

Information Paper
Recent Events in Satellite-derived Bathymetry and Hydrographic Remote Sensing

<i>Submitted by:</i>	Canada, France, Germany, United States of America
<i>Executive Summary:</i>	This paper highlights recent events relating to hydrographic remote sensing and satellite-derived bathymetry.

Introduction

1. The utility of air- and space-borne remote sensing to hydrography continues to grow with developments in technologies and methodologies.
2. Research and experience have moved these developments more into the day-to-day operations of hydrographic offices in the areas of satellite-derived bathymetry, shoal detection, coast line delineation, feature change detection, other applications.
3. Public accessibility to satellite imagery is increasing and this creates pressure on the custodians of traditional navigation products.
4. Member states, academia, and industry are investing in hydrographic remote sensing (HRS).
5. For the information of IHO Council members, this paper would like to bring to their attention two recent events of interest related to this field.

Discussion

6. The Satellite-Derived Bathymetry (SDB) Technology and User Forum was held 6-7 June 2018 at Herrshing, Germany and was hosted by EOMAP GmbH. Participants represented academia, industry, and other government and non-government bodies. Further conference materials may be found at:

<https://sdbday.org/conference-materials/>

7. The International Hydrographic Remote Sensing Workshop was held 18-20 September in Ottawa, Canada. This event was sponsored by the Canadian Hydrographic Service (CHS), Service hydrographique et océanographique de la Marine (SHOM), and the National Oceanic and Atmospheric Administration (NOAA). The Agenda of this workshop can be found in Annex A.

Topics and highlights from these events.

8. The need for, and the benefits of HRS/SDB were widely demonstrated. Particularly for shallow waters, these benefits included: relative easy access to data in remote and ship-inaccessible areas; comparative lower cost (e.g. compared to LiDAR); ability to repeat surveys more frequently; and the expanded interest from other stakeholders in data/information about shallow waters.
9. Multiple sensors and processing techniques can be used to generate satellite derived bathymetry.
10. Hydrographic offices have published charts were SDB was incorporated. In every case, calibration with existing acoustic bathymetry was necessary. The development of quality control procedures for accuracy, validation and uncertainty estimates is critical, as is the use of automation.
11. Hydrographic offices are using different portrayal and notes on charts when incorporating SDB.
12. There is a need for standardization within the realm of HRS/SDB to facilitate its integration into the workflow of the modern data-centric hydrographic office. This includes the use of CATZOC for this type of data.
13. Standardization should also be considered while addressing the challenges of incorporating, qualifying, and displaying HRS/SDB data on an electronic chart system or ECDIS.
14. Open source tool kits are being developed following GEBCO SDB cookbook principles.
15. SDB tenders process needs to be more precise so processing techniques applied are transparent and traceable.
16. The use of SDB by EMODnet to fill bathymetric data gaps, and the EMODnet Data Ingestion Portal was demonstrated.
17. Hydrographic offices shared their experiences and their use of SDB to support nautical chart updates.

Closing comments

18. The regional hydrographic commissions should encourage the use of SDB. In both workshops it was discussed that HRS is more than just SDB, and that imagery should be used daily by hydrographic offices to improve chart information and to assist in making cartographic decisions on navigation products.
19. Charts are being challenged by imagery products because they portray more up-to-date information. This can improve safety to navigation and provide additional support for emergency response. Particularly in poorly charted areas, an element of HRS/SDB should be considered for inclusion in initiatives related to capacity building (e.g. funding for improving navigation products).
20. Despite effective needs and ongoing initiatives, SDB is not yet a widely accepted as a trustworthy data source and there is still a deficit of reliability to match the market, even for non-navigational usages. It is encouraged that research and development in this area continues, with the strong support of hydrographic offices, academics, and industry. During the course of these activities, it is equally important that liaisons with the IHO HSPT and the DQWG for both S-44 and CATZOC extents, as well as the NCWG for a standardized portrayal in line with S-100 series, take place to generally ensure effective knowledge dissemination in HRS/SDB fields.

Action Required of the Council

- 21. The Council is invited to:
 - a. **Consider** this report and the information therein.
 - b. **Take any other actions** that may be required.

Annex A

Agenda of the International Hydrographic Remote Sensing (HRS) Workshop

Day 1 (September 18, 2018) – HRS in support of planning, monitoring, risk assessment:

- Water Clarity monitoring for Lidar planning;
- HRS as reconnaissance survey tool;
- Natural disaster recovery, survey planning;
- Change detection (bathymetry, shoreline); and,
- Chart adequacy analysis.

Day 2 (September 19, 2018) – HRS Hydrospatial applications and services:

- Integration of Satellite Derived Bathymetry on navigation products;
- Chart representation and standards (S-44 / S-57 / S-100);
- HRS process inclusion in traditional Hydrographic offices workflows; and,
- Potential collaborations, joint initiatives, capacity development.

Day 3 (September 20, 2018) – HRS Emerging technology, solutions, sensors and missions:

- Existing and emerging technologies which can be leveraged for HRS purposes;
- Potential and limitations of existing sensor technologies in terms of data accuracy, precision, and their suitability in various applications; and,
- Expected technological advances and their impact on HRS.