**Minutes V1.0**

**WGCV-50 Day #1**

**Tuesday, 22 March 2022**

**Participants**

**AEM:** Adrian Guzman

**BIRA-IASB:** Jean-Christopher Lambert

**CEO:** Marie-Claire Greening

**CNES:** Patrice Henry

**CONAE:** Laura Frulla, Matias Palomeque

**CSIRO:** Cindy Ong

**EC-JRC:** Peter Strobl

**ESA:** Philippe Goryl, Paolo Castracane, Fabrizio Niro

**FSI/SmartSat:** Jasmine Muir

**GA:** Medhavy Thankappan

**GISTDA:** Prayot Puangjaktha, Yossavin Sombutpanich

**ISRO:** Arundhati Misra

**JAXA:** Akihiko Kuze

**Labsphere:** Brandon Russell

**LPV:** Fernando Camacho

**MYSA:** Adhwa Amir Tan, Wayne Ng, Jessica Wong

**NASA:** Kurt Thome

**NOAA:** Changyong Cao, Taeyoung (Jason) Choi, Larry Flynn

**NRSCC**: Xiaolong Dong

**Symbios:** Matt Steventon, Riza Singh, Libby Rose, Stephen Ward

**UKSA:** Nigel Fox

**USDA:** Michael Cosh

**USGS:** Greg Stensaas, Cody Anderson

Yaokai Lui

Yonhhuang Zhao

**Welcome and Chair Report** [[Slides](https://ceos.org/document_management/Working_Groups/WGCV/Meetings/WGCV-50/Presentations/1.1_WGCV-50-Macrh2020ChairGHG_v2.pptx)]

Presenter: A. Kuze

Main points:

* Kuze-san (WGCV Chair, JAXA) welcomed everyone to the meeting.
* He hopes the next meeting (WGCV-51) will be in person later this year.
* Kuze-san noted that the Living Planet Symposium will be held on May 23-27, 2022. A poster dedicated to the CEOS Cal/Val Portal is being prepared for the session.
* He noted the CNES CEOS Chair priorities related to the UNFCCC Global Stocktake and Cal/Val for TIR sensors (cross-calibration of thermal infrared measurements to support future CEOS Agency missions). Both are of particular relevance to WGCV.
* A discussion is needed regarding the Atmospheric Composition Subgroup (ACSG) Chair.

**Action Review**

Presenter: A. Kuze

Main points:

* Reviewed WGCV-49 actions and noted that *WGCV-49-01, WGCV-49-02, WGCV-49-03* and *WGCV-49-04* have been completed. *WGCV-49-05* action is in progress. Details of the actions can be viewed [here](https://docs.google.com/document/u/0/d/1YwwL5RfRwWjmdV50NAJoRLuqJvFqXdNLQa0yAoR5dP8/edit).
* Noted there are two candidates for the WGCV Vice-Chair term that begins from CEOS Plenary 2022.
* Noted the past discussion on the TSIS solar irradiance spectrum and WGCV’s potential recommendation of this dataset to CEOS. The TSIS dataset covers wide spectral ranges with reduced uncertainties. A user-friendly database with various spectral resolutions from broad-band radiometers to high-resolution spectrometers is particularly useful for GHG spectrometers, as it corrects a large error in the SWIR part of the spectrum.
* The original plan is for the WGCV recommendation to take place in about a year, allowing for additional studies, campaigns and meetings.
* A telecon related to TSIS high spectral resolution and long-term data using GHG sensors with LASP was held on March 2, 2022. An in-person meeting will be held in Colorado in September 2022. Planning to review Version 2 of the TSIS dataset in the WGCV-51 meeting in October and present the recommendation at the CEOS Plenary.

Discussion

* Nigel Fox (UKSA) suggested that the decision to recommend the TSIS spectrum should be brought forward, as it has been shown that the old spectrum has some relatively large errors. Nigel proposed that the TSIS-1 spectrum as the CEOS recommendation should be adopted at this moment in time. It should also be noted that an update will be forthcoming, with likely small evolutions in the near term. GSICS are already using the new spectrum, after recommending it last year. CEOS should not wait another 6-9 months to correct the recommendation.
* Kuze-san noted we still need time to review version 2 and are not sure of the significance of the changes.
* Larry Flynn (NOAA) shared the [TSIS-1 HSRS page on the GSICS website](http://gsics.atmos.umd.edu/bin/view/Development/ReferenceSolarSpectrum) which claims it is both the GSICS and CEOS spectrum. Two GSICS subgroups have recommended the spectrum. Full GSICS recommendation is still pending and underway.

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| **Decision 01** | WGCV recommends that CEOS Agencies adopt the TSIS Solar Irradiance Spectrum, noting that incremental updates will be forthcoming. |

* In practice the recommendation can be a statement on the CEOS Cal/Val Portal that references the presentation made at WGCV-49, the IVOS recommendation, the LISIRD link (<https://lasp.colorado.edu/lisird/data/tsis1_hsrs>) and the WGCV-50 recommendation.

**CEOS Priorities and Work Plan** [[Slides](https://ceos.org/document_management/Working_Groups/WGCV/Meetings/WGCV-50/Presentations/1.3_WGCV-50_CEOSWorkPlan_MCG.pptx)]

Presenter: Marie-Clare Greening (CEO)

Main points:

* Recalled the mission statement of CEOS and the primary objectives. The primary objectives are to optimise the benefits of space-based Earth observation; serve as the focal point for international coordination of space-based Earth observation activities; encourage complementarity and compatibility.
* CEOS’s long-term priorities were identified in the Kyoto statement of 2015. These include working with the Global Climate Observing System (GCOS), the Sendai Framework for Disaster Risk Reduction, support for the Group on Earth Observations, and support for the UN 2030 Agenda for Sustainable Development.
* The current 2022 CNES CEOS Chair priorities are encapsulated as *“Paths to Sustainability: From Strategy to Practical Measures.”* Of particular note for WGCV, priority three is on support to CEOS cal/val initiatives, in particular around land surface temperature and collaboration among various CEOS agencies.
* Highlighted that the WGCV mission and objectives are well aligned with the overall objectives of CEOS.
* CEOS has a full suite of governing documents, including four key documents: the [Terms of Reference (ToR)](http://ceos.org/document_management/Publications/Governing_Docs/CEOS_Terms-of-Reference_Nov2013.pdf), [Strategic Guidance](http://ceos.org/document_management/Publications/Governing_Docs/CEOS_Strategic-Guidance_Nov2013.pdf), [Governance and Processes](http://ceos.org/document_management/Publications/Governing_Docs/CEOS_Governance_and_Processes_rev1.1-2019.pdf) and the three years rolling [Work Plan](https://ceos.org/document_management/Publications/CEOS_Work-Plans/CEOS_2021-2023-Work-Plan_Mar2021.pdf).
* The CEOS work plan helps to track progress across the organisations, with detailed work defined as deliverables, tracked with the [CEOS deliverable tracking tool](http://deliverables.ceos.org/). The CEOS Work Plan was endorsed on 21 March 2022. The deliverables are updated annually. WGCV has closed five deliverables this year, carried six over and created two new deliverables. The efforts of WGCV are well recognised and appreciated.

**WGCV Vice Chair Nomination**

Kuze-san noted that there are two nomination presentations from USGS and CONAE today followed by a discussion. Formal voting will take place at WGCV-51 in October. Kuze-san noted there is nothing in the terms of reference that forces a geographical rotation, meaning there is the possibility that USGS and CONAE could serve as Chair back-to-back. He cited the example of CSIRO followed by JAXA just recently.

USGS

Presenter: Cody Anderson

Main points:

* Cody Anderson is the Project Manager of the USGS EROS Cal/Val Centre of Excellence and is responsible for overseeing the entirety of Cal/Val activities of USGS.
* Cody will be succeeding Greg Stensaas who is retiring in May. Greg has been leading JACIE and commercial engagements. Greg supported Cody’s nomination.
* Cody has about 18 years of experience in optical radiometry as a Cal/Val engineer, both representing the government, and employed as a contractor on the technical side.
* Directly involved with WGCV for the last few years and has been on evaluation panels for CARD4L and RadCalNet.
* USGS is one of the co-leads of the LSI-VC and is also the incoming WGISS Vice Chair. ARD and interoperability are two headlines for USGS engagement in both WGCV and WGISS.
* Heavily involved in validation networks, getting more people involved and wants to push this to CEOS to continue to expand.
* Keen to increase commercial engagement and ensure commercial data meets the quality that government agencies require.

CONAE [[Slides](https://ceos.org/document_management/Working_Groups/WGCV/Meetings/WGCV-50/Presentations/1.4_Palomeque_WGCV50_ViceChairNomination_v3.pptx)]

Presenter: Matias Palomeque

* CONAE has a national space plan which is reviewed periodically. Priority is to provide the information needed to create socio-economic impacts.
* Seeking further cooperation with the community on cal/val reference data, protocols, knowledge, and networks.
* Encourage the revision and update of methodologies and protocols for Cal/Val and quality analysis for all types of satellite sensors; promote information sharing between CEOS Working Group on Cal/Val subgroups; foster forums among end-users for developing models, and for implementing adequate validation techniques for bio-geophysical parameters derived from EO satellite systems; promote the link and interaction among other CEOS Working Groups; explore new engagements to increase and ensure more validation sites (e.g., for biomass); continue and strengthen the current Cal/Val activities related to GEO.
* CONAE plans to promote and carry out technical meetings, promote the exchange of Cal/Val data and knowledge; foster the technology transfer in Cal/Val issues; promote joint Cal/Val activities between CEOS members, including through field campaigns; promote data interoperability tasks for information sharing; and encourage meetings with users for a better understanding of high-level products requirements.
* CONAE has experience with the SAC-C satellite, which included a multi-spectral medium-resolution camera, and a highly sensitive camera. This involved collaboration with NASA, with EO-1 and SAC-C both part of the Morning Constellation.
* CONAE has also launched the SAOCOM-1 SAR constellation and is planning the launch of SABIA-Mar in 2024.
* CONAE can offer experience in SAR calibration, interaction for ocean colour sensor calibration, full access to the In-Situ Data Telemetric Network from which soil moisture is obtained, temperature and conductivity, SAR calibration sites are available for other SAR missions, spectral measurements collection for different surface types.
* CONAE also has experience in planning spectral measurement campaigns; field campaigns for calibration and validation of high-level products from SAR acquisitions; protocols, methodologies, knowledge and algorithms for instruments and products Cal/Val; and experience with user requirements for product development.

Discussion

* Kuze-san noted that the voting will take place at WGCV-51 in October, with the new Vice Chair to be approved at the CEOS Plenary in December. He encouraged everyone to discuss the candidates within their agencies ahead of the vote.

**New Space and Future CEOS WGCV Role** [[Slides](https://docs.google.com/presentation/d/1Iq_T49pfKfUSPWNTLgArvyuEqJGG5NJ0/edit?usp=sharing&ouid=117023330514006103074&rtpof=true&sd=true)]

Presenter: Stephen Ward (SIT Chair Team)

Main points:

* New space and the future of CEOS is a theme being explored by the ESA SIT Chair team. CEOS needs to consider the new landscape for CEOS with the rapid increase in New Space commercial companies in the EO sector. CEOS needs to strategise how it fits in this landscape and works alongside and supports these new players. CEOS should be proactive.
* The share of satellites from the public programs is shrinking rapidly and that of the commercial sector is dramatically increasing. By 2020, more than 50 commercial companies have announced their intention to develop Earth-observing missions or constellations.
* There is an explosion in the data types from the commercial sector. Emphasised that now is the time to apply the standards on the public data to maintain its relevance and get the maximum benefit.
* Stephen is also contributing to the Aus/UK Spacebridge Cal/Val project, which is exploring common interests in Cal/Val.
* CEOS has a huge legacy infrastructure for Cal/Val. Stephen suggested advocating the infrastructure to the commercial sector for the benefit of the public sector.
* Noted the efforts of agencies regarding SITSATs (SI Traceability Satellites).
* An *“Open-Source tool kit”* for Cal/Val was discussed in the Space Bridge project. Many CEOS agencies and partners have expressed interest. Suggested WGCV support for this would be key given the group’s long history, infrastructure and expertise. The basic idea is to simplify access to Cal/Val and improve the utility of New Space missions.
* Welcome feedback and suggestions from WGCV experts.

Discussion

* Kuze-san noted that the New Space will have a variety of requirements for cal/val that will first need to be understood. He asked WGCV to provide their feedback to Stephen.
* Greg Stensaas (USGS) supported this and noted there are many experts in the ARD/Interoperability WS (many standards bodies, OGC, IEEE, VH-RODA and JACIE) and it would be good to bring them in through a subgroup or other mechanism. Greg also wonders how CEOS can better take advantage of the work going on outside of space agencies. Perhaps engaging them through a subgroup (e.g., IVOS/LPV) is the best way.

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| **WGCV-50-ACT-01** | WGCV members to provide feedback on the open-source toolkit idea to Stephen Ward <mail@stephenward.net> and to flag any relevant experience or tools they might be able to contribute. | **30 June** |

**Land Product Validation (LPV) Subgroup Report** [[Slides](https://docs.google.com/presentation/d/1fCdHcWwMiV3ONWOOX6tVYyTMXoKLXr2j/edit?usp=sharing&ouid=117023330514006103074&rtpof=true&sd=true)]

Presenters: F. Camacho, M.Cosh, F. Niro

Main points:

* Voting is underway for the new LPV Vice Chair position.
* Shared the action plan for 2019 to 2022, which identifies 34 actions for the subgroup, of which 6 are also within the CEOS Work Plan.
* In summary, 54% of actions have been closed, 25% are in progress and 21% have been delayed due to external circumstances.
* The team published three good practice protocol documents over the last three years on: Global Surface Albedo Product Validation, Soil Moisture, and Aboveground Woody Biomass.
* Surface Albedo Validation (SALVAL) is an online open-source tool for validation of Surface Albedo (SA) products that follows the principal of the previous CEOS OLIVE tool. This tool can be accessed from <https://www.salval.eolab.es/>. The SALVAL tool implements best practices for the validation of SA products.
	+ The team analysed 99 sites after visual screening and used various metrics to provide a score for each site. The team found that a score of 1.5 was sufficient, and this gave 73 sites and more than 22,000 samples of daily observations of albedo from 2000 to 2020.
* SRIX4Veg represents a joint effort to ensure consensus on surface reflectance validation protocols using drones. The first workshop will be held on March 28, 2022. There are 9 confirmed participants for the round-robin in Barrax, Spain in July 2022. The workshop registration link is <https://frm4veg.org/srix4veg/workshop-1/>. SRIX4Veg is a joint initiative of ESA, USGS, GA and CSIRO. There is a possibility to replicate the round-robin in Australia. This will be confirmed in a few weeks.
* Fernando is leaving the role of LPV Chair and suggested changing the point of contact to Michael Cosh and Fabrizio Niro.
* Provided an update of the Direct 2.1 database of LAI and FAPAR upscaled measurements. This database is currently being updated with 44 new sites. Multitemporal sampling was done in China, and these have been added to the database.
* Proposed to host Direct 2.1 in the CEOS WGCV Cal/Val Portal.
* Other achievements include upgrades in LPV supersites for ground reference data and the establishment of the forest biomass reference system for Tree-by-Tree Inventory Data (GEO-TREES).
* Two papers were submitted to the International Journal of Applied Earth Observations and GeoInformation related to LPV. The papers focused on the importance of consistent global forest aboveground biomass product validation and recent advances in satellite-derived global land product validation.
* Michael Cosh provided an update on the various subgroups of LPV, including the biophysical, fire/burn area, phenology, vegetation index, land cover, snow cover, surface radiation, soil moisture, LST and emissivity, and aboveground biomass. Details of the updates can be viewed from the linked [slides](https://docs.google.com/presentation/d/1fCdHcWwMiV3ONWOOX6tVYyTMXoKLXr2j/edit#slide=id.p15). He noted that there has been lots of engagement from the community looking towards CEOS product validation documents as the standard to be followed for their activities.

Discussion

* Philippe Goryl (ESA) thanked Fernando for his contribution to LPV for the last few years and welcomed Michael Cosh to the role of LPV Chair.
* Philippe Goryl noted the SALVAL tool looks good and advised Fernando and Michael to work with Paolo to see how to integrate the tool into the Cal/Val Portal.

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| **WGCV-50-ACT-02** | LPV Chair to work with Paolo to update the WGCV Cal/Val Portal with information on the Direct 2.1 database (LAI and FAPAR sites) and the SALVAL tool. | **ASAP** |

**Infrared and Visible Optical Sensors (IVOS) Subgroup Report** [[Slides](https://ceos.org/document_management/Working_Groups/WGCV/Meetings/WGCV-50/Presentations/1.7a_IVOSWGCV50.pdf)]

Presenter: N. Fox

Main points:

* The role of IVOS is to coordinate Cal/Val activities for optical sensors. The team focuses on Cal/Val requirements, identifies test sites, coordinates observations, undertakes intercomparisons between sites, archives data and makes it accessible in future, and encourages full consideration of traceability in the whole end-to-end Cal/Val cycle.
* The vision of IVOS is to facilitate the provision of ‘fit for purpose’ information by enabling data interoperability and performance assessment through an ‘operational’ CEOS coordinated and internationally harmonised Cal/Val infrastructure consistent with QA4EO principles.
* Trying to establish the key infrastructure for Cal/Val to make it a standard, accessible by the commercial sectors as well as CEOS Agencies.
* The team is working to establish a CEOS reference and method of use for L1 radiometric interoperability with GSICS including potential tools and databases.
* Planning for a hybrid meeting possibly in June/July or Sept/Oct time frame. The topics to be covered will be the updates on agency activities and progress, missions reports from thematic groups: PICSCAR, RadCalNet, Surface reflectance, Ocean Colour, Lunar, Uncertainty/traceability and what is needed and how to achieve this, Solar specific irradiance update, Terminology, Sensor level 1 harmonisation, QA frameworks assessment and reporting, Needs of climate/commercial sector, priorities, future needs for IVOS.
* PICSCAR activity is led by Patrice Henry of CNES. PICSCAR prioritises desert sites for coordination of knowledge to harmonise methodologies for interoperability and cross-calibration activities.
* SI-traceable space-based climate observation system: a CEOS and GSICS workshop, National Physical Laboratory, London, UK, 9-11 Sept 2019. The workshop report is now available: <https://doi.org/10.47120/npl.9319>. This was/will be presented and referenced at COP26, AGU, ESA Living Planet 2022, and CalCon2022.
* The 5th CEOS comparison of SST satellite validation capabilities will be held in the UK in June. There will be comparisons of radiometers and black bodies both in the laboratory (NPL) and in the Field (Bournemouth), there are currently participants from the US, Europe, China and Australia. The team is hoping to include a drone in this study.

Discussion

* It was noted that IVOS recommends the adoption of the TSIS solar irradiance spectrum by CEOS/WGCV, noting that incremental updates will be forthcoming.

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| **WGCV-50-ACT-03** | WGCV Chair and Vice-Chair to coordinate a formal statement and other announcements (including to CEOS Plenary) of WGCV’s recommendation that CEOS Agencies adopt the TSIS Solar Irradiance Spectrum, noting that incremental updates will be forthcoming. | **ASAP** |

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| **Decision 01** | WGCV recommends that CEOS agencies adopt the TSIS Solar Irradiance Spectrum, noting that incremental updates will be forthcoming. |

**TRUTHS (Traceable Radiometry Underpinning Terrestrial & Helio Studies)** [[Slides](https://ceos.org/document_management/Working_Groups/WGCV/Meetings/WGCV-50/Presentations/1.7b_Ceos_Truths.pdf)]

Presenter: N. Fox

Main points:

* TRUTHS is a climate mission, led by the UK Space Agency (UKSA), which will be delivered by the European Space Agency (ESA) to enable in-flight calibration of Earth observation (EO) satellites. TRUTHS will help deliver improved confidence in Earth Observation data gathered from space and the forecasts driven by this data.
* TRUTHS is implemented through ESA and jointly funded by the UK, Greece, Switzerland, Romania and the Czech Republic.
* TRUTHS will speed up the identification of climate change processes and help anchor observations used to support the stocktake of emissions and sinks.
* TRUTHS will also help to harmonise and improve the accuracy of data and confidence in derived information from the world’s current, historic and future satellites, creating improved time series of Essential Climate Variables and understanding of the workings of the planet.
* It will be essentially a ‘metrology laboratory’ in space, including instruments measuring energy from the sun, providing the direct traceability to International Standards (CSAR), a ‘Camera’ (Hyperspectral Imaging Spectrometer, HIS) observing the direct incoming and Earth reflected sunlight at high spectral and spatial resolution, and a novel on-board calibration system (OBCS) ensuring traceability to an absolute reference (CSAR), mimicking terrestrial methods.
* Currently in Phase A/B1, which will be completed in April/May.
* More details can be viewed in the [slides](https://ceos.org/document_management/Working_Groups/WGCV/Meetings/WGCV-50/Presentations/1.7b_Ceos_Truths.pdf).
* The UK is the dominant funder of this mission comprising around 85%. There will be a formal decision of the space agency to determine if Phase B1 meets the requirement. Further funding will be decided accordingly in November. The launch target is in Q3 of 2029.
* Working towards the international missions, which may be called CEOS Climate and Calibration Observation. The NASA CLARREO Pathfinder is a ‘sister mission’, and the team hopes there will be an overlap between the two missions. The Chinese Libra mission is also launching in 2023/24.

Discussion

* Greg Stensaas (USGS) noted that Andrea Marini is the TRUTHS project manager and Thorsten Fehr is the Mission Scientist.

**Day 1 Close**

Kuze-san thanked everyone for joining and closed Day 1 of the WGCV-50 meeting.