Coordination of observing assets for improved ocean observations

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In the current state of affairs, each observing system (satellite, buoy, Argo etc') works independently. Data from sensors may be compared to data climatology (e.g. Argo), but is not routinely inter-compared to data from other sensors in proximity in time *and* space.

With the increase in sensing system deployed each with more parameters measured on them we can gain much benefit from regular inter-comparison of sensors measuring in proximity, for example, to warn us that a measurement may be biased or to provide us with a cross-calibration, increasing our confidence in both sensors.

In order to make these match-ups, a database of assets, updated with their locations, times of measurements and parameters they measure needs to be created. Whenever two assets are in proximity at a given space and time, an entry needs to be created with the relevant information, including the data from both assets. Whether data is fully calibrated or already flagged as likely off needs to be taken into account.

An example of a tool matching up satellite Ocean Color estimates of chlorophyll with surfacing profiling floats can be found at: http://seasiderendezvous.eu/mapmatchup. Similarly, the Argo system uses close-encounters between profiling floats as part of its quality control.

How close should sensors be in space and time to be expected to be comparable depends on latitude (deformation radius), depth of measurement, proximity to land etc', and presence of fine and meso-scale features could explain a mis-match between sensors. Over the life time of a sensor, however, it may be expected to have no significant bias and trend in bias relative to other assets, and hence such a bias history could be used to 'adjust' data (with appropriate flags).

Given the increase in number of autonomous platforms in the oceans as well as satellite observations, the investment in the necessary human and cyber infrastructure to execute these matchups is likely to pay back handsomely in providing robust bounds on uncertainties in data they provide. I have little doubt that in the process will also improve the technologies themselves. For example, we recently discovered a large bias (factor of ~7) between factory-calibrated chlorophyll fluorometers, water samples and satellites estimates of chlorophyll in the Southern Ocean, technologies we have been using for years but have not systematically compared. A systematic comparison (Roesler et al., in review), showed that this bias is, on average, a factor of two around the globe and varies between biogeochemical regions.

Roesler C., J. Uitz, H. Claustre, E. Boss, X. Xing, E. Organelli, N. Briggs, A. Bricaud, C. Schmechtig, A. Poteau, F. D'Ortenzio, J. Ras, S. Drapeau, N. Haëntjens, and M. Barbieux, 2017, Challenges of and recommendations for absolute calibration of in situ fluorometers for assessing 2 global phytoplankton distributions, Limnology and Oceanography, Methods, in review.