

Paper for Consideration by TSMAD

New Work Item Proposal for the Establishment of a Standard auxiliary layer product specification (S.10y) for Navigationally significant Surface Currents

Submitted by:	Canadian Hydrographic Service
Executive Summary:	Development of a New Work Item for an IHO standard in the suite of S.100 standards (S.10y) for the creation of a Surface Current layer Product Specification that address navigationally significant currents within in the top 0 to 10 meters of the water column.
Related Documents:	S.100, S.101, S.102,
Related Projects:	S.100, S.101, S.102

Introduction / Background

An Understanding of surface currents is an important factor in the safety of navigation as currents affect the motion of vessels, Surface current information (analogue and digital) is now used for more efficient and safe navigation (fuel economy, ice movement predictions, etc). This proposed New Work Item provides a standardized solution that can integrated into ECS/ECDIS navigation. This information may be considered auxiliary information that complements the ENC. This proposal is for an S-100 compliant product specification for Surface Currents for Navigation data which may be used alone or as an auxiliary layer of data with an S.101 ENC or other S-100 compatible data including S.102 Bathymetric Surface data. This product specification serves as one of a plurality of additional layers that may be integrated with other S-100 products for use with ENC as supplementary aids to navigation. It specifies a vector field coverage including orientation and intensity at each grid point vertex in a quadrilateral grid coverage structure as defined in S-100 Part 8.

Surface currents are represented as a gridded coverage. A value representing the orientation and intensity (direction and speed of the current) at each vertex point in a grid coverage is used to describe the current coverage function. An example is illustrated in Figure 1.



Figure 1 - An Example of a Gridded Coverage of Surface Currents in the St. Lawrence River (High Tide - Reverse Flow)

Each grid may be standalone or be a tile within a larger set of data. The metadata defining the tiling scheme will be inherited through the S100_IGCollection. Optionally, an uncertainty coverage may also be included which describes the uncertainty of each grid vertex value. The uncertainty may be bivariate, including a value of uncertainty for both orientation and direction. The surface may be certified by using a digital signature. This product specification includes a content model and separate encodings.

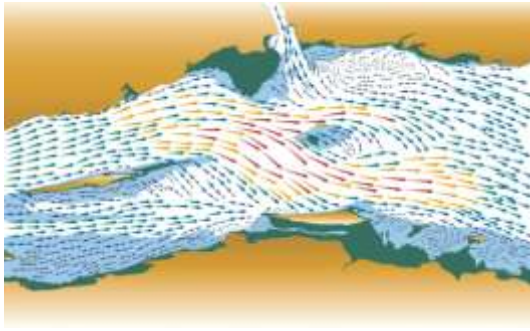


Figure 2 - Example of volumetric currents represented as a layer of point set coverage data.

Figure 2 presents an example of point set coverage data for volumetric current representation with a vector of direction (in x,y,z) and magnitude at each point for a given time forming a multidimensional coverage function.

Volumetric currents are distinct from surface currents and have application on Oceanography. They are illustrated here to show the difference with the proposed Surface Current coverage. If addressed, volumetric currents would be a separate product specification. Volumetric current information is complementary to surface current information, but is not directly an aid to navigation.

The coverage structure is built upon S.100 Part 8 Section 8.7 which describes the general structure of auxiliary data layers of coverage data compliant with S.100. The data structure is defined in a manner independent of the encoding so that multiple encodings may be used for the same data. This is the same approach as was used in the definition of the S.102 product specification for Bathymetric Data. The Surface Current for Navigation product specification is a template application schema. A profile can be developed that further refines the application schema. For example, the choice of whether to use a tiling scheme and which tiling scheme to use is left open. The tiling scheme, extent, resolution of the grid coverage of points at which current values are provided, the availability of the optional associated uncertainty coverage and the optional Digital Certification Block are left to the national hydrographic office defining the profile or data producer to specify. Software that claims conformance to this template application schema should be able to interpret and process all of the optional elements.

A product specification, in the suite of S.100 standards (e.g. S.10y) is required to address Surface Currents as an aid to navigation.

Analysis/Discussion (as per HSSC requirements)

The following issues are addressed:

Is the subject addressed by the paper within the scope of IHO objectives?

The description of surface currents as an aid to navigation is within the scope of the IHO's objectives. The purpose of separating S.100 and S.101 was to permit addressing different product specifications, and the support for different data types is explicitly addressed in S.100.

Is the subject of the paper within the scope of an item of the current IHO work programme?

The scope of S.100 includes addressing multiple information types. One auxiliary product specification has been defined to date, which is S.102 for bathymetric coverage information. This proposal is for an additional coverage for what is considered the next most important auxiliary aid to navigation - surface currents.

Do adequate industry standards exist?

The ISO TC / 211 suite of geographic information standards provide a strong basis for the creation of a S.10y standard. It provides the description of coverage geometry and data structure elements. The work on Web Mapping in the Open Geospatial Consortium (OGC) addresses the co-presentation of data in a web service. Web services may make use of surface current information encoded in a manner supported by the OGC / ISO WMS / WFS / WCS services.

Do the benefits justify the proposed action?

The addition of Surface Currents for Navigation coverage information to the suite of available aids to navigation will benefit overall navigation decision-making including route planning and pilotage. The provision of auxiliary current information may give greater safety assurances under conditions of close navigation.

Hydrographic Offices will be advantaged by an S.10y standard for surface currents that will permit the provision of this additional information as an aid to navigation. Provision of an IHO standard product specification will ensure that systems in different jurisdictions interoperate so that ships that operate in multiple jurisdictions can make use of the auxiliary aids to navigation provided in that jurisdiction.

Are there any potential cost impacts on the maritime industry, Member States or other involved parties?

The proposed standard will provide a mechanism for Surface Current information to be described. There is no intent to make the support of Surface Current information mandatory for navigation systems, nor the production of such data mandatory for hydrographic offices, and as such there should be no negative cost impact on the maritime industry or Member States. There is expected to be a cost benefit if organizations decide to take advantage of this product specification.

Conclusions

The creation and adoption of a product specification for Surface Currents is a logical extension of the underlying purpose of S.100 and its development is work appropriate and suitable to TSMAD.

Recommendations

The TSMAD should request the HSSC to approve a New Work Item on an S.10y standard as outlined in this paper, as part of the scope of work of TSMAD.

Justification and Impacts

The benefits which would accrue from any proposed action;

The establishment of a NWI for a product specification for Surface Currents for Navigation as an Aid to Navigation will allow the potential of S.100 to be utilized.

Identifying any resource implications resulting from the recommendations, such as the number of working group sessions, expertise, need for expert consultants, funding, et cetera;

A Project Leader and a Project Team is required with at least three persons operating for one year to take the input from Member States to develop the standard. Given approval in principle of this project by TSMAD, Canada will seek resources to lead a project team on this topic under TSMAD.

Identifying which HSSC working group(s) are essential to completing any proposed new work items;

The NWI should be addressed under TSMAD. Liaison is required with the NATO GMWG and ISO TC / 211 WG 6 Imagery. The TSMAD S.100 and S.102 projects are essential to completing the proposed work.

The date when any proposed new work item is expected to be completed;

The project should be targeted for completion 2014.

The proposed priority (high, medium, low);

The priority should be MEDIUM.

Any related activities that may impact on a proposed work item or decision.

Work on this project is dependent on the progress of the work on S.100, S.101 and S.102..

Action Required of TSMAD

The TSMAD is invited to:

Prepare a submission to the HSSC, based on this paper for the HSSC to **Approve** the establishment of a New Work Item for a Product Specification for Surface Currents as an aid to navigation, as part of the scope of work of TSMAD.