

Uncertainties & consistency

Session

➤ **Uncertainties**

- Talk: rigorous error propagation (C. Merchant)
- Talk: practical limitations (A. Povey)
- Discussion

➤ **Consistency**

- Talk: multi-ECV connections OC SST Aerosol Sea ice (S. Sathyendranath)
- Talk: CMUG inter-ECV consistencies (U. Willen)
- discussion

Uncertainties

- **Basic approach: rigorous error propagation through all levels wherever possible**
 - Learn from metrology community
 - Apply standard-conform terminology
 - In EO often “structured random errors” or “locally correlated” uncertainties (not easily split in random / uncorrelated and systematic / correlated uncertainty)
 - Uncertainty cascade through levels: detector, calibration, inversion, sampling
 - Different uncertainties dominate in different temporal-spatial scales
 - Propagate differently correlated uncertainties separately
 - An estimate of uncertainty is always possible
 - Allows to justify neglecting uncertainty terms / priorities

Uncertainties

- There are reasons where this may not (yet) be possible
 - Correlation of uncertainties not yet understood
 - Missing reference data for certain conditions
- In such cases **clear communication to users** is needed
- In such cases experimental approaches can be used
 - be practical and focus on dominant uncertainties first
- **Ensemble of retrievals** can help out / user communities are well acquainted with this tool
- In all cases **uncertainties need to be validated** as far as possible

Uncertainties representation / communication

- Depends a lot on type of users
- Uncertainties maturity evolves
- Uncertainty propagation needs knowledge on uncertainties of input data
- Use of ECV simulators to assess potential importance of approximations
- Inform users on any approximations
- Request to portal project for flexible subsetting variables on download for different uncertainty information (one total uncertainty value <-> full covariances, uncertainty components)
- Short technical notes should have a special section on uncertainties

Uncertainties

discussion points

- Discussion how to represent uncertainties in a long-term series with different missions with different uncertainty structures / ensemble approach
- Inform users on change of sensor + represent in associated uncertainty information
- Sentinel-3 simulated data: no proper pre-launch uncertainty characterisation contained -> ESA to work on this / commissioning phase for measured data

Consistency

- **Option started: Ocean colour – AOD - SST**
 - Missing data random or systematic, regional differences
 - Understand areas of ocean colour low coverage (also high concentration)
 - Potential correlation with AOD
 - Understand the underlying mechanisms (dust fertilisation, decrease of light by aerosol, ...)
- **Ocean started: colour – SST – sea ice**
 - Biomass plumes moving to higher latitude
 - Chlorophyll and SST at sea ice edge
 - Separate clouds from sea ice
- **CMUG consistency preliminary analysis**
 - Sea ice consistency with model ocean temperature at sea ice edge
 - Consistency of aerosol time series overlap
 - SST and chlorophyll
 - Correlation of El Nino index with OLR
 - O3 assimilated -> STDV decreasing

Consistency analysis

- **On level of retrievals**
 - Cross-talking ECVs consistency
 - Auxiliary datasets, by-products vs. ECV datasets
 - Several comparisons are planned
- **On level of processes / geophysical cycles**
 - Model studies integrating multi-ECVs
 - taking into account their uncertainties
- CCI program starts with some analysis
- Feedback from further analysis in the wider community needed