

## SI-Traceable In-Situ Aquatic Radiometry: Bridging the Gap Between Different Measurement Methodologies

Chair: Agnieszka Bialek

Co-Chairs: Carol Johnson, Giuseppe Zibordi

Rapporteur:

### Introduction

In situ radiometry is a necessary step in the derivation of all aquatic products from open ocean to coast and inland waters. Recent improvements in technology and heritage from pre-existing efforts such as AERONET-OC and MOBY allowed for the development of in situ networks of hyperspectral radiometers. This includes “undocked” profilers such as BGC Argo, HyperNAV, and drones (AUV) with multi- and hyperspectral cameras, as well as hyperspectral radiometry from fixed platforms. While the former permit to achieve a better understanding of unsampled regions of the global ocean, the second are easier to operate and produce massive numbers of high quality match-ups, albeit restricted to waters accessible from land. In either case, all aquatic instrumentation and methods require a robust link to SI units, entailing knowledge about instruments non-ideal performance, measurement protocols, data reduction and quality assurance/control schemes and open-for-scrutiny processing. The most critical element for all in situ radiometry methods is the modelling of correction steps such as glint correcting for above water methods, extrapolation to the surface and above for in water methods, and the correction of bidirectional effects for all.

1. What should be our priority when addressing existing discrepancies between the aquatic radiometry methods?

### Session Summary

The session included four presentations that were followed by the discussions.

#### List of presentations:

SI Traceable Aquatic Radiometry	Carol Johnson
Field Radiometry Methods	Giuseppe Zibordi
Modelling and simulations	Davide D'Alimonte
Uncertainties	Agnieszka Bialek

## **Key discussion points:**

### Protocol Expansion for New Methods

- Autonomous profilers and UAVs are emerging techniques which should be supported by protocols shared through living documents to accommodate advances. Any new, dedicated implementation requires clear documentation, such as a peer-reviewed publication to ensure transparency and to support reproducibility.
- Aquatic radiometry protocols in coastal marine and fresh waters require incorporation of land surface reflectance contributions and may benefit from collaborations with land or atmosphere communities.

### Modeling Challenges

- The sea-surface reflectance factor sparked the most debate, highlighting its impact on radiometric products and uncertainty.
- This suggests a need for focused actions on modeling implications and uncertainty quantification.

### Best Practices & Training

- Continued adherence to established protocols and best practices is essential.
- Ongoing training and collaboration with instrument manufacturers were emphasized, particularly to support their efforts in providing uncertainty with absolute calibration.

## **Review of Existing IOCS Recommendations**

2017.04.07 protocols and training	Need for standardization of procedures for in situ data collection in inland waters	Community	Actioned	Largely covered by the IOCCG Protocol documents
2013.06.1	In situ measurement protocols should not be revised by a	IOCCG	Actioned	IOCCG Protocol documents

	single investigator but through an international community effort spanning multiple universities and space agencies e.g. under the IOCCG umbrella.			
2017.08.1	The current best practices for in-water measurements are not described and need to be detailed.	Community	Actioned	IOCCG Protocol documents

### New IOCS Recommendation(s)

Continuous support for global training initiatives with coordinated and coherent approach to radiometry to ensure that participants fully understand protocols and measurements uncertainty with hand on experience. This action, largely relying on IOCCG and Agency initiatives, should not see a decrease in training over time.

Dedicated effort in sea-surface reflectance factor modelling, comparisons and uncertainty evaluations summarized in a dedicated breakout session at IOCS meeting 2027. This action, relying on Community efforts, should lead to an increase of dedicated investigations

Regular (every 3-5 years) comparisons should be supported by the Agency with funding available for participants, including uncertainty workshops and participants involvement in the planning phase. This action, relying on both Agencies and the Community, should lead to a number of inter-comparisons planned and executed by international teams.