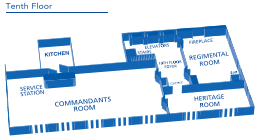

UNDERSTANDING AND ESTIMATING UNCERTAINTY IN OCEAN COLOUR REMOTE SENSING DATA AND DERIVED PRODUCTS

Co-Chairs: Part I: Kevin Turpie (UMBC), Emmanuel Boss (U. Maine), Part II: Stéphane Maritorena (UCSB), Frédéric Melin (JRC ISPRA), Part III: Jeremy Werdell (NASA GSFC).

Quantifying data uncertainty is a critical part of scientific investigation and application. Estimates of uncertainty are vital to determine whether data support hypotheses, e.g., indicating whether a change or trend is significant. Assigning uncertainty also lets us know whether the information derived from the data is of sufficient quality to support decision-making. Despite the necessity of quantifying uncertainty, most ocean colour products have so far been distributed without associated uncertainty estimates, or with indicators only partially describing uncertainty. This requirement is now well recognized and included in the planning of future missions; it should help supporting user confidence, defining the range of possible applications of data products, favoring the operations of data assimilation in ecological and climate models, or allowing trend analysis in climate research. This breakout meeting will showcase work done towards estimating uncertainty in the field of ocean colour remote sensing, with a focus on standard satellite data products. Characteristics and limitations of each approach will be highlighted, followed by a community discussion on the path forward. The meeting will begin with several talks dealing with the various aspects of uncertainties in ocean colour, from top-of-the-atmosphere radiometry; to retrieval of remote sensing reflectance (Rrs); to apparent and inherent optical properties and other environmental parameters derived from the Rrs. Techniques for estimating and evaluating uncertainty will also be considered, including approaches that rely on the compilation of validation results, model-based estimates, class-based techniques, error propagation, or inter-comparison of satellite products. The resulting estimates may have different time and/or space characteristics, rely on various assumptions, and represent different parts of the uncertainty budget. Inherent algorithm uncertainties, algorithm sensitivity, and uncertainty associated with in situ measurements and validation activities, including biases arising from differences in scale between satellite and in situ measurements, are also relevant. Following the talks will be a structured, moderated community discussion about where the community is at about uncertainties in ocean colour and where it needs to go in the future.

QUESTIONS THAT WILL BE ADDRESSED INCLUDE:
Coordinating and Integrating Efforts
- What information is currently not sufficiently characterized, but that would be helpful for the derivation of uncertainty estimates?
- How does the community coordinate and integrate disparate efforts and results?
· What are the pros and cons of the techniques used to derive uncertainties?
Standardizing Methods and Metrics
- How do we standardize data quality metrics and their derivation across multiple missions?
- What are the types of uncertainty statistics that are associated with data measurement types?
- Which specific metrics do we use to quantify uncertainties?
Determining Uncertainty Estimation Quality
- Can we validate, or perhaps verify, uncertainty estimates and to what extent is good enough?
· How do we achieve traceability from in situ data uncertainties to satellite products?

Part I: ***Theory and overview***

14:30-14:45 **Uncertainty definitions and theory**
Kevin Turpie (UMBC)

14:45-14:50 **IOCCG/CEOS/GCOS context**
Frédéric Mélin (JRC ISPRA)

Part II: ***Surface reflectance uncertainty estimation methods***

14:50-15:00 **Synthesis of published methods and collocation approach**
Frédéric Mélin (JRC ISPRA)

15:00-15:10 **Uncertainties from the Bayesian method**
Robert Frouin (UCSD)

15:10-15:20 **Uncertainty propagation**
Philippe Goryl (ESA)

15:20-15:30 **Neural networks and Rrs uncertainty**
Roland Doerffer (Helmholtz Zentrum Geesthacht)

Part III: ***Derived product uncertainty methods***

15:30-15:40 **Status report on in situ uncertainties**
Emmanuel Boss (U. Maine)

15:40-15:50 **Overview of methods for remotely-sensed IOP uncertainties**
Suhyb Salama (U. Twente)

15:50-16:00 **Spatial, temporal, and content considerations for Level-3 uncertainties**
Tim Moore (U. New Hampshire)

16:00-17:15 **Moderated Community Discussion**