**Minutes 1.0**

**WGCV-50 Day #3**

**Thursday, 24 March 2022**

**List of Attendees**

**AEM:** Adrian Guzman

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

**CEO:** Marie-Claire Greening

**CNES:** Patrice Henry

**CSIRO:** Cindy Ong

**EC-JRC:** Peter Strobl

**ESA:** Philippe Goryl, Paolo Castracane

**GA:** Medhavy Thankappan

**GISTDA:** Prayot Puangjaktha

**JAXA:** Akihiko Kuze

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

**NASA:** Kurt Thome, Bruce Chapman, Jaime Nickeson

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

**NRSCC**: Xiaolong Dong

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

**UKSA:** Nigel Fox

**USDA:** Michael Cosh

**USGS:** Greg Stensaas

Yonhhuang Zhao

Lingling Ma

Antonio Valentino

**Welcome** [[Slides](https://docs.google.com/presentation/d/1Z_aIr3gUYkjiHLdoFQUMM6eGGU1haq0Z/edit#slide=id.g11ecbf6b422_0_0)]

Presenter: A. Kuze, P. Goryl

Main points:

* Kuze-san (JAXA, WGCV Chair) welcomed everyone to the meeting, summarised the Day 2 discussion and reviewed the Day 2 action items.
* He noted the upcoming launch of DLR’s EnMAP on April 1 from Florida on a SpaceX rocket.
* Cindy Ong (CSIRO) gave a brief overview of the EnMAP mission. EnMAP is a hyperspectral mission measuring from 400-2500 nm and it was first announced as approved in March 2006.
* Kuze-san congratulated DLR for getting the EnMAP mission to this point on its long journey.
* Philippe Goryl (ESA) noted the upcoming 1st workshop of ACIX-III Land, Aqua and CMIX-II, which will be held on 20-21 June 2022, at ESA/ESRIN in Frascati, Italy. He invited everyone to attend. Event registration can be accessed [here](https://earth.esa.int/eogateway/events/1st-workshop-of-acix-iii-land-aqua-and-cmix-ii).

**Synthetic Aperture Radar (SAR) Subgroup Report [**[Slides](https://ceos.org/document_management/Working_Groups/WGCV/Meetings/WGCV-50/Presentations/3.2_3.3_SAR_Chapman.pptx)**]**

Presenter: B. Chapman

* Noted that the second virtual meeting of the SAR subgroup was held on November 2-4, 2021. There were three discussion sessions on Cal/Val updates on operating SAR missions, upcoming SAR missions and CARD4L, calibration targets and SARCalNet updates. There were around 40-70 attendees over the workshop’s three sessions.
* Provided an update on operating and upcoming SAR missions and their performance.
* Upcoming SAR missions include NISAR, Copernicus Rose-L mission, Sentinel-1C and Sentinel-1 next generation, Biomass, HRWS-X.
* SARCalNet was the main focus of the SAR subgroup meeting. Reviewed calibration targets for SAR missions, including from JAXA, GA, ESA, DLR, ISRO, CONAE and NASA.
* A small writing committee was formed to work on requirements for SARCalNet, there are 15 volunteers holding monthly meetings. Three meetings have been held so far.
* Planning an in-person meeting at CSA this fall. The agenda will include SARCalNet and draft requirements for SAR calibration targets, and updates on operating and upcoming missions.

**SARCalNet [**[Slides](https://ceos.org/document_management/Working_Groups/WGCV/Meetings/WGCV-50/Presentations/3.2_3.3_SAR_Chapman.pptx)**]**

Presenter: B. Chapman

Main points:

* The team has been working on the SARCalNet for over a year. SAR instruments need external calibration targets to calibrate imagery and for long-term monitoring of image calibration stability.
* The team wanted to develop something similar to RadCalNet, to facilitate the collaboration between sensors by using the same calibration references.
* Three different types of external calibration targets are used by SAR missions: natural, artificial active and artificial passive.
* The target database is hosted on the SAR Cal/Val Portal [webpage](https://calvalportal.ceos.org/point-distributed-targets-db). However, the information shared on the site is lacking in terms of natural targets as targets are not curated, and the regions are broadly specified and are sensor frame-based. It is currently an incomplete list of natural targets and there is no reporting of image backscatter in the target database.
* The artificial targets in the database are not curated either and they could be out of date. They have varying degrees of measurement specificity, different measurement techniques and requirements, and there is no reporting of RCS or background clutter.
* Natural targets are typically large, and uniform SAR backscatter areas are needed. They can be used to monitor SAR image calibration over time. Very specific shapefiles are used to delineate each natural target area. Examples include the Amazon rainforest and Dome C in Antarctica.
* Incidence angle effect is an important measurement to compare results between sensors.
* Trying to put together a set of a natural target for SARCalNet, get the detailed specifications of the target areas, frame-based referencing for the natural target and the time history of SAR backscatter from all the different instruments. This would be important for cross-comparison of calibration results.
* Artificial targets are point targets with known brightness. It can be used to assess image radiometric calibration, geolocation accuracy and resolution. How the reflectors are to be utilised and the frequency bands of the sensors, dictate the size and material. Typically deployed by a mission for their commissioning period.
* Persistently maintained arrays can be costly as there are resurvey, maintenance and land rights costs involved.
* SARCalNet will provide a framework for the sharing of up to date target site information, including information on the survey accuracy, the deployment dates, termination date or any gap in the deployment, and characterisation of the background SAR backscatter overtime for the region, etc.
* Artificial active targets are band-specific, retransmit the received signal and can be polarimetric. These require power and need to be powered on for the satellite overpass.
* To make SARCalNet a reality, a team of volunteers has been assembled to meet virtually regularly and will implement a rotating lead, ideally having a representative from each agency.
* Working to construct a web portal for SARCalNet. The web interface requirements are 70% complete, with the lead author being Pinherio. Requirements for distributed natural targets are 10% complete, with the lead author being Klenk. The requirements for artificial targets are 15% complete, with Riemann being the lead author. The requirements for image calibration analysis are 10% complete, with the lead author being Thibeault.
* The team will define how to report values, such as brightness profile and imbalance and discuss how to format the images and documentation. The SARCalNet team notes that it would be particularly helpful if CEOS Agencies could make their calibration resources freely available for SARCalNet purposes.
* A SARCalNet submission template has been prepared. This is 85% complete, and Bruce is the lead author.
* There has been a positive response from CEOS Agencies. It would be helpful if agencies could provide their target analyses. These are often published in journals, however, it would also be good to host these on the SARCalNet portal.
* The first drafts of the aforementioned documents will be ready for review at the next general meeting of the SAR subgroup, in the Northern Hemisphere fall.
* Paolo and Muriel have started planning for the new SARCalNet webpage on the Cal/Val portal, which will be based on the current target database.

Discussion

* Kuze-san (JAXA, WGCV Chair) noted that the current web page is based on KML files. He asked if this will be the plan for the new SARCalNet site as well. Bruce noted the webpage will have a similar interface but with additional information that is accessible to the user. Will differentiate natural and artificial targets in the web interface and make more information available that is currently not shared.
* Jaime Nickeson (NASA) asked if SARCalNet is planning to engage the commercial sector in this effort. Bruce noted they are planning to engage the commercial sector. Frequent emails are received from the commercial sector. Someone from Capella is engaged in the SARCalNet writing committee, as an observer.
* Greg Stensaas (USGS) asked whether the CEOS and NISAR calibration sites are aligned for the future. He also asked if the Civil (Sentinel) and other commercials that SAR collects are included in the SAR site databases and how the test sites support SAR ARD efforts, specifically, SARCalNet comparison and trending. Bruce noted that the construction of the NISAR reflectors is in progress. The plan is to deploy them next year. They will support both left and right looking sensors, for ascending and descending passes, and so could also be used by other missions. Hoping for a long-term presence of these reflectors. Bruce also noted we often have participation from the commercial sector at the SARCalNet annual meeting. ICEYE and Capella mostly participate and use SARCalNet calibration targets. Occasionally get enquiries from other commercial sectors who would like to deploy their targets and are seeking advice. We would like to incorporate such commercial targets into SARCalNet as well. In terms of making the actual image data readily available to the community, we would request the ARD compiled with CARD4L. Sometimes, CARD4L products developed so far are not for calibration. So, for those times, raw data are used to examine calibration instead of CARD4L. For natural targets, we do expect that the requirements for CARD4L would be very relevant to understanding how we are reporting the results for the SAR backscatter calibration targets.

**Terrain Mapping Subgroup (TMSG) Report** [[Slides](https://ceos.org/document_management/Working_Groups/WGCV/Meetings/WGCV-50/Presentations/3.4_CEOS_WGCV50_TMSG-update_PS_20220324.pdf)]

Presenter: P. Strobl

Main points:

* Reported on the progress of TMSG and Digital Elevation Inter-Comparison (DEMIX) activities.
* TMSG membership site: <https://ec.europa.eu/eusurvey/runner/WGCV-TMSG_membership> still receive new subscriptions mainly because of the interest in the DEMIX activities. Members are not only coming from the CEOS background but also from the commercial sector.
* The three subgroups of DEMIX that are currently active are terminology and analytical basis, algorithms and software, and platforms and processing.
* A [conference paper](https://doi.org/10.5194/isprs-archives-XLIII-B4-2021-395-2021) on DEMIX is available on the CEOS website. There is also an introductory [video](https://youtu.be/veZA4O1rU28).
* The terminology and definitions subgroup (Subgroup 1) has essentially finished their work and has published a peer-reviewed paper ([Guth et. al. 2021](https://doi.org/10.3390/rs13183581)).
* The algorithms and software subgroup (Subgroup 2) runs an extensive test of algorithms and tools, develops criteria categories and catalogue, compares the criteria and prepares a criteria consensus document, develops data preparation protocols, implements the ‘wine contest’ concept using Jupyter notebooks. They are also preparing a peer-reviewed paper on methods and results. This type of benchmarking will hopefully provide a basis for other product types and improve useability not only with DEMs but will also see a huge rise in the available products.
* The platforms and processing subgroup (Subgroup 3) implements the work of Subgroup 2. Grateful for ESA’s support in providing the cloud-based infrastructure. Subgroup 3 works with the CEOS Earth Analytics Interoperability Lab (EAIL) to ensure easy and consistent access to the tools and data. Subgroup 3 is also preparing to roll out tests on a continental and global scale, using the agreed global master grid.
* Currently starting phase 4 of DEMIX which is the global roll-out phase. Hopes to have the methods paper containing the DEMIX results finished by the middle of this year.

**CEOS Terms and Definitions Wiki (​​CV-22-02)** [[Slides](https://ceos.org/document_management/Working_Groups/WGCV/Meetings/WGCV-50/Presentations/3.5_CEOS_WGCV50_Terminology-update_PS_20220324.pdf)]

Presenter: P. Strobl

Main points:

* This is a joint initiative between WGCV, WGISS and LSI-VC. The mandate was developed following the CEOS WGCV action item CV-49-06, in June 2021. The CEOS Common Terminology group was established in August 2021.
* Around six people are involved in this group. An expanded membership is desired to provide the capacity needed to achieve the work.
* Merged the WGISS glossary into the WGCV ‘Terms and Definitions’ wiki.
* Have decided to split terms into two groups, the ‘base terms’ and the ‘high impact terms’.
* The base terms illustrate the fundamental concepts, and they should use understandable, use unambiguous language and be built only on other base terms.
* High impact terms refer to expressions used within a domain to define more complex concepts or make important distinctions.
* Candidate lists are being assembled for both categories. Proposals are welcomed with or without a definition. Please send your inputs to [katrin.molch@dlr.de](mailto:katrin.molch@dlr.de)
* ISO and OGC have been contacted to try and align approaches and learn about the most recent standards developments in this area. The central one is ISO, which maintains the ‘Geolexica’ comprehensive glossary. CEOS should make sure that this existing ISO terminology is fit for our purposes, especially for the ‘high impact’ terms.
* Peter asked the group to provide any feedback to himself, Steven Labahn (LSI-VC) or Katrin Molch (WGISS).

Discussion

* Peter noted the terms and definitions wiki covers all EO and related terms, not just those related specifically to Cal/Val or WGCV. The goal is a vocabulary that everyone across CEOS agrees with and uses consistently. It is important to understand the concepts to achieve technical as well as semantic interoperability.
* Marie-Claire offered to help in making connections between the groups across CEOS, noting broad and cross-cutting nature of this activity.
* It was noted that WGClimate is interested in participating. Peter will be following up.

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| **WGCV-50-ACT-07** | Peter and Marie-Claire to discuss the CEOS Terms and Definitions work with a view to ensuring broad participation across CEOS. | **ASAP** |

**CEOS ARD Update** [[Slides](https://ceos.org/document_management/Working_Groups/WGCV/Meetings/WGCV-50/Presentations/3.6_CEOS_ARD_Update_24-March-2022.pptx)]

Presenter: M. Thankappan

Main points:

* Medhavy (GA) noted the CEOS-ARD Oversight Group [Terms of Reference](https://ceos.org/document_management/Meetings/SIT/SIT-37/Documents/CEOS%20ARD%20Oversight%20Group%20Terms%20of%20Reference%20v1.0%2015%20March%202022.pdf) will go for endorsement at SIT-37.
* The CEOS-ARD Oversight Group has been formed recently and was identified as a core component of the CEOS-ARD Governance Framework.
* The members are drawn from the Virtual Constellations and Working Groups. The group is led by the SIT Chair Team.
* Medhavy will be supporting Philippe Goryl (ESA) as the point of contact from the WGCV. The Oversight Group will act as a forum for all matters related to CEOS-ARD and will provide strong coordination across CEOS and promote CEOS-ARD in a unified way.
* Representatives from the CEOS Virtual Constellations are integral to the effort going forward, as these are the CEOS entities with the technical expertise to recommend, develop and maintain Product Family Specifications (PFS).
* CEOS-ARD review panels are now only used for ‘Target’ level submissions, as agreed at WGCV-49. There have not been any Target level submissions at this point.
* Medhavy will be reaching out to people to seek some nominations and set up a review panel for the SAR domain.
* Threshold level CARD4L submissions are evaluated through one-on-one interactions between the data provider and PoCs for WGCV and LSI-VC.
* Congratulated ESA for achieving CARD4L compliance with Sentinel-2 Level 2 Surface Reflectance (SR) products and DLR for achieving compliance with EnMAP SR (prior to launch).
* The Element 84 Sentinel-2 Level-2A Surface Reflectance and Sentinel-1 RTC Normalised Radar Backscatter (NRB) products are currently under peer review.
* There are four more products under self-assessment, including ALOS-2 PALSAR-2 Global Mosaics (RTC), Sentinel-1 NRB, NovaSAR-1 RTC, Harmonised Sentinel-2 and Landsat 8/9 (Level 2H), and Fused Sentinel-2 and Landsat 8/9 (Level 2F).

Discussion

* Greg Stensaas (USGS) asked if any commercial data providers have submitted an assessment for the CARD4L process. Medhavy noted the Element84 self-assessment for another version of a Sentinel-2 product. There is also a Sentinel-1 NRB self-assessment prepared by Sinergise for Digital Earth Africa.
* Philippe Goryl (ESA) noted that SuperDove will run into issues with the CEOS-ARD geometric accuracy requirements, being high resolution (same issue flagged earlier by KARI). Accommodating high resolution datasets is something LSI-VC needs to work on.

**Microwave Sensors (MSSG) Subgroup Report Continued** [[PPT](https://ceos.org/document_management/Working_Groups/WGCV/Meetings/WGCV-50/Presentations/2.2_WGCV50-MSSG-report.pptx)]

Presenter: X. Dong

* KNMI has provided the global climate data record of L2 winds and NSOAS has produced three months of HY-2B/HSCAT and CFOSAT/CSCAT L2B data, and CFOSAT/CSCAT L1B data, and 7 days of HY-2B/HSCAT L1A.
* The first progress was made on evaluation and assessment which included an active calibrator, global ocean data and natural terrestrial targets.
* The second progress noted was the standardisation and best practices of retrieval approaches of ocean surface winds (L2B data by scatterometer data and guidelines to users. This includes the geophysical model function (GMF), wind removal, and ambiguity removal to select the optimal solution for retrieval, using quality control indicators to separate good quality winds from poor quality ones. New wind products such as CSCAT coastal product, ASCAT coastal products and wind variability products were developed.
* The third progress noted was the development of guidelines/standards of validation of ocean surface winds (L2b data) by radar scatterometer data. Buoy, ECMWF and ASCAT winds are used to validate HSCAT and CSCAT winds (NSOAS). Alongside this, these comparisons are operationally performed once a week to monitor the stability of HSCAT and CSCAT (NSOAS, KNMI). Triple and/or quadruple collocation analysis is proposed to reveal the inherent wind errors and the wind calibration factors (KNMI).
* The fourth progress noted was identifying and organising collocation data. The team held a meeting to respond to a call from the Coordination Group of Meteorological Satellites (CGMS) of the World Meteorological Organization (WMO) to improve the coordination of scatterometer missions. The CGMS meeting was held in May 2021, where the constellation of scatterometers was addressed and expanding the scope of the report and including other non-conventional instruments was considered.
* Many satellites allow calibration evaluation for almost identical weather samples. The remaining effects are typically 0.1 dB which corresponds to about 0.1 m/s retrieval bias for nominal winds.
* There are now three HY-2 satellites in operation, which allows for better calibration and validations.
* A meeting has been planned for May to review the draft and document data sharing. The expected deliverables in 2022 Q2 are:
  + A draft of a standard for definition and requirement of calibration of spaceborne radar scatterometers for ocean surface vector wind;
  + A draft of a technical specification for processing of post-launch calibration data of spaceborne radar scatterometers for ocean surface vector wind;
  + A draft of a best practice recommendation for retrieval algorithms of ocean surface vector wind from spaceborne radar scatterometers;
  + A draft of a best practice recommendation for quality control and assessment of spaceborne radar scatterometer data;
  + L1 and L2 data for Cal/Val purposes;
  + Website for the deliverables;
  + Further development to an ISO standard or technical specification.
* The team has had communications with the GSICS Microwave Subgroup (MWSG). The GSICS MWSG workshop was held from February 28 to March 1, 2022. A MWSG breakout session was held on March 17, 2022. The GSICS MWSG is focused on recalibration and reanalysis of passive data for CDR.

Discussion

* Kuze-san (JAXA, WGCV Chair) asked about the current CEOS Cal/Val portal seemingly not having any deliverables from the MSSG. Xiaolong Dong (NRSCC) is not familiar with the WGCV Cal/Val portal but suggested the aforementioned deliverables could be published there.
* Changyong Cao (NOAA) asked about the ocean surface wind retrieval and whether the GSICS community showed interest when Xiaolong presented there. Xiaolong noted there was interest from the GSICS group when this task was reported. There were also discussions within the GSICS Microwave Subgroup.

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| **WGCV-50-ACT-08** | Philippe, Paolo and Xiaolong to discuss increased MSSG representation on the WGCV Cal/Val portal. | **ASAP** |

**Day 3 Close**

Kuze-san thanked everyone for joining and closed Day 3 of the WGCV-50 meeting.