J65.3 Leveraging Predictions from Noaa's Oceanographic Forecast Models to Increase Environmental Variability Awareness in Ocean Mapping

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The efficient acquisition of high-quality data using modern seafloor mapping systems is too often limited by the poor awareness of the oceanographic environment in which the surveys are conducted. As such, two tools that support ocean mappers in accessing the increasingly reliable predictions from NOAA's operational 3-D oceanographic forecast modeling systems and also NOAA's World Ocean Atlas have been developed and made freely available: Sound Speed Manager and SmartMap.
Sound Speed Manager is an open-source, Python-based library and desktop application to perform accurate processing and management of sound speed profiles. Once loaded, the measured oceanographic data may be enhanced/extended using different sources (e.g. the National Ocean Service's Gulf of Maine Operational Forecast System, the National Weather Service's Global Real-Time Forecast System), validated, and exported in several file formats commonly recognized by acquisition and processing applications. The processed profiles are stored in a per-project SQLite database, and several analysis functions and tools to manage the database-stored profiles are also available.
SmartMap provides web services (and a GIS portal) that transpose publicly-available oceanographic environmental data predictions into the estimated effects on the survey data. The adopted spatial variability analysis estimates the uncertainty using model-retrieved synthetic profiles. The data ingestion is performed using a combination of code written in Python and C++ to combine the strengths of both languages. The results, provided as a water-depth percentage of ray-tracing depth uncertainty, are useful in all the phases of a survey, from planning to the execution and processing phases. SmartMap outputs can be accessed using Open Geospatial Consortium (OGC) web services (and thus loaded as a map layer in existing desktop GIS applications) and through a dedicated Web GIS site (https://www.hydroffice.org/smartmap/).
Ongoing research efforts for both tools are targeting the adoption of NOS' operational Great Lakes, estuarine and coastal 3-D oceanographic forecast modeling systems - like the Gulf of Maine Operational Forecast System (GoMOFS) - to enhance and extend (or even substitute the data collected on-site by sound speed profilers, and the use of the model-derived environmental uncertainty as a meaningful input to better predict profiling times.

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