Splinter Session 6: In situ Measurement Protocol Revision for Cal/Val

Co-Chairs: Giulietta S. Fargion (SDSU) and Jean-Paul Huot (ESA)

The session was well attended with around 66 participants. The presenters reviewed the status of the assigned protocols (i.e., AOP, IOP, carbon stock rates and particle sizes). In addition, presenters addressed the present protocol status and, if available, the community protocol consensus, highlighted the possible areas of protocol improvement, and concluded with recommendations. Presentations have been posted on the meeting web site (http://iocs.ioccg.org/presentations/). We encourage the community to download them and contact the presenters if they have questions.

The present ocean colour community agreed on the strong need to revise protocols for calibration and validation (Cal/Val) activities. The last revisions to NASA Protocols were in 2003 (Mueller, Fargion, et al.) under the SIMBIOS Program. These protocols are now over ten years old. Within that time, several new instruments have been developed and are now in use, and in some areas there has been an important evolution of methods. As such, revised protocols are needed in consideration of several new ocean color missions presently flying, as well as for upcoming missions.

The 2003 NASA protocols and other documents such as the ACE/GEO---CAPE review of bio---geochemical protocols for accuracy assessment and the report from the ACE Workshop on Ocean Productivity and Carbon Cycle (http://people.eri.ucsb.edu/~davey/OPCC/) can act as a starting point for the revised protocols.

The SIMBIOS program's revision of SeaWiFS protocols may provide a template for revising protocols for calibration and validation. Although not discussed, it should be noted that the SIMBIOS Program's starting point in revising the old SeaWiFS protocols was to define the "essential and required" parameters to be sampled during the field campaigns, in reference to the wanted ocean color products' required accuracy (see "Ocean Optics Protocols For Satellite Ocean Color Sensor Validation, Revision 4, Volume I: Introduction, Background and Conventions", page 38). Further, SIMBIOS identified the importance of doing coincident measurements for atmospheric and marine bio-optical properties in a variety of bio-optical regions. These regions include under sampled regions and/or those that might be "problematic" due to the presence of dust, rich in CDOM, etc. Particular attention was given to support regions, where historically, we had long time series (i.e., CalCOFI, CARIACO etc.).

Recommendations:

1. Protocols should not be revised by a single investigator but through an international community effort spanning multiple universities and space agencies.
2. The IOCCG is the ideal entity for this international effort.
3. The effort should be done if possible through a working group or workshop type meeting to facilitate discussion among participants in a manageable group size. This group could be led by one or two topic leaders. The need for a technical

editor/organizer was recognized as well. The participants also thought that this goal would only be achievable if a minimum level of funding was secured for the workshop (to cover travel) and if a technical editor were present to compile all documents produced, coordinate the effort, and handle logistics.

4. It was further recommended that for the IOCS community to move forward, some support for protocol development should be secured from various agencies (NASA, ESA, EUMESAT, etc.).
5. All workshops currently planned and those in the future should be under the IOCCG umbrella.

The workshop location should be located in the US, Europe, or in a similarly convenient location to facilitate participation. The proposed workshops should coordinate with upcoming events such as Sentinel 3 activities for possible inclusion. Further, NASA GSFC is planning a CDOM workshop (soon to be scheduled), in addition to a NASA GSFC particle absorption workshop to be scheduled afterwards.

The format of new protocols (paper, PDF, web forum) was left to be discussed and decided in the future. Some discussion was devoted to defining the concept of the "*revised protocols.*" Generally, the participants felt that written documentation (to be defined) and open source, computer code should be made available to the community. The document produced should be a "living document," in other words, a readily accessible, Internet document that can be modified with relative ease (e.g., Wiki). The community computer code for *in situ* data could be implemented in gradual steps, such as open access libraries, but no code ownership was identified. It was not discussed whether or not the community should request manufacturers to adopt common data formats that would facilitate the use of open source software.

The splinter session did not address or discuss the essential field measurements that are required for calibration and validation efforts, or the accuracy/precision required for each parameter, or the uncertainty of the measurement budget. Other topics not discussed but to be addressed in future workshops are the use of different instruments among investigators, different national calibration standards (such as traceability to NIST in the USA), and quality assurance criteria (such as those implemented in SeaBASS). Effects of the above differences may lead to unpredictable uncertainties seriously affecting Cal/Val activities. The community recognized the need for convergence towards a minimum level of uncertainty. The importance of round---robins (RR) and the SIMBIOS radiometric RR activities were briefly discussed.

Participants voted and agreed on the following workshop rankings (highest to lowest) and possible workshop leads:

1. Inherent Optical Properties (IOPs): E. Boss, D. Röttgers (lab particle abs), N. Nelson (lab CDOM abs), M. Twardowski, E. Rehm (code) and other TBD;
2. Apparent Optical Properties (AOPs): G. Zibordi (not confirmed), K. Voss, E. Rehm (code) and other TBD;
3. Particle sizes: M. Twardowski and others;

4. Carbon stocks and rates: A. Mannino, H. Sosik, G. Mitchell (bacteria), B. Balch (PIC) and others;
5. Bio---fouling and deployment modes: no identified leads

We encourage the community to contact Giulietta Fargion to participate in the upcoming workshops (gfargion@ldeo.columbia.edu). All necessary word documents will be provided to the workshop leads identified above. Workshop leads will also state if documentation is still current.

Finally, having a standard set of measurement protocols is indispensable in developing consistency across the variety of international satellite ocean color missions either recently launched or scheduled to launch in the next few years. While each mission has its own validation effort, the mission validation teams should not need to define separate validation measurement requirements (protocols).