MASTS DPMS Case Study

Extended Ellett Line 2015 Workshop Report

MASTS Annual Science Meeting
October 2, 2015, Glasgow

Workshop participants

Jacob Ainscough, social science (University of Edinburgh)
Winnie Courtene-Jones, ecology (SAMS)
Clemens Engelke, chemistry (SEPA)
Michelle Elliot, microbiology (SEPA)
Stefan Gary, physics (SAMS)

Introductions

Stefan opened the workshop by emphasizing that although the primary objective of the Extended Ellett Line (EEL) is to provide physics-based sampling and analysis of the waters between Scotland and Iceland with ships and gliders, there are many possibilities for opportunistic and interdisciplinary data collection via the EEL platforms. The historical data is also freely available.

Clemens and Michelle introduced SEPA as most active within 3 nautical miles of the coast but due to the geometry of the Outer Hebrides, SEPA regulates the Minch and the Sea of the Hebrides. SEPA maintain long-term hydrographic datasets in the Firth of Clyde and Firth of Forth and a network of buoys in the same region. SEPA is also developing opportunistic sampling from ferries.

Winnie is interested in microplastics in the benthic samples from the Ellett Line. One aspect of her project will use Lagrangian techniques to estimate the spatial and temporal scales of pathways of microplastics. Clemens expressed interest in Lagrangian models that allow for deposition and resuspension, such as CMS, for tracking the fate of microplastics as well as other marine pollutants.

Jacob mentioned that his interest lies primarily with community-based management of Marine Protected Areas. His previous work was with monitoring populations of fish and seals. This work was similar to some of Michelle's work and allowed for a nice connection.

Potential synergistic activities on the Extended Ellett Line identified by participants

- The use of autonomous robots for monitoring, especially glider data within the areas relevant to SEPA. The SAMS glider deployment location north of Tiree is a data hotspot.

- The Ellett Line's location at the southern end of the Sea of the Hebrides and long history means that there is potential for its nutrient data to help classify coastal waters.

- Chlorophyll observations and data from optical sensors collected in the appropriate way could be useful for ground truthing the new satellite systems feeding data to the Copernicus data portal. Most ocean colour algorithms are designed for work in the open ocean and coastal data is particularly valuable for the next generation of satellites.

- Carbon parameters are the obvious, first candidate for opportunistic observations and it's nice to see that there is already a well-established tradition of this observation on the EEL.

- Zooplankton samples over many decades would be useful for investigations of species migrations and any potential drivers for those movements.

- It is widely assumed, but not proven, that the concentration of microplastics is high near the coast (a source) and less in the deep sea. Tows of the Marine Scotland surface-skimming catamaran or the ship's non-toxic underway system may be ways to address this question. Currently, analysis techniques for microplastics at depth require filtering 1000's of L of seawater and isn't possible on a regular hydrographic cruise.

- Estimates for deposition rates of pollutants (Hg, Persistent Organic Pollutants) are generally global with very few region-specific estimates. The open ocean concentration of Hg is viewed as the atmospheric background while land is the source region. Occasional (~5 yearly) transects capturing the open ocean to coastal water gradient of these pollutants would be of tremendous benefit for estimating the deposition of these pollutants in Scotland.

Discussion

The final possible opportunistic observation enumerated on the list above started a discussion about the time scales necessary for repeat sampling. The suggested pentadal time scale is also consistent with consensus of the global carbon community for identifying acidification and uptake of anthropogenic carbon in the global ocean. The optimum sampling frequency for a particular variable depends on the natural variability of the variable being measured as well as whether the objective is to simply detect a change in status or to look for a trend. Estimating trends is particularly challenging because if the sampling temporal resolution is reduced, the length of time needed to detect the trend may be substantially increased.

Conclusions

Overall, this workshop was an opportunity for EEL stakeholders to meet each other for the first time and find common interests. Lagrangian particle tracking and autonomous vehicles were strong points of commonality. The ideas suggested by workshop participants for opportunistic leveraging of the EEL platforms are exciting and very relevant to society's needs.

Acknowledgements:

SFG is grateful for MASTS support through the MASTS Dynamics and Properties of Marine Systems (DPMS) Research Theme Case Study: The Extended Ellett Line.