The Open Backscatter Toolchain (OpenBST) project: towards an open-source and metadata-rich modular implementation

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Most ocean mapping surveys collect seafloor reflectivity (backscatter) along with bathymetry. While the consistency of bathymetry processed by commonly adopted algorithms is well established, surprisingly large variability is observed between the backscatter mosaics generated by different software packages when processing the same dataset. Such a situation severely limits the use of acoustic backscatter for quantitative analysis (e.g., monitoring seafloor change over time, or remote characterization of seafloor characteristics) and other commonly attempted tasks (e.g., merging mosaics from different origins).

Acoustic backscatter processing involves a complex sequence of steps, but inasmuch as commercial software packages mainly provide end-results, comparisons between those results offer little insight into where in the workflow the differences are generated. In addition, preliminary results of a software-inter-comparison working group have shown that each processing algorithm tends to adopt a distinct, unique workflow; this causes large disagreements even in the initial per-beam reflectivity values resulting from differences in basic operations such as snippet averaging and evaluation of flagged beams.

Far from ideal, this situation requires a clear shift from the past closed-source approach that has caused it. As such, the Open Backscatter Toolchain (OpenBST) project aims to provide the community with an open-source and metadata-rich modular implementation of a toolchain dedicated to acoustic backscatter processing. The long-term goal is not to create processing tools that would compete with available commercial solutions, but rather a set of open-source, community-vetted, reference algorithms usable by both developers and users for benchmarking their processing algorithms.

As a proof-of-concept, we present a prototype implementation with the key elements of the OpenBST approach:

- The data conversion from a native acquisition format (i.e., Kongsberg EM Series) to NetCDF-based data structures (components of the eXtensible Sounder Format) better suited to data exploration, processing and metadata coupling.
- A processing pipeline constituted by a set of interlocking, task-oriented tools simplifying their substitution with alternative approaches.
- The creation of final products (i.e., angular response curves and backscatter mosaics) capturing relevant acquisition and processing metadata.