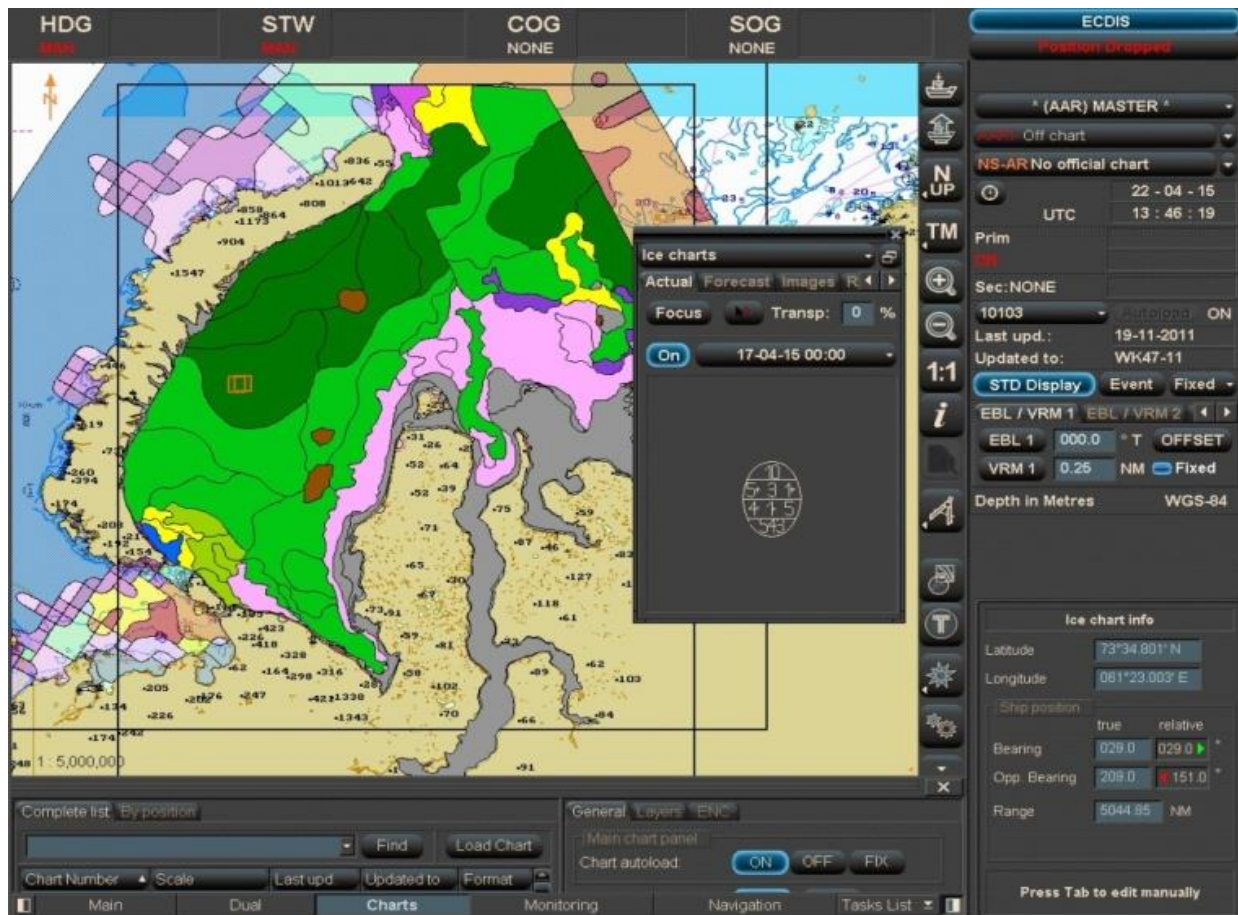
**Figure 13.4: Example of ice analysis and forecast ice chart for
the Kara Sea in a ENS system**

13.8   Information to be provided

See Appendix 13, MS 13 Ice Navigation Service

13.9   Associated technical services

Name	ID (MRN)	Description	Architect(s)	Standardisation Body
Ice Service		Service that provides sea ice and iceberg information to mariners and related support services.		JCOMM (WMO/IOC)

13.10 Relation to other Maritime Services

Description	Examples of data that could be used in MS 13
MS 5 Maritime Safety Information	Provides supplemental up-to-date information on the status of ice dangers.
MS 11 Nautical Chart Service	Provides supplemental navigational information
MS 12 Nautical Publication Service	Provides supplemental navigational information
MS 14 Meteorological Service	Provides supplemental navigational (meteorological) information
MS 15 Real-Time Hydro and Information Service	Provides supplemental navigational (hydrographic) information

MS 14 – Meteorological information service

14.1   Submitting Organization

World Meteorological Organization

14.2   Description of the Maritime Service

To provide meteorological information digitally to ships

14.3   Purpose

The World Meteorological Organization's *Manual on Marine Meteorology* (WMO No. 558) defines two types of marine meteorological information:

- Forecasts and warnings for the High Seas; and

- Forecasts and warnings for coastal, offshore and local areas (including ports and harbours).

SOLAS regulation V/5 obligates contracting parties to produce and distribute to shipping warnings about severe weather such as gales, storms and tropical cyclones, and to produce and provide other weather information suitable for shipping consisting of data, analyses, warnings and forecasts of weather, waves and ice.

Resolution A.1051(27) outlines the functions of the Worldwide Met-Ocean Information and Warning Service (WWMIWS). The WWMIWS provides meteorological Maritime Safety Information (MSI) to mariners in the form of marine forecast and warning products. The WWMIWS is coordinated across the worlds' oceans through 21 defined areas, called METAREAs. Ships receive the MSI products via marine communication systems such as SafetyNet and NAVTEX, which form part of the Global Maritime Distress and Safety System (GMDSS).

The IMO Polar Code (MSC, MEPC) outlines the environmental information requirements for ships operating in polar waters. The IMO Polar Code reinforces operating guidelines for the hazard of Ice Accretion and Ice Waters (sea-ice conditions), and introduces new operating guidelines for hazards related to Low Air Temperature, and defines the Polar Service Temperature for equipment performance.

Weather routing services are provided in accordance with SOLAS regulation V/34, resolution A.893(21) on *Guidelines for voyage planning* and MSC/Circ.1063 on *Minimum Standards for Provision of Weather Routing Services*, outlines the minimum characteristics for a service. SOLAS regulation V/5 states that met-ocean services shall be issued by the National Meteorological Service, and this would imply that WMO and its Members should oversee weather routing services and standards as well.

The standards for the portrayal of met-ocean conditions on Electronic Navigational Chart systems are documented within S-412.

Details of service availability, broadcast times and radio frequencies for services provided to vessels at sea are maintained in the WMO publication: *WMO No. 9, Volume D, Information for Shipping.*

Examples of Meteorological Information Service is listed in Table 1.

Table 1 – Meteorological Information Service

Information related to:	Examples:
Wind	● Wind speed, direction, gust information ● Real-time values from instruments or satellite
Waves	● Forecast wave height, direction, period ● Real-time values from buoys or satellite
Atmospheric conditions	● Forecast temperature, squalls, cloud, rainfall ● Real-time values from instruments or satellite
Ocean	● Forecast surface temperature, currents, salinity ● Forecast sub-surface temperature and currents ● Real-time values from instruments and satellite
Weather systems	● Mean Sea Level Pressure contours ● System features such as cold fronts, tropical cyclones, low pressure centres, high pressure centres ● Satellite images
Dangerous weather	● Warnings about location, strength, and movement of storms ● Warnings about fog or phenomena causing reduced visibility, ice accretion, cold air temperature, squalls
Bulletins and forecasts	● Surface weather analysis, synoptic features with barometric pressure ● Forecasts of wind, waves, weather
Polar Service Temperature	● Historical values for ocean and port areas
Low Air Temperature	● Forecasts of hazard areas ● Historical values for ocean and port areas
Ship observations	● Receipt of reports from ships in the Voluntary Observation System ● Transmission of information extracted from received ship reports to shipping

MS14 can be delivered in all sea areas (1-6).

14.4   Operational approach

In general, marine meteorological services have two functions:

.1   to serve international shipping, fishing and other marine activities on the high seas; and

.2   to serve the various activities which take place in coastal and offshore areas, ports and on the coast.

The SOLAS Convention (regulation V/34, and within Annex A.24 Voyage Planning) describes how vessels should prepare for their trip and route and therefore their information requirements. The Annex specifically outlines to small vessels the importance of:

- checking the weather forecast for the journey;

- knowing the tides;

- knowing the vessel limitations for the expected weather and wave conditions.

SOLAS regulation V/5 describes the underlying obligations for weather services, i.e., conveying warnings about severe weather and other weather information useful for shipping, and facilitating weather reports by ships and their distribution as needed for the safety of navigation.

In general, the impact which could result from a meteorological condition depends on its severity and on the sensitivity of a particular activity or operation to that condition. Similarly, meteorological phenomena can make recreational activities and the work of fishing and shipping fleets much more difficult or hazardous.

Marine operations are sensitive to environmental conditions. Generally, extreme values of waves, wind and obstructions to visibility increase the risk to the safety of the vessel or sea structure and to the persons involved in the operation. Less extreme values, even if safety is not threatened, will affect the efficiency, effectiveness or comfort of the operation. The usefulness of a warning or a forecast depends on the accuracy of the prediction, the format and communication platform through which the information is delivered, its timeliness, i.e. the number of hours or days in advance of the event that the forecast can be provided, and the ability of the user to react to the information.

Warnings of ice accretion highlight areas where the accumulation of ice on the superstructure and deck equipment of vessels may potentially (effect depends on true wind and waves angles, tonnage, hull shape) affect safety and operational efficiency.

Information about extremely low air temperatures is important for the safety of workers, while historical information about cold air temperatures enables planning and ship design based on the Polar Service Temperature guidelines.

14.5   User needs

14.5.1 Activity based information requirements

Information related to	Examples
En-route or at sea	- Broad, area-based forecasts - Higher detail in complex waterways - Increased interest in synoptic features and movement - Longer forecast lead-time essential
Entering, transiting and exiting a port	- Point (small area) based forecasts, - High spatial and temporal detail - Real-time observations

	• Warnings of reduced visibility, squalls
	• Focus on short-term lead-times
At berth	• Warnings of squalls, thunderstorms
	• Forecasts of general weather conditions
Planning a trip	• Focus on short-term timeframes, as well as longer forecast lead-times
	• Increased interest in synoptic features and movement
	• Forecasts and warnings
	• Specific details on timing of wind changes or hazardous weather
	• Focus on forecast details for specific areas or routes
Vessel and equipment design	• Historical values of low air temperatures and water temperatures
	• Focus on ocean and sea routes

14.5.2 Formats

Weather information may be provided in a number of formats to meet user requirements. The following descriptions outline some of the benefits and constraints for each format:

- Map

  - Map displays provide highly detailed information across defined spatial domains, and if provided as a time sequence, a user can study the evolution of the weather and ocean elements during specific time periods. Maps may be produced in an image format, or provided as a web map service, gridded or S-100 compatible file for display by on-screen software.

- Text

  - Text products provide short summaries and broader detail for a defined area and time period. These text products may be simpler to interpret for most users, and can be used for marine radio broadcasts. Text products generally have a small file size for internet dissemination to mariners at sea.

- Voice

  - Voice products may be transmitted as audio or by video accompanied by other formats. There may be time limits imposed for radio broadcasts, and consideration should also be given to the reception quality on board vessels and impact on a mariner's ability to interpret the information whilst doing other duties if the broadcast is too long. These constraints have an impact on the information provided in the text product that it is based on.

- Table

  - Information displayed as a table is usually for a specific location, so a user will get the benefit of detailed information over a period of time for that location but may lose context of what is happening over nearby areas.

● Grids

    o   Gridded information may be integrated into decision support systems and situational awareness tools, or interrogated to output customized information for the particular marine activity or operating risk threshold.

14.5.3 Examples

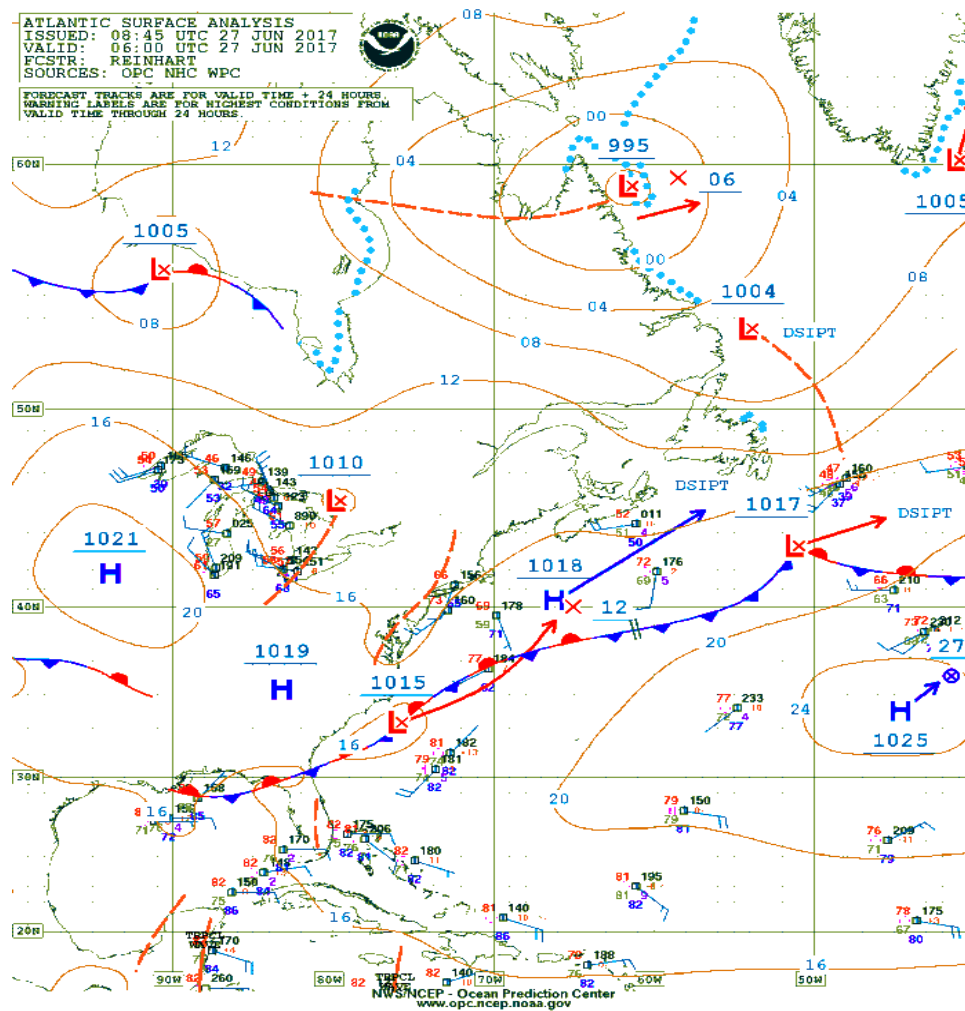Examples of products include surface analysis, wind and wave forecasts and analyses.

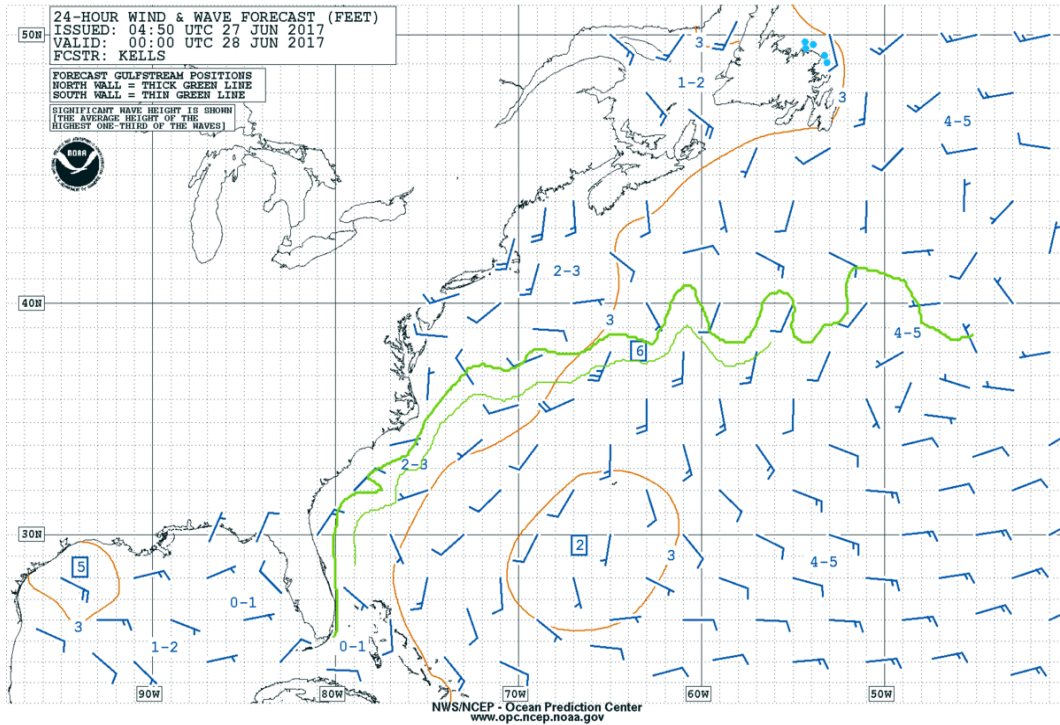**Figure 4.14-1: Surface analysis, West Atlantic. (NOAA)**

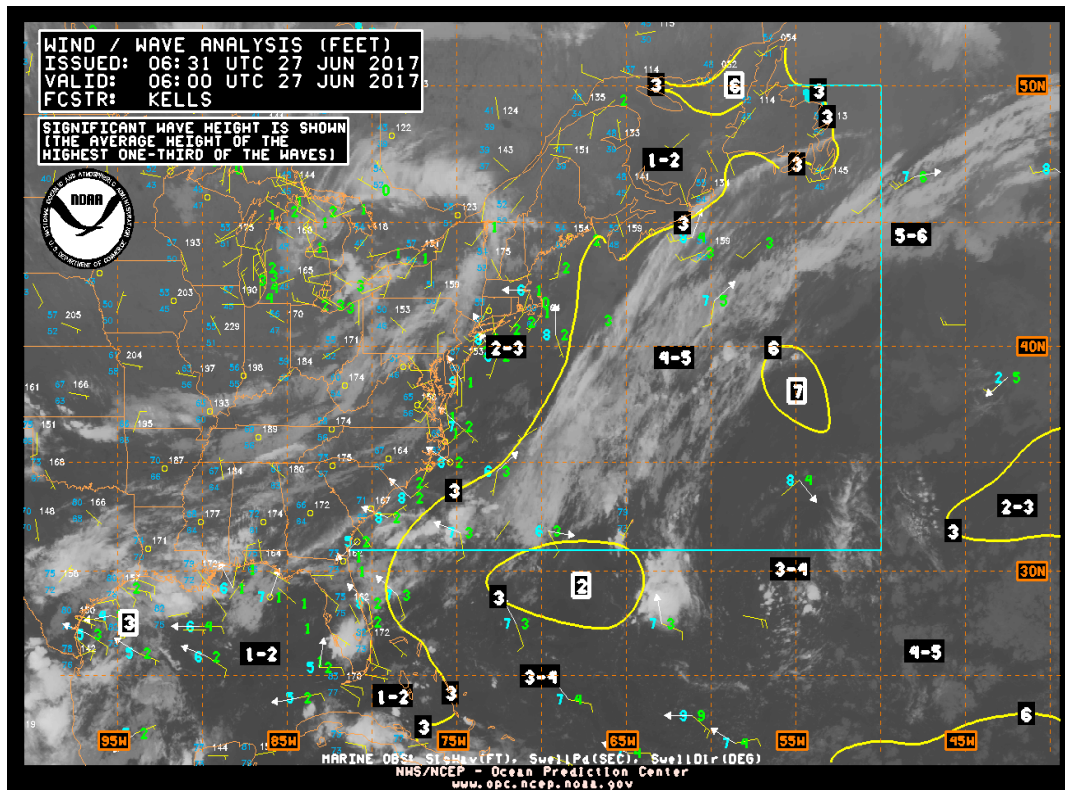**Figure 4.14-2: Wind and wave forecast. (NOAA)**

Figure 4.14-3: Wind and wave analysis (NOAA)

14.6   Information to be provided

See Annex 14, MS 14 Meteorological information service

14.7   Associated technical services

Name	ID (MRN)	Description	Architect(s)	Standardisation Body

14.8   Relation to other digital Maritime Services

Description	Examples of data that could be used in MS 14
MS 5 Maritime Safety Information	Provides supplemental up-to-date information on the status of extreme weather.
MS 11 Nautical Chart Service	Provides supplemental navigational information
MS 12 Nautical Publication Service	Provides supplemental navigational information
MS 13 Ice Navigation Service	Provides supplemental navigational information
MS 15 Real Time Hydro and Information Service	Provides supplemental navigational information

MS 15 - Real-time hydrographic and environmental information services

15.1 Water Level information for navigation (S-104)

15.1.1   Submitting Organization

International Hydrographic Organization.

15.1.2 Description of the Maritime Service

Oceanic and Inland water level information is essential for determination of under keel clearance required safe navigation. Real-time water level information is important for applications such as route planning port entry and the determination of tidal prediction. Water level information consists of:

.1   observed and/or forecasted time series at one or more fixed stations;

.2   forecasted gridded forecasts of water level for one or more regions and/or

.3   a gridded hydroid surface.

15.1.3 Purpose

The development of electronic navigation systems that use high resolution bathymetric data, are demanding the provision of real-time water level data. The IHO water level specification provides a standardised mechanism to digitise and transfer water level data.

15.1.4 Operational approach

Water level data are usually provided by Hydrographic Organizations, or on their behalf by an approved authority. Datasets are based on an internationally harmonised model and data encoding specification. Water level datasets will be provided via online internet services or distributed by appropriate distribution networks used for other navigational products and services.

15.1.5 User needs

Tidal and/or tidal water information, is intended for activities such as situational awareness, hazard avoidance, works on renewable marine energy and route planning. A knowledge of water levels and under keel clearance water along a planned route, and for some time in the future, can help planners select the most efficient time and safest route for transit.

15.1.6 Information to be provided

Digital water level metadata and catalogue information is encoded using the eXtensible Markup Language (XML). The HDF5 format is used for water level surface coverage data.

15.1.7 Associated technical services

The following technical services are associated with this Maritime Service.

Name	ID (MRN)	Description	Architect(s)	Standardization body
Nautical Publication Services	urn:mrn:iho	Maritime descriptive information		IHO (NIPWG)
Nautical Chart Service	urn:mrn:iho	Maritime geospatial data		IHO (S-100WG)

15.1.8 Relation to other Maritime Services

This product may conflict with simplified information on water levels that are included with many nautical charts. The data from this product should have "display priority" over older simplified water level information. This template should have a relationship with the Nautical Publication Services (Maritime Service No. 12), with under keel clearance water (NIPWG) and S-100 working on a harmonised hydrographic data model.

Name	ID (MRN)	Description	Architect(s)	Standardization body
under keel clearance water	urn:mrn:iho	Nautical Information Provision		IHO, NIPWG
Nautical Publication Services	urn:mrn:iho	Maritime Service Number 12		HSSC
Data Quality	urn:mrn:iho			IHO,DQWG
ENC Standards	urn:mrn:iho			IHO, ENCWG
Interoperability Specification for Navigation Systems	urn:mrn:iho:s99	Maintain, develop and extend Operational Procedures for the Organization and Management of the S-100 Geospatial Information	S-99	IHO, HSSC, S-IHO, S-100WG
Geospatial Information Registry	urn:mrn:iho	Supervise the management and development of the S-100 Geospatial Information Registry		IHO, S-100WG
S-100 Universal hydrographic Data model	urn:mrn:iho	Monitor the development of other relevant international standards		IHO, S-100WG

Maintenance of S-100-based product specifications	urn:mrn:iho	Advise and support the development and maintenance of S-100-based product specifications in liaison with the relevant IHO bodies and non-IHO entities		IHO, S-100WG
Bathymetry information	urn:mrn:iho			IHO

15.2   Surface water currents for navigation

15.2.1 Submitting Organization

International Hydrographic Organization

15.2.2 Description of the Maritime Service

This product provides digital information on surface current speed and direction to land-based and ship-board ECDIS. The information consists of:

.1   time series at one or more fixed stations;

.2   gridded forecasts of surface currents for one or more regions; and/or

.3   time series at a moving (i.e., drifting) station.

Surface current information is portrayed as colour-codes vector lines, with additional information available via mouse pick command.

15.2.3 Purpose

This Marine service includes:

- surface current vector and tidal information, intended for situational awareness;

- hazard avoidance;

- works on renewable marine energy; and

- route planning.

The implementation of this service should result in improved safety and cost reductions due to time and fuel efficiencies. The associated product specification implemented update mechanism to ensure that the latest data is available to the mariner and other users.

Additional education and/or information will be necessary to distinguish the digital product, which will often include the influence of winds, from existing paper/image currents products that represent only the tidal currents

This marine service includes:

- The information traditionally provided within nautical publications such as tide and surface current information necessary for the route planning (link with SOLAS).

- Surface current vector and tidal information, intended for situational awareness, hazard avoidance, works on renewable marine energy and route planning. Information derived from observations and/or from numerical model.

- service to allow users to determine what is available in their area of interest (geographic and context);

- An ordering service to allow users to order the information required from the service providers identified;

- A delivery service to allow the user to receive the information required

Service provides information on current and tide in complement to ENCs/nautical charts.

15.2.4 Operational approach

Data are created by Hydrographic Organizations and are disseminated via internet or other available channels.

One evolution of the marine service is the provision of datasets information based on an internationally harmonised and appropriate model. The datasets will be distributed by appropriate methods for use by on-board navigation equipment.

15.2.5 User needs

Surface current vector information and water level are intended for situational awareness, hazard avoidance (storm surge forecast, analysis, marine submersion), and route planning. Upon entering a harbour or other confined body of water, knowledge of currents is essential to pilots to avoid hazards. Knowledge of currents and under keel clearance water along a planned route, and for some time in the future, can help planners to select the most efficient time and route for transit.

15.2.6 Information to be provided

Data is contained in XML files that consist of metadata and HDF5 data files containing arrays of speed and direction information, tidal amplitude, tidal water level and water level. This Information and all other necessary information are provided in various IHO Standards (ex: S-111, S-104 IHO recommendations).

15.2.7 Associated technical services
Using the table below list existing or potential technical services associated with this Maritime Service.

Name	ID (MRN)	Description	Architect(s)	Standardization body
Nautical Chart Services	urn:mrn:iho			IHO (ENCWG)
Nautical Publication Services	urn:mrn:iho			IHO (ENCWG)
Real-time hydrographic and environmental information services	urn:mrn:iho	(Water Level information for navigation)		IHO (TWCWG)

15.2.8 Relation to other Maritime Services

This product may conflict with simplified information on tidal currents, chart datum, tidal water level, that are included in nautical charts. The data from the new product must have display priority over the older simplified information.

Maritime Service No.	Real-time hydrographic and environmental information Service			
	provides overview	summarizes information	supplements information	reuse of information
1 VTS Information Service (INS))	•	•	•	•
2 Navigational Assistance Service (NAS)	•	•	•	•
3 Traffic Organization Service (TOS)	•	•	•	•
4 Local Port Service (LPS)	•	•	• Tidal information • Under Keel Clearance information	•
5 Maritime Safety Information Service (MSI)	•	•	• Tidal information • Under Keel Clearance information	•
6 Pilotage service	•	•	•	•
7 Tug service	•	•	•	•

8 Vessel Shore Reporting	•	•	•	•
9 Telemedical Assistance Service (TMAS)	•	•	•	•
10 Maritime Assistance Service (MAS)	•	•	• Tidal information • Under Keel Clearance information	•
11 Nautical Chart Service	•	•	• Charted tidal information	•
12 Nautical Publication Service	•	•	• Tidal information • Under Keel Clearance information	•
13 Ice Navigation Service	•	•	•	•
14 Meteorological Information Service	•	•	• Tidal information	•
16 Search and Rescue Service	•	•	•	•

Another way of providing the information above

Description	Examples of data that could be used by MS 15
MS 1 VTS IS	
MS 2 VTS NAS	
MS3 VTS TOS	
MS 4 Local Port Service	
MS 5 Maritime Safety Information	
MS 6 Pilotage Service	
MS 7 Tug Service	
MS 8 Vessel Shore reporting	
MS 9 Telemedical Assistance Service	
MS 10 MAS	
MS 11 Nautical Chart Service	
MS 12 Nautical Publication Service	
MS 13 Ice Navigation Service	
MS 14 Meteorological Service	
MS 16 Search and Rescue Service	

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