

CEOS WGCV 38: CEOS SST-VC Cal/Val activities

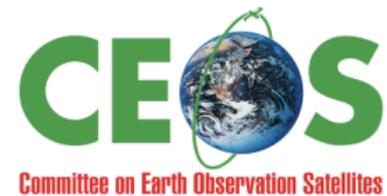
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On behalf of the SST-VC



<http://www.ghrsst.org>



SST-VC cal/val activities

- Clear separation of calibration and validation activities
 - Each one clearly defined by the WGCV
- For calibration
 - Coordinated through CEOS WGCV IVOS and reported to CEOS SST-VC/GHRSST
 - Strong interaction with instrument teams
- For validation
 - Coordinated through GHRSST and reported to CEOS SST-VC/CEOS WGCV IVOS
 - Maintain established links to JCOMM DBCP and SOT, Argo, ship radiometer teams and other reference data sources

Calibration requirements

- Provision of calibrated geolocated radiances is the responsibility of the instrument provider (to Level 1b)
- Require standard set of instrument parameters
 - E.g. Spectral profiles (relative spectral response functions); instrument T; instrument stability; detector non-linearity; etc.
 - Information ideally provided through web portal
 - For all sensors - future, current & past
- Communication methods
 - Two way feedback is essential e.g. via CEOS WGCV IVOS

Validation requirements

- Validation of geophysical parameters should also involve other groups such as GHRSSST
 - May be same entity as responsible for calibration
 - **Independence** of reference data, methods and personnel is preferable
- Require **long-term SI-traceable reference measurements**
 - Ideally global in coverage, reporting every minute, to minimise uncertainties
 - Of course this is not practical so in reality we use what is available
 - But it is important to maintain key data at a minimum level (see next slide)
 - Need to maintain strong two-way dialogue with reference data providers
 - To understand existing data and seek cost-effective upgrades that benefit an integrated measurement system for SST

CEOS WGCV/SST-VC Projects

- SI traceability
 - IR inter-comparison
 - Of laboratory reference sources and field radiometers
 - In lab and in situ (under representative operating conditions)
 - Ship-borne radiometers as bilateral
 - All surface T domains included (SST, LST, IST)
- Deployment of calibrated drifters
 - Joint project with JCOMM DBCP
- Both covered (to some extent) by ESA ITT

- Set-up activities for joint ISAR/SISTeR bilateral deployment have begun on QM2

Other related projects

- MetEOC-2
 - Led by NPL (N. Fox)
 - Starts September 2014
 - SST-VC interest: Next generation field radiometers (Fiducial Reference Measurements - FRM)
- FIDUCEO
 - Led by University of Reading (C. Merchant)
 - Starts March 2015
 - SST-VC interest: Next generation FCDR's with uncertainties/stabilities from first principles

MetEOC-2

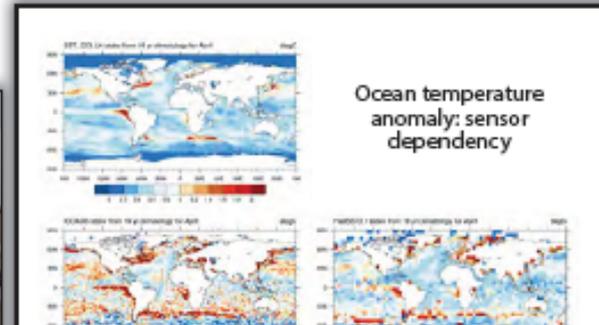
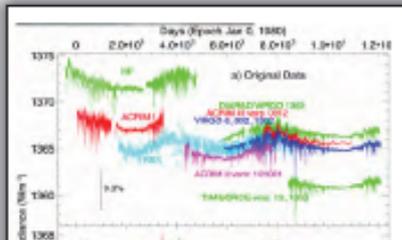
European focus for International EO metrology; i.e. CEOS, QA4EO, GEO, GCOS, WMO, GSICS...

WP4: Radiation Balance ECVs

(SFI-Davos, NPL and STFC-RAL) + GHRSSST, CEOS VCSST and ESA

SI-traceability and uncertainty analysis of three radiation balance ECVs: Total Solar Irradiance (TSI), Sea Surface Temperature (SST) and Land Surface Temperature (LST), and the creation of reliable multi-decadal Climate Data Records (CDRs).

- Application of metrology best practice to enable pre- and post-launch SI-traceability of a new spaceborne TSI radiometer named CLARA ($U_c < 0.1\%$)
- Develop new 'field-deployable' radiometer for SI-traceable cal/val of Sentinel 3 SLSTR, to meet the needs of independent SST and LST CDRs (U_c 0.05 °C & 0.25 °C respectively)
- Define best practice protocols to assess and minimise impact of observational gaps, natural variability, instrument cross-comparisons, (ocean buoys, surface thermometers, etc.) to establish a trusted SI-traceable CDR capable of detecting the global trends expected from climate change



Fidelity and Uncertainty in Climate Data Records from Earth Observation (FIDUCEO)

Aims and outputs

- Science for well-characterised uncertainties in Climate Data Records (CDRs)
- Techniques, toolbox and training for tracing uncertainty from detector to geophysical product
- New infra-red, visible and microwave FCDRs and CDRs
- Knowledge about observational stability from first principles

Project headlines

- 4 year project under H2020
- 10 partners including a national metrological institute
- “Metrology for Earth Observation” across all wavelength domains for EO
- 2 international workshops
- 10 new datasets with rigorous traceable uncertainty info
- Cookbooks, open source tools, e-learning



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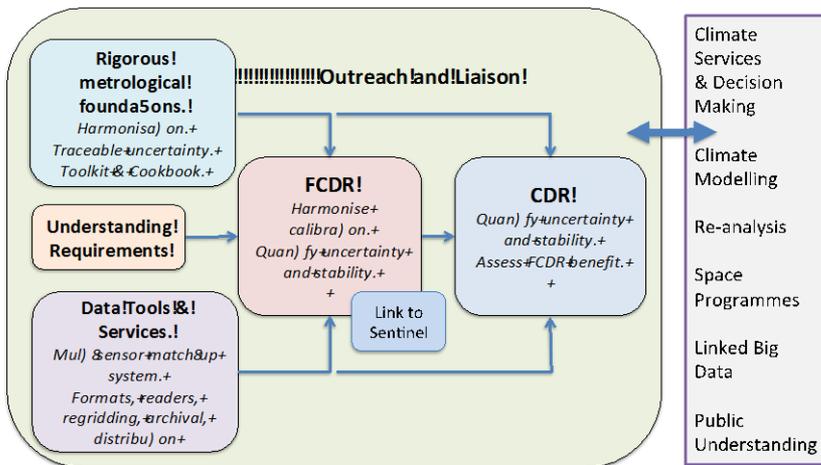
DLR



EUMETSAT

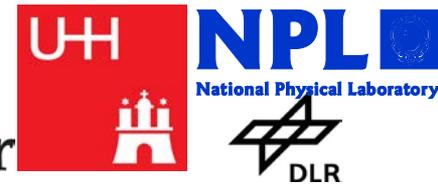
Fidelity and Uncertainty in Climate Data Records from Earth Observation (FIDUCEO)

FIDUCEO project elements



Novel character of FIDUCEO data output

Characteristic	Typical FCDR	FIDUCEO	Typical CDR	FIDUCEO
Ensemble spanning all forms of uncertainty	No	Yes	No	Yes
End-to-end traceability and propagation of uncertainty	No	Yes	No	Yes
Satellite-series harmonisation at radiance level based on rigorous physics	Some examples (e.g. MW); Others seem ad-hoc	Yes	Some examples	Yes
Uncertainty estimates for every pixel	No, usually generic values at best	Yes	Some examples	Yes
Uncertainty components support uncertainty propagation in aggregated data	No	Yes	One known example	Yes



Summary

- Very strong CEOS WGCV/SST-VC interaction
 - Mainly IR-related though - though IVOS
- Clear separation of Cal and Val
- Several related projects starting now or soon
 - Thanks to ESA for supporting WGCV/SST-VC dedicated projects
- Would like to increase focus on microwave radiometers
 - AMSR2, HY2A, etc.
 - We welcome WGCV input on how best to do this