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

Report to CEOS WGCVC 38

Chair: Nigel Fox
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UK

with support from UKSA
Activities since WGCV 37

• IVOS 26 @ Pasadenda 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

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

Focus task groups
- WG 4 cross-comparisons – Bouvet ESA
- Libya 4 - Henry CNES
- RADCALNET prototype – Bouvet ESA

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

- IVOS as Conduit for existing “community expert groups” –
  - Serving Cal/val needs of IVOS relevant constellations
    - 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 4\textsuperscript{th} 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 BRF 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 usage
- 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
- 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
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

- Phase 1 (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
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.