Backscatter "From Ping to Database", a Canadian Hydrographic Service perspective

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INTRODUCTION

The Canadian Hydrographic Service (CHS) is planning to make a better use of the backscatter intensity data collected with their multibeam sounding systems. All the backscatter data collected during the last 2 decades were not systematically processed and maintained, so a lot of valuable information has not been used yet and is archived on tapes and disks. The intent of CHS is to make an inventory of this data and to process it to a minimum level so that it can be made accessible to its cartographers and to the scientific community.

A team of hydrographers from the Canadian Hydrographic Service, Quebec Region office, have produced a poster showing a potential dataflow which may serve as a guideline for future processes and tool development related to backscatter data.

BATHYMETRIC PROCESSING and MULTI-RESOLUTION

The implementation of CUBE (Combined Uncertainty and Bathymetry Estimator) in the Caris Software Suite had an important positive impact in terms of processing time and data handling philosophy as we now see a dataset as a whole instead of a series of dots. In the past, the final extract of the dataset was mainly determined by the manageability of the data in the cartographic processes. With today's technologies, it is now possible to manage large volumes of data and bathymetric surfaces are now created at their optimal resolution (best extract of a dataset based on the sounder footprint and sounding density) independently from the cartographic process.

In order to obtain the most from CUBE, the number of soundings per cell is critical and must be perfectly balanced. With too many soundings, CUBE may "forget" shoals and on the contrary, with not enough soundings, CUBE may "accept" outlier data. In large depth range areas, the use of a single resolution is not desirable as the sounding density varies with depth. Multiresolution is a key element in the future bathymetric data processing as it will help to get the most out of the data.

As they come from the same sounding system, the bathymetric and backscatter data are strongly linked. They should therefore be kept together in the final processing stage. Merging these 2 entities will greatly facilitate data management and data accessibility. A solution is to include the backscatter intensity layer in the bathymetric surface set of layers (.csar dataset).

CHS is in the process of loading its source and chart data in Caris BDB and HPD databases. At the end of this process, continuous maintenance will make the product generation faster and easier. All the new multibeam data sent to the bathymetric database will contain the final merged bathymetric and backscatter data surfaces.

BACKSCATTER PROCESSING and BASIC SEAFLOOR CLASSIFICATION

It is widely recognized that producing one specific seafloor classification may not be suitable for all applications. The intent of CHS is to extract the best information from their sounding systems and make it accessible to its cartographers and to whoever may be interested in this valuable source of information. The bathymetric-backscatter data layers would be a starting point for enhanced seafloor classifications.

For many years, the processing of backscatter data signal has been in constant evolution and some concepts are promising. The implementation of these concepts in the processing tools is not yet always reliable. Once again, CHS is willing to take the best out of the backscatter intensity data, including the resolution and the resulting backscatter values. The 2 processing paths available at this time are the signal base and the image base processing. CHS's intent is to experiment Caris HIPS Geocoder module to process the backscatter, and the implementation of the tool within the Caris software is in the process to be refined.

CHS's willingness to use the potential of the data collected while surveying, will result in producing, for its own use "Basic Seafloor Classification" (BSC) datasets. The idea of this BSC is to bring the data at the same level of processing. Data cleaning and adjustment will be based on a minimum bottom sampling and seafloor type classification (CHS Chart #1, for ex. Rock gravel, sand, mud). The resulting surfaces will be loaded in the bathymetric source database.

One objective of the backscatter data processing and management is to find a way to bring the backscatter layer information on the official CHS products. Nature of Surface (NATSUR attribute) can be extrapolated from the Basic Seafloor Classification in the form of S57 area objects SBDARE (Seabed area). This area object creation process could be done manually at this time, but must be done automatically in a near future. The result of this process will be a series of seabed classification areas in the HPD source database available for the final products.

CONCLUSION

With the increase of backscatter data collected by a range of sounding systems, this process will help CHS to significantly improve its backscatter data management and accessibility. Backscatter will be systematically processed and used in the cartographic products as area objects instead of point features which is a giant leap in hydrographic seafloor characterization practices. In line with CHS's will, this process will remain valid when calibrated backscatter data will be available.

CHS has the intention to work toward this goal and make sure all those valuable returns from the pings are brought into its databases and products. It will then lead to a better and more complete delivery of seafloor information to the mariners and chart users. This is not only useful for navigation but also for sustainable development with respect to the environment, and therefore helping taking care of the sea.

BIOGRAPHIES

Roger CÔTÉ has been working for the Canadian Hydrographic Service for 27 years . He is Project manager with the Quebec Region's Hydrographic Operation Division, responsible for hydrographic survey projects and chart production projects.

Louis MALTAIS has been working for the Canadian Hydrographic Service for 15 years. He is a project ingeneer involved in numerous R&D projects, implementing solutions to improve productivity, efficiencies and to better meet the clients' needs.

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