

**CEOS WGCV IVOS Sub-group
(Infrared, Visible and Optical Sensors)**

Report to CEOS WGCV 38

**Chair: Nigel Fox
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UK**

with support from UKSA

Activities since WGCV 37

- IVOS 26 @ Pasadena hosted by NASA JPL June 4-6
- 22 agency/orgs represented
- All themes and topics (work-plan discussed or summarised)
- Next Physical Meeting @ Toulouse, France hosted by ONERA (spring 2014)
 - Full week to include 2/3 workshops
 - Some webex planning to be organised shortly



Special Projects:

- RadCalnet met June 3 @JPL (AOE via telecon)
- SST/LST comparison being organised under ESA contract subject to open ITT

Operational Structure

- Agency reports to be encouraged but not presented except in exceptional circumstances or if a new member.
- Detailed Technical focused theme each meeting (0.5 – 1 day)
- Community technical workshops ~ tri-annual
- Membership fully open (no constraints)
- Theme/topic Champions

Cross-cutting

- Atmospheric corn – Thome NASA
- Geo/Spatial Quality – Helder UofSD
- Geometric image Quality – TBD
- Sensor to Sensor biases – Fox NPL
- RT code – Widlowski JRC
- Communication/portal – Goryl ESA

Focus task groups

- WG 4 cross-comparisons Bouvet ESA
- Libya 4 - Henry CNES
- RADCALNET prototype - Bouvet ESA

Sector themes:

- Land (reflectance) – Czaplak-Myers (U of Ariz)
- Ocean (reflectance) colour – Zibordi JRC
/Murakami JAXA
- Surface temperature – Corlett Uof Leic

Also more general activities at plenary
e.g. sensor pre-flight calibration/
formal recommendations

- **IVOS** as Conduit for existing “community expert groups” –
- **IVOS** Serving Cal/val needs of IVOS relevant constellations
- **IVOS** - e.g. org of comparison, interface to CEOS

To facilitate the provision of 'fit for purpose' information through enabling data interoperability and performance assessment through an 'operational' CEOS coordinated & internationally harmonised Cal/Val infrastructure consistent with QA4EO principles.

- *Pre-flight characterisation & calibration*
- *Test – sites*
- *Comparisons*
- *Agreed methodologies*
- *Interchangeable/readable formats*
- *Results/metadata - databases*

Key Infrastructure to be established and maintained independent of sensor specific projects and/or agencies

Main Topics: details on Cal/Val portal

- Activities of VC-SST and priorities plans for SST (LST) comparison project
 - Concept of Fiducial reference measurements
- Ocean colour activities – plans for comparison and preparations for Sentinel 3 t
 - Concerns of creation of parallel Cal/Val groups in CEOS (In-Situ-OCR) including sensor pre-flight IVOS requests that group reports Cal/Val through WGCV
- Review of various sensor Cal activities
 - **Desire to establish a 3 day workshop (potentially across Sub-groups & GSICS) on pre-flight/on-board Cal of ‘optical based sensors’ 2015/2016 (organise planning telecon following WGCV)**
- Discussion on Climate/calibration benchmark missions: US, UK/Europe, China
 - **Potential joint workshop in collaboration with GSICS**
- Geo-spatial image quality
 - Reinvigorating discussion on this topic (lead D Helder of SDSU) **plan for 1 day workshop at IVOS 27 encourage agencies to support with personnel and to provide details on Geo-spatial test sites for CEOS (USGS) catalogue**
- Method of selecting vote for Vice Chair

Main Topics: details on Cal/Val portal



- The Moon as a calibration reference
 - **Joint Workshop organised by GSICS (Dec 2014) to harmonise and compare uses and variants of USGS originated ROLO model**
- RadCALnet
 - Cross-agency Agreement on project 2yr work-plan for prototype operational traceable radiometric Cal service for <50 m land imaging sensors
 - Strategy to find a 4th ESA/CNES funded site via a global search
- Pseudo-Invariant-Calibration-Sites (PICS) particularly Libya 4
 - ESA plans to do site visit to collect samples
 - LPV offered support to collaborate on modelling BRDF of dunes etc
 - Propose a second Libya 4 workshop at IVOS 27 in collaboration with GSICS compare results, use some standard test data etc (arrange telecon to plan a potential project)**
- Treatments of Spectral bandwidth and convolution with sensors, surface, solar
 - **Potential project to develop best practice guidance and how to treat uncertainties as WGCV activity in collaboration with GSICS (including interpolation various scales (spectrometer resolution to broadbands))**
- Sensor to Sensor comparisons and analysis
 - Discussion on tools and databases
 - How to link/present results - ref to an arbitrary named sensor, on a bi-lateral basis, to a CEOS virtual reference? Coordination/harmonisation of different results?
 - Plan to have workshop at IVOS 27 with GSICS to discuss community strategy**

CEOS WGCV(IVOS) potn interactions with GSICS



Following attendance at technical workshop (March 14)

- Deserts (PICS) methods for cross- comparisons (Vis and IR)
- Moon as a calibration reference - improved models and useage
- LEO – LEO cross-calibration methods in general
- Cross-comparison tools and databases and results
- Pre-flight calibration workshop
- Use of atmospheric hyperspectral imagers for band to band correction
- Reference solar Irradiance spectrum & methods to convolve with instrument bands
- IVOS to make more visible its activities through GSICS newsletters
- Request for examples of Cal/Val best practise following QA4EO principles to serve as case studies [Http:www.QA4EO.org](http://www.QA4EO.org)
- Efforts to establish SI Traceable Climate and calibration sat in space
- Many overlaps of personnel perhaps some joint co-located meetings
- Surface measured test-sites and associated in-situ / cross comparisons is of supporting interest to GSICS
- Contribution to survey on Cal/val methods: activities/priorities
- Strategy for common method to report sensor to sensor biases

Project 1: SST/LST Comparison Campaign Status



Cal/Val sensor comparison campaign in support of SST and LST measurements from space (support action for VC-SST and WGC) (follows similar highly successful Tuz Golu campaign for surface reflectance and Miami 3 (2009) for SST (10 global participants) using QA4EO guidelines

PROJECT (under open ITT) with funding from ESA to carry out 4th of ~5 yearly ('Miami' 1,2,3) WGCV comparisons for radiometers including black bodies

- **Phase1 (2015): - Laboratory based vs. SI traceable standards (radiometers and black bodies) (Land and Ocean applications)**
 - Controlled conditions but in Sunlight and external comparison
- **Phase 2A (2015 – 2017): Series of ship/ocean based radiometer campaigns**
- **Phase 2B (2015 – 2017): Field-based calibration of radiometers (Land, ideally also Ice)**
- Participation open to all – Encourage CEOS agencies to support attendance
- Look to also establish best-practise guidance on making measurements and traceability

Background

- **Essential Climate Variables Sea Surface Temperature (SST) and Land Surface Temperature (LST) are both dependent on global satellite observations of surface emitted thermal radiation**
 - Heritage long-time series of data from multiple sensors exists
 - New sensors soon to be launched e.g. Sentinel 3, JPSS-1
- **International comparisons are essential to provide confidence in data, test innovation and facilitate capacity building and training**

Project 2: SST (pilot) 'Operational Validation Project' Proposal



Background:

- For SST validation (Operational and Climate) require network of high performance drifting Ocean Buoys for continuous monitoring of Ocean Temps, in addition to Ship borne radiometers analogous to 'test-sites' such as Aeronet and new LandNET
 - Key part of strategy to bridge 'data gaps' between sensors for climate
 - White paper drafted by VC-SST, GHRSSST, WGCV-IVOS detailing background available
 - Existing networks not sufficient in number for necessary coverage

Request to agencies

- Agency (or group of) to provide resources to launch a set of high performance well-calibrated SI traceable drifting Ocean Buoys as an initial demonstration pilot project. Buoys can be built nationally to meet community defined specification
- Agencies to allocate resources to continue and where possible extend number of ocean borne radiometer cruises for SST validation - independent of specific satellite missions to facilitate improved management of 'data gaps' between missions for Climate.



Project 2: Plan

- Perform a study, funded by ESA, to evaluate what is achievable in terms of accuracy and relative benefits of both improved Ocean Buoys: performance and number and similarly for Ship borne radiometers in the context of Satellite derived SST products and CDRs Including means to establish SI traceability
- Lead to a potential future proposal to CEOS agencies based on an update of the existing white paper with more rigorous cost-benefit analysis.