
Plenary Report

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)

San Francisco, California USA
16 June 2015
AGENDA

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
Methods producing spatially-resolved uncertainty estimates for $R_{RS}$:

- **Class-based approach**
  
  Moore et al. *RSE* 2009, 2015
  Jackson et al., *in prep*

- **Bayesian methods**
  
  Frouin & Pelletier *RSE* 2015

- **Uncertainty propagation**
  
  ESA ATBD

- **Algorithm-based method**
  
  Hu et al. *RSE* 2013

- **Colocation approach**
  
  Mélin, *IEEE GRSL*, 2010
  Mélin & Franz 2014
  Mélin et al. *RSE* submit

Based on different assumptions, covering different facets of the uncertainty budget.
**Take Aways**

Matchups are not a measure of uncertainty for ocean. The sample is too small to account for all conditions under which satellite measurements are taken.

There is a wide range of activities in the community, but no clear, goal-oriented direction.

Need clearly defined language for uncertainty. Are GUM and VIM being used universally by the community?

There is some controversy regarding whether or not or how to report uncertainty based on systematic measurement errors.
Take Aways

Community is still in a mode of exploration, no consensus yet on methodology or metrics.

Space agencies would like to fully quantify uncertainty, but currently can only partially quantify uncertainty (limited resources → limited accounting of error sources and effects?).

Uncertainty products that users (modelers) want are not necessarily what space agencies require.

Upcoming OLCI and MERIS reprocessing will use an error propagation scheme (from TOA to surface reflectance). [Bourg and Goryl]
Take Aways

To first order, validation error can be view as a sum of contributing errors:

\[
\epsilon_{\text{val}} = \epsilon_{\text{PME}} + \epsilon_{\text{IME}} + \epsilon_{\text{agg}} + \epsilon_{\text{in}} + \epsilon_{\text{s}}.
\]

Need to leverage work done by existing fields (e.g., atmospheric sciences and closure studies).

Need more discussion regarding temporal and spatial variability in uncertainty.

Need additional exploration of propagating $R_{rs}$ uncertainties into bio-optical algorithms.

Need additional exploration of propagating in situ measurement uncertainties into bio-optical algorithms.

Need additional exploration of propagating uncertainties from Level-2 to -3 files. What uncertainties should be produced? Do they mean what we think they mean?

Need more exploration of propagating uncertainties from L3 to regional and global time series.