

# MINUTES OF THE 38<sup>TH</sup> CEOS PLENARY (2024)

22 – 24 October, 2024

Hosted by the Canadian Space Agency (CSA)

Version 1.0 FINAL

## Executive Summary

1. CEOS Plenary endorsed the 2024 update to the **CEOS Strategic Guidance document**.
2. The initial findings of the **CEOS Executive Officer's assessment of the level of activity of CEOS constituent groups** in response to action SIT-39-01 was shared. It was agreed that further analysis is needed, specifically for the Virtual Constellations, in order to provide CEOS Principals with actionable information that can be used to direct the VCs more effectively.
3. The **Ecosystem Extent Task Team Demonstrators** demonstrated the unique value of satellite Earth observation for large geographic area studies; the benefits of combining different data types (optical, SAR, hyperspectral) for distinguishing ecosystem types; and the great potential of global, regular repeat hyperspectral data.
4. CEOS Plenary recorded as **formally completed the two-year mandate and tasks assigned to the CEOS Ecosystem Extent Task Team** in 2022.
5. CEOS Plenary agreed to establish a **Biodiversity Study Team** to undertake the mandate described in the [CEOS New Initiative Proposal – Biodiversity Study Team](#).
6. The **Working Group on Calibration & Validation (WGCV)** recommended the establishment of test sites for radiometry and geometry, where member agencies regularly collect and provide free access to imagery and associated metadata for cross referencing purposes (a New Space Task Team follow-up).
7. The **WGCV Terrain Mapping Subgroup (TMSG)** notes that continuity of open, reference quality, global DEM products is at risk and needs the attention of CEOS Agencies. Also noted the proposition for Tom Maiersperger (USGS) to serve as TMSG co-chair.
8. CEOS Plenary endorsed the **nomination of Medhavy Thankappan of Geoscience Australia as Vice Chair of the Working Group on Calibration and Validation (WGCV)** for two years (2025-2026), followed by WGCV Chair for two years (2027-2028).
9. CEOS Plenary agreed that the **WGDisasters and its EW4All subgroup should lead the CEOS response to the UN's Early Warnings for All (EW4All) initiative**, coordinating with the CEOS Secretariat, Working Groups, Virtual Constellations, and other CEOS entities as needed to address the breadth of topics. CEOS Agencies were asked to consider nominations to the WGDisasters EW4All subgroup beyond the usual participation in WGDisasters, since broader engagement and expertise (e.g., capacity development) will be critical to addressing EW4All.
10. **CEOS Agencies are invited to nominate for the next WGISS Vice Chair**, for the term of 2025 CEOS Plenary to 2027 CEOS Plenary, and subsequently the two-year WGISS Chair term to follow.
11. CEOS Plenary **endorsed the 2024 update to the Terms of Reference of the Working Group on Information Systems and Services (WGISS)**.

12. A new and simplified version of the Essential Climate Variable Inventory is coming in May 2025. It will be continuously updated and known as the **Satellite Agency Climate Data Record Inventory (SACDRI)** going forward.
13. In the days following the 2024 CEOS Plenary, CEOS agencies will be asked to review the **merged gap analysis and coordinated action plan for the prior two Essential Climate Variable (ECV) Inventory analyses** and provide feedback to the WGClimate Chair ahead of a planned virtual endorsement process.
14. WGClimate, in collaboration with the SIT Chair team, will summarise the **UNFCCC Global Stocktake (GST) lessons learned** and recommendations in a concise report for endorsement at SIT-40. WGClimate will support the SIT Chair to **update the CEOS Global Stocktake Strategy in 2025**. As part of the lessons learned report, the SIT Chair hopes to compile information on what each agency did for GST1 as well as plans for GST2.
15. CEOS Plenary **endorsed the nomination of Vincent-Henri Peuch of the European Centre for Medium-Range Weather Forecasts (ECMWF) as Vice Chair of the Joint CEOS/CGMS Working Group on Climate (WGClimate)** for two years (2025-2026), followed by WGClimate Chair for two years (2027-2028).
16. CEOS Plenary endorsed the [Statement by the Committee on Earth Observation Satellites \(CEOS\) and the Coordination Group for Meteorological Satellites \(CGMS\) on Progress in Supporting UNFCCC Needs for Global Observations](#) to be presented to the 61<sup>st</sup> Session of the UNFCCC Subsidiary Body for Scientific and Technological Advice (SBSTA) on 11 November 2024.
17. CEOS Plenary **endorsed Issue 2 of the CEOS-CGMS Greenhouse Gas (GHG) Roadmap (2024)**. Issue 2 has been written with coordination with WMO's Global Greenhouse Gas Watch (G3W) and UNEP's International Methane Emissions Observatory (IMEO) in mind. A new executive summary has been added and there is now a focus on co-developing activities with stakeholders.
18. The **Aquatic Carbon Roadmap draft is in progress**, with the outline agreed, and contributors being sought. The finalisation of the AFOLU Roadmap actions, which the LSI-VC Forests and Biomass Subgroup will track, is also nearing completion. There is a future need to ensure coordination and consistency across the three CEOS Carbon Roadmaps.
19. Regarding CEOS efforts on climate policy impact, it was recognised that engagement with national inventories is critical. The CEOS Greenhouse Gas Task Team has invited national inventory representatives from Denmark, Norway, and Germany to the next WGClimate meeting.
20. There has been **good progress on the Greenhouse Gas Best Practices**, which seeks to provide common practices for reporting facility-scale emissions. Version 1.0 is expected to be presented for endorsement at the 2025 CEOS Plenary. The UKSA 2025 CEOS Chair aims to have these methane best practices included as a measurement standard in the framework of the **Global Methane Pledge** at UNFCCC COP30 (Brazil, November 2025).
21. CEOS agencies were asked to identify points of contact to contribute to an **18-month Essential Agriculture Variables (EAV) stocktake and LSI-VC Subgroup on GEOGLAM scoping effort**. Ideal candidates are people who have been mission scientists or directed research around missions or people who have worked on agricultural uses of satellite data.
22. The **Sustainable Development Goals Coordination Group (SDG CG)** is the least actively supported of the groups assigned to a headline CEOS priority. The Coordination Group exists to coordinate work being done elsewhere in the organisation. The SDG CG needs increased support from the CEOS

Working Groups, Virtual Constellations, and agencies. All activities relevant to the SDGs should be identified as such in the 2025-2027 CEOS Work Plan.

23. **Step-C of the UNCCD External Request review** process calls for a more specific assessment of CEOS activities and capabilities against the requests. CEOS agencies and entities are invited to contact the JAXA SIT Chair Team if willing to join this assessment. There are a number of individual agency activities already underway in support of UNCCD. CEOS will have a small presence at UNCCD COP16 (2-13 December 2024 in Riyadh, Saudi Arabia).
24. CEOS Plenary endorsed the [CEOS Analysis Ready Data Strategy 2024](#). The 2024 update to the CEOS-ARD Strategy aims to reaffirm CEOS Agency commitment to CEOS-ARD, as well as reflecting on the progress to date, taking stock of future directions and needs, and confirming the plans for the coming years. The ultimate goal is to develop a broad portfolio of CEOS-ARD that is easily discovered, accessed and utilised.
25. Jeremy Werdell of NASA, PACE Project Scientist, joins as an **Ocean Colour Radiometry Virtual Constellation (OCR-VC)** co-lead.
26. The **Ocean Surface Topography Virtual Constellation (OST-VC)** is preparing its new document “*A Coordinated International Satellite Altimetry Virtual Constellation: Toward 2050*”, which is planned for finalisation in the first quarter of 2025.
27. The **Ocean Surface Vector Wind Virtual Constellation (OSVW-VC)** noted that temporal gaps in scatterometer coverage still exist, and there is a need for more observations in support of tropical cyclones.
28. The **Precipitation Virtual Constellation (P-VC)** reported that a low-inclination, wide-frequency radiometer (GMI/AMSR-class) is deemed imperative for cross-calibrating passive microwave radiometers from space agency and commercial providers. Furthermore, there is a paucity of low frequency (sub-23 GHz) passive microwave observations, which are sensitive to precipitation (high frequency sounders sense temperature and humidity). There are no planned commercial low frequency missions.
29. The **Sea Surface Temperature (SST-VC)** and **Coastal Observations Applications Services and Tools (COAST-VC)** Virtual Constellations are collaborating on coastal SST coverage needs and will bring an update to the SIT-40 meeting in April 2025.
30. CEOS Plenary endorsed the [38<sup>th</sup> CEOS Plenary Montréal Statement](#).
31. CEOS Plenary **endorsed the nomination of the Commonwealth Scientific and Industrial Research Organisation (CSIRO) as 2026 CEOS Chair**, to be supported by Geoscience Australia and the Australian Bureau of Meteorology, in representation of the Asia-Pacific region.
32. CEOS Plenary welcomed the **United Kingdom Space Agency (UKSA) as 2025 CEOS Chair**.

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## Day 1: Wednesday, October 23

### Session 1: Welcome and Core Business

#### 1.1: Welcome from CSA Vice President of Space Programs

Presenter: Jean-Claude Piedboeuf (CSA)

Main points:

- Welcomed participants to CSA on this occasion of the 40th anniversary of CEOS.
- Acknowledged the traditional owners of the land, the Haudenosaunee and Anishinaabeg peoples.
- Noted the broad reach of Earth observation and its impact on many aspects of life. Earth observation will help us understand the key challenges of our time, including climate change, disasters and sustainable development.
- Over the last 40 years, CEOS has created a robust framework for Earth observation to power decision makers worldwide. CSA is proud of their contributions to CEOS, especially most recently on the topic of biodiversity. Continuous collaboration and innovation will be needed to conserve biodiversity around the world.
- Wished everyone a productive and successful meeting.

#### 1.2: Opening Remarks, Agency Introductions, and Summary of Objectives [[slides](#)]

Presenter: Eric Laliberté (CEOS Chair, CSA)

Main points:

- A *tour de table* of in-person and online participants was undertaken.
- The objectives of the 2024 CEOS Plenary, detailed in the meeting agenda, were summarised.

#### 1.3: CEOS Executive Officer Report [[slides](#)]

Presenters: Steven Ramage (CEOS Executive Officer) and Lefteris Mamais (CEOS Executive Officer Team)

Main points:

- The Executive Officer team manages the CEOS Work Plan, which currently details 117 open deliverables. The deliverables and most recent status updates can be viewed via the [online CEOS Deliverables tool](#).
- Action SIT-39-01 called on the Executive Officer team to undertake an assessment of the level of representation and activity of each CEOS entity in the CEOS Work Plan. Findings were shared ahead of the 2024 CEOS Plenary, on October 18, in the form of a report and compilation of underlying data. A new version will be finalised following the 2024 CEOS Plenary.
- The Executive Officer team devised a framework for the assessment that took into account deliverables, meetings, and an analysis of synergy. Extent of information sharing, exchange of good practices, and mobilisation of experts were also factors considered in the analysis.
- The analysis identified some barriers and constraints, including expansion of activities, personnel or funding constraints, travel restrictions, need for increased coordination, and communication gaps.
- To fully capture the CEOS scope of activity and impact, a more comprehensive assessment would be necessary, and should involve detailed evaluations from all CEOS Agencies, including a thorough

analysis of CEOS influence outside the immediate community, especially in the areas of policy making, capacity building in developing regions, and international collaboration on environmental challenges. Assessments of impact and footprint in the broader community could be suitable metrics for an expanded analysis.

- The open call for proposals for the Post-2025 GEO Work Programme was shared with the CEOS community. There are a number of activities across the current GEO Work Programme where CEOS contributes, and the Executive Officer is working with relevant groups to coordinate any inputs from CEOS for the new Work Programme.
- A total of 16 minor changes to the CEOS Strategic Guidance document have been proposed by the Executive Officer team, CEOS Chair, and other contributors. An update of the CEOS Strategic Guidance document was presented for endorsement. The changes mostly relate to points that were out of date or statements that could be modified to make them evergreen.

#### *Discussion*

- Beth Greenaway (UKSA) thanked the Executive Officer team for their analysis of the CEOS entities and Work Plan in response to action SIT-39-01. Beth suggested that CEOS leadership level meetings such as this one would benefit from regular synoptic overviews/reports of activities happening in all CEOS entities. This would increase awareness of activity status and the potential for connections to be made. Beth also noted the underrepresentation of the Virtual Constellations in the analysis.
- Godela Rossner (DLR) suggested that it can be difficult to understand exactly where CEOS wants each of its activities to impact, e.g., a specific user group or policy framework. CEOS is perhaps missing a clear summary of the intended impact of each activity, as well as a description of how all the pieces fit together.
- Steve Volz (NOAA) thanked the Executive Officer team and appreciated the chart regarding methodology and impacts. Impacts are very difficult to discern since they are often multiple steps downstream. The metrics are therefore very important. He added that Working Groups are often more closely connected to end users. He also noted a disparity in the deliverables of the Virtual Constellations (VCs), which he would like to better understand. It raises the question of whether CEOS leadership is giving sufficient direction to the VCs. VCs have great potential to support agency planning, noting examples of recent NOAA studies on precipitation and scatterometry measurements. There would be great value in having the VCs provide feedback on new measurement techniques and usable information to help guide agency investments. CEOS needs the next level of analysis detail in regard to the VCs, and it might highlight a need for more leadership and guidance from CEOS Principals.
- Julie Robinson (NASA) suggested that the Joint CEOS-CGMS WGClimate could provide a good interface to GEO's Climate Change Working Group (CC-WG).
- It was agreed that the action from SIT-39 be recorded as complete and a new CEOS Plenary action recorded to capture the need for additional analysis with metrics and evaluation elements, particularly in relation to the Virtual Constellations.
- Osamu Ochiai (JAXA, SIT Chair Team) noted that the VCs are under the oversight of the SIT Chair, so the SIT Chair should be engaged in any assessment of the VCs.
- The new CEOS Strategic Guidance document was endorsed. Eric Laliberté (CEOS Chair, CSA) thanked everyone that contributed to the review, and called on CEOS to consider the four headline priorities when it comes time to developing the 2025-2027 CEOS Work Plan in the next few months.

<b>CEOS-38-01</b>	<p>CEOS Executive Officer to consult the SIT Chair Team on the requirements and approach for the further level of analysis that was requested by the Plenary in order to close action SIT-39-01 (regarding an assessment of the level of activity of CEOS constituent groups).</p> <p><i>Note: The SIT Chair Team is responsible for the CEOS Virtual Constellations (VCs), and this additional analysis was primarily related to the VCs. The goal is to provide CEOS Principals with actionable information that can be used to direct the VCs more effectively.</i></p>	<b>SIT-40</b>
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<b>Decision 38-01</b>	CEOS Plenary endorsed the 2024 update to the CEOS Strategic Guidance document.
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## Session 2: Biodiversity

### 2.1: 2024 CEOS Chair Biodiversity Theme Overview and Report on Outcomes [[slides](#)]

Presenter: Eric Laliberté (CEOS Chair, CSA)

Main points:

- CSA's chosen theme for 2024 was biodiversity, focusing on two aspects:
  - o Exploring a post-2024 strategy for CEOS and biodiversity; and,
  - o Increasing policy footing and linkages to the biodiversity community.
- Various activities took place throughout 2024, including a Joint Workshop on Biodiversity with GEO, GEO BON, and the UN CBD Secretariat. CEOS perspectives on the workshop were compiled [here](#). The CEOS Chair has drafted a [Joint Communiqué on Biodiversity](#) in collaboration with these external stakeholders, which has been shared ahead of CEOS Plenary for information. The Communiqué might be developed further and presented to CEOS at a later date for formal endorsement.
- CSA has also been working on a CEOS New Initiative Process submission as a next step following the good work the Ecosystem Extent Task Team began for CEOS in the biodiversity domain. A Biodiversity Study Team is proposed, and this will be discussed under agenda item 2.4, where it is presented for decision.

### 2.2: Canadian Ecosystem Extent Demonstrator: Hudson Bay Lowlands – Report on Outcomes and Future Developments [[slides](#)]

Presenter: Jason Duffe and David Harper (Environment and Climate Change Canada)

Main points:

- Environment and Climate Change Canada (ECCC) is a new CEOS Associate, joining the organisation at the 2023 CEOS Plenary. ECCC is proud to provide a lead in Jason Duffe for the Ecosystem Extent Task Team Demonstrator.



- The Demonstrator aimed to develop standardised mapping approaches with machine learning, AI, cloud computing and EO to map ecosystems across the target area (Wapusk National Park in the Hudson Bay Lowlands). The ecotypes established were designed to be consistent with International Union for Conservation of Nature and Natural Resources (IUCN) 2.0 Typology, with a comprehensive hierarchical classification framework for global ecosystems. The Demonstrator also aimed to determine which CEOS sensors contribute most to the discrimination of ecotypes.
- The Demonstrator highlighted: the importance of high-resolution bare Earth models for ecosystem mapping and change analysis; that fully polarimetric SAR data is as good as multispectral optical data at discerning ecotypes; hyperspectral data is also important, but more work is needed to implement this research at scale.
- This Wapusk National Park activity will now cease; however the broader Hudson Bay Lowlands Demonstrator will continue.

#### *Discussion*

- Karen St. Germain (NASA) noted that NASA's Plankton, Aerosol, Cloud, ocean Ecosystem (PACE) and the NASA-ISRO Synthetic Aperture Radar mission (NISAR) will provide new and insightful sources of data for these studies.
- The importance of continuous observations and time series was noted, particularly for quantitative assessments.
- There were some comments made about the level of coordination of the *in situ* community. Jason clarified that from his experience in Canada, *in situ* activities are spread across a number of different organisations, government departments, etc, and there is a need for more coordination and sharing of data each of these groups generate. There have been discussions about an *in situ* database, however this is yet to eventuate and a tremendous amount of time was spent looking for legacy plot and land cover data and then cross-referencing this to IUCN Global Ecosystem Typology.

### **2.3: CEOS Ecosystem Extent Task Team (EETT) and Demonstrator Outcomes [[slides](#)]**

Presenter: Gary Geller (EETT Co-lead, NASA/JPL)

Main points:

- The EETT set out to assess the utility for mapping ecosystem extent using current and new space-based observations that will become available in the next 10 years. Findings were compiled in a white paper that also features recommendations on user engagement, technical needs, and capacity development.
- Demonstrator work is underway in Hudson Bay (Canada), Western Australia, and Costa Rica. The Wapusk National Park part of the Hudson Bay Demonstrator is wrapping up, but the work will continue more broadly. The other two Demonstrators will continue for at least two more years, continuing the momentum started by the EETT.
- Data Cubes (Open Data Cube specifically) are integral to this work, providing a means to work with and merge different datasets, including from different satellite missions and *in situ* data.
- With the completion of the white paper (2023) and the Demonstrator results (see [slides](#)), the Task Team's work and mandate is concluded.

## *Discussion*

- Selma Cherchali (CNES) thanked the EETT and Co-Leads on behalf of CNES. The level of work has been very impressive, with great results achieved in a short period of time. Selma commended the white paper which was well received by the community. During the 2024 CEOS Plenary side meetings it was correctly recognised that biodiversity is very complex, and the field covers much more than just ecosystem extent, highlighting the need for a broader view in CEOS. CNES is dedicated to supporting efforts around biodiversity both nationally and at CEOS level.
- Selma also highlighted a recent scientific seminar and congress in France, during which one of the top priorities highlighted at national level was related to biodiversity including the marine domain. CNES is currently studying a future high resolution hyperspectral mission for biodiversity applications.
- Selma thanked Sandra Luque for her leadership of the EETT and the Costa Rica Demonstrator, as well as her overall commitment and coordination efforts at both French and European levels.
- Alex Held (CSIRO) reported that CSIRO will continue to support CEOS biodiversity efforts, including through the work of Shaun Levick and Adriana Parra Ruiz on the Greater Western Woodlands Demonstrator. He remarked that it is good to see the uptake of the CEOS Analytics Lab, which is built on the CSIRO Earth Analytics Science and Innovation (EASI) platform.
- Julie Robinson (NASA) commended the work of the EETT, which has been delivered as scheduled and provided a strong basis for CEOS investigation of biodiversity through the white paper and Demonstrators, the latter of which have provided amazing insights. Julie acknowledged the leadership of the EETT and Demonstrators and noted the dual agency participation nature of Jason (ECCC and CSA) and Sandra (CNES and CNRS (Centre National de la Recherche Scientifique))
- The benefit of combining SAR and hyperspectral optical data for distinguishing different ecosystems was noted. While these individual missions were not necessarily designed with this in mind, it reinforces the recommendation from the white paper regarding multimodal data.
- Mauro Facchini (COM) congratulated the team on the impressive outcomes, which were delivered in a short time. The multimodal work is particularly noteworthy, noting that the Copernicus programme will soon have a greatly expanded portfolio of technologies, including hyperspectral and L-band SAR. Gary Geller (NASA/JPL) agreed that these offerings will be revolutionary, however we need to continue working on technologies to deal with the massive volumes of data – particularly the case for hyperspectral, further complicated by the numerous levels of products needed to extract all of the information from the different bands. But overall, global, regular repeat hyperspectral data will be tremendously valuable.
- Eleni Paliouras (ESA) thanked the four co-leads and the CEOS Agencies that supported them. The task team has achieved much more than many thought possible when this task started. She thanked CSA for elevating this topic during their Chair year, which was well timed.
- ESA will host BIOSPACE25 in February 2025 at ESA ESRIN. It is the first international conference exclusively dedicated to the application of Satellite Remote Sensing (SRS) across the various dimensions of biodiversity and addressing the use of Earth observations in all realms, from terrestrial, freshwater, coastal to marine ecosystems. CEOS is a partner organisation for the event. ESA looks forward to continuing the discussions around biodiversity and the continued work of the Demonstrators.

- Jonathon Ross (GA) echoed the sentiments about the amazing amount of work done in a short period of time. As an agency that delivers operational products to an array of different users, GA is grateful to have this insight into what is possible for this domain. The results show the unique value of satellite Earth observation, that is, being able to periodically cover such large, remote, geographic areas as selected for the Demonstrators. It is hard to imagine how that would be done without space-based Earth observation. All projects also leveraged multiple datasets and used them together in an integrated way, showing the importance of collaboration and groups like CEOS.
- Eric Laliberté (CEOS Chair, CSA) thanked the EETT co-leads and Demonstrator leads. The challenge put to them was to showcase the value of EO and they have answered this very well. The comments from CEOS Agencies at this Plenary show that biodiversity is of importance to all of us – it is a global challenge with close connections to other global challenges such as climate. CEOS needs to continue thinking about the interplay between the different global challenges. The collaboration between different agencies and missions demonstrates the strength of CEOS.
- Roger Sayre (USGS), Shaun Levick (CSIRO), and Sandra Luque (CNES/CNRS) added their thanks to agencies for their support, as well as Gary Geller (NASA/JPL) for his co-leadership of the EETT. Behind the leads there are a lot of colleagues who have also done a substantial amount of work, and the co-leads thank them for their efforts.

#### Decision 38-02

CEOS Plenary recorded as formally completed the two-year mandate and tasks assigned to the CEOS Ecosystem Extent Task Team in 2022.

## 2.4: Future of CEOS and Biodiversity [[slides](#)]

Presenter: Eric Laliberté (CEOS Chair, CSA)

Main points:

- A [video address from UN CBD](#) was shared.
- The CEOS Chair proposes the establishment of a CEOS Biodiversity Study Team for one year to provide information for CEOS to assess which shape or form biodiversity activities would take in the CEOS organisation, as well as to design any new entity mandate, should that be required. The CEOS Biodiversity Study Team would:
  - o Assess the options for sustainable support for biodiversity in CEOS.
  - o Conduct a stakeholder assessment.
  - o In collaboration with the CEOS Executive Officer, develop supporting documentation for the recommended option.
  - o Consult across CEOS entities and agencies to leverage existing practices on biodiversity and implement lessons learned and recommendations.
- These activities were adjusted and refined during the 2024 CEOS Plenary side meeting.
- The four EETT co-leads are ready and willing to assist in starting the process. Agencies are invited to identify Study Team members within two weeks.

### Discussion

- Karen St. Germain (NASA) appreciated the efforts of the EETT, which have helped elevate biodiversity in CEOS and shown us what a path forward might look like. In light of upcoming missions, NASA strongly supports a Biodiversity Study Team to investigate a suitable model for longer term CEOS

engagement on biodiversity. NASA will continue to support the activity and nominate additional biodiversity and mission expertise. NASA supports the proposed one-year approach.

- Mauro Facchini (COM) supports the proposal for a Biodiversity Study Team and COM will seek to identify a nomination. Mauro suggested a review of existing activities in this domain.
- Regarding the stakeholder assessment, Eric Laliberté (CEOS Chair, CSA) clarified that this will not aim to be comprehensive but instead focus on just the most important stakeholders. Constraining the scope is important. Understanding who will be part of that analysis would be one of the first tasks for the new Study Team.
- Paul Bate (UKSA) congratulated the CSA CEOS Chair Team for their work on biodiversity. The 2025 CEOS Chair Team hopes to maintain the energy. The UK has key policies in this area and UKSA are keen to see how EO can support. Given that the four existing EETT Co-Leads are willing to take this forward, UKSA is happy to endorse the Biodiversity Study Team, with the presented mandate.
- Eleni Paliouras (ESA) reported that ESA is very supportive of the idea to establish a dedicated Study Team to explore how this topic should move forward and would be pleased to nominate participants.
- Selma Cherchali (CNES) supported the establishment of a Biodiversity Study Team. She suggested we need a continued collaboration with UN CBD and IPBES. Assessing the other key stakeholders will be an important question. CNES will come back at a later date to confirm the involvement from CNES in the Study Team.
- David Harper (ECCC) is supportive of CEOS advancements on biodiversity. The joint dialogue between CEOS, UN CBD, GEO and GEO BON has been valuable. Canada's principal for GEO also sits on the board for GEO BON and will continue to advocate for biodiversity and EO. ECCC is willing to continue contributing to these efforts.
- Steve Volz (NOAA) congratulated the science teams and the CEOS organisation for proposing a way forward. Steve seconded Mauro Facchini's comment on identifying existing activities in this domain. He noted that the EETT white paper makes a start on this. For NOAA the water/marine aspect of biodiversity is of particular importance, and they will identify suitable experts to support the Study Team.
- Jenn Lacey (USGS) is very happy to see biodiversity as a focus area for CEOS and commended what has been accomplished already. USGS concurs with the recommendation to continue as a Study Team and will continue to support a co-lead in Roger Sayre. As options are being assessed by the Study Team, it would be good to share these broadly throughout the year before reaching the 2025 CEOS Plenary.
- Alex Held (CSIRO) is supportive of the Biodiversity Study Team. Alex hopes that this new team can also include aquatic and marine ecosystems where possible. Mangroves and wetlands are of particular importance. Alex will attend the UN CBD COP next week in Cali, Colombia and offered to represent CEOS. He will attend the launch of the GEO Ecosystems Atlas. Eleni Paliouras noted that Marc Paganini of ESA is also attending UN CBD COP.
- Hironori Maejima (SIT Chair, JAXA) recognised the connection between biodiversity loss and climate change, which is a headline priority for JAXA and the SIT Chair Team. JAXA agrees with the proposal for the Biodiversity Study Team. JAXA will look at how to contribute and the SIT Chair Team will continue to support this topic in its CEOS leadership/oversight role.

- Eric Laliberté noted that the four co-leads are discussing the exact nature of their leadership roles and how this will evolve in the new Study Team. He added that the Study Team should comprise biodiversity experts as well as CEOS administrative experts in a multi-disciplinary team. The SIT Chair Team support is welcomed. CSA will continue to be involved and will remain part of the CEOS Troika and Secretariat over the next year, in addition to being involved in the Biodiversity Study Team itself.

<b>Decision 38-03</b>	<p>CEOS Plenary agreed to establish a Biodiversity Study Team to undertake the mandate described in the <a href="#">CEOS New Initiative Proposal – Biodiversity Study Team (23 Oct 2024)</a> and to initially be led by the former co-leads of the CEOS EETT (exact leadership structure is still under discussion).</p> <p><i>Note: The multidisciplinary study team should include biodiversity experts and representatives who are knowledgeable of CEOS governance and processes.</i></p>
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<b>CEOS-38-02</b>	CEOS agencies are asked to nominate individuals to the newly formed Biodiversity Study Team, via the former Ecosystem Extent Task Team co-leads.	<b>30 November 2024</b>
<b>CEOS-38-03</b>	CEOS Biodiversity Study Team to present its findings and recommendations to the 2025 CEOS Plenary, with a progress report at SIT-40 and (at least) quarterly updates to the CEOS Secretariat.	<b>CEOS Plenary 2025</b>

### Session 3: CEOS Working Groups

#### 3.1: Working Group on Capacity Building and Data Democracy (WGCapD)

No report.

#### 3.2: Working Group on Calibration and Validation (WGCV) [[slides](#)]

Presenter: Philippe Goryl (WGCV Chair, ESA)

Main points:

- Thanks to CONAE and USGS for hosting the two WGCV meetings held during this calendar year.
- The WGCV subgroups remain very active. Some notes for 2024 include:
  - o Infrared Visible Optical Sensors (IVOS): IVOS has identified a consolidated subset of test sites for radiometry and geometry to serve as a common CEOS reference against which sensor performance can be demonstrated in a consistent manner. This is one task in response to the New Space Task Team white paper. This is covered further below.
  - o Terrain Mapping (TMSG): The TanDEM-X Global DEM covers the entire land mass to 99.9%, and the Copernicus DEM is an edited version of the TanDEM-X Global DEM. With more than 17 and 14 years in orbit, both satellites have considerably exceeded their design lifetime (initially 5.5 years). The TMSG notes that continuity of open, reference quality, global DEM products is at risk and needs the attention of CEOS agencies. CEOS needs to secure future DEM updates and bare surface DEMs in particular (in another frequency band in addition to X).

- Microwave Sensors (MSSG): MSSG is active in retrieval and validation of high winds with combined active-passive microwave measurements and on sea surface atmospheric pressure with microwave remote sensing.
- Synthetic Aperture Radar (SAR): The WGCV SAR Workshop 2024 is being held on November 12-15, 2024 in Ahmedabad, India. The workshop is hosted by ISRO.
- Atmospheric Composition (ACSG): ACSG has developed a [Best Practice Protocol For The Validation Of Aerosol, Cloud, And Precipitation Profiles](#). This was endorsed at WGCV-54 in October 2024.
- Land Product Validation (LPV): LPV has identified evapotranspiration and GPP/NPP as land product focus areas.
- The [SI-Traceable Satellite \(SITSat\) Task Team](#) is led by Nigel Fox (NPL) and Yolanda Shea (NASA). It aims to provide a forum for collaboration on these new types of missions. The TRUTHS for Climate Workshop will be held on 27-28 June, 2024, in Harwell, UK.
- A [Workshop on Pre-flight Calibration and Characterisation of Optical Satellite Instruments for Earth Observation](#) is being organised jointly by CEOS WGCV and CGMS GSICS on 19-22 November 2024, at ESA-ESTEC.
- The Good Practice Guidelines for UAV-based Surface Reflectance Validation document is undergoing a final review and should be finalised by November 2024.
- To facilitate a consistent understanding of the relative radiometric and spatial performance characteristics of passive optical satellite Level 1 imagery, WGCV recommends that CEOS member agencies regularly collect and provide free access to imagery and associated metadata against a common 'CEOS reference' from their own missions as well as encourage/request any commercial data provider they can influence to do the same. The imagery can be made available for collection by API or deposited to a dedicated CEOS archive held in the UK Earth Observation Data Hub (EODH). CEOS will provide feedback on relative performance for QA purposes for both satellite operators and data users via a tool/web app developed by NPL (UKSA).
- WGCV plays an important role in peer reviewing self-assessments of data providers against the CEOS-ARD specifications.
- Philippe Goryl (ESA) steps down as WGCV Chair after two years in the role. Cody Anderson (USGS) will become the new WGCV Chair. A nomination has been received from Geoscience Australia for Medhavy Thankappan to take on the role of WGCV Vice Chair for 2025-2026, and subsequently Chair for 2027-2028. Medhavy has been an active member of WGCV for many years and contributes to numerous areas of WGCV activity, such as RadCalNet, CEOS-ARD assessments, the SITSat Task Team, and many more.

#### *Discussion*

- Jenn Lacey (USGS) thanked Philippe Goryl and ESA for their leadership of WGCV. USGS was happy to host the recent joint WGCV and WGISS meeting week. USGS is glad to continue supporting WGCV through the chair term of Cody Anderson (USGS). USGS also nominates Tom Maersperger as a co-chair of the Terrain Mapping subgroup. USGS strongly supports the nomination of Medhavy Thankappan (GA) as the next WGCV Vice Chair.
- Jenn noted the 2025 Joint Agency Commercial Imagery Evaluation (JACIE) Workshop, which will be held April 7-11, 2025 at USGS Headquarters in Reston, Virginia, USA.

- Steve Volz (NOAA) commended the work of the WGCV and noted that the GNSS Reflectometry Radio Occultation activities in WGCV are of great support to NOAA. NOAA also strongly endorses Medhavy Thankappan as the next WGCV Vice Chair, noting NOAA's long-standing collaborations with him and Geoscience Australia.
- Beth Greenaway (UKSA) thanked Philippe for his service as WGCV Chair. WGCV is incredibly active and is central to many activities, noting links to interoperability, CEOS-ARD, etc. Beth noted that the new SITSat Task Team is co-led by Nigel Fox of the UK's National Physical Laboratory (NPL). This new Task Team directly supports ESA's TRUTHS mission, which will be a 'standards laboratory in space', setting the 'gold standard' reference for climate measurements.
- Mark Dowell (COM) noted the breadth of WGCV's activities, noting that it is very complex. It is critical that CEOS know how to harness all of the efforts of WGCV to support its ambitions, e.g., with New Space, Greenhouse Gas Task Team, etc.
- Selma Cherchali (CNES) thanked Philippe Goryl and ESA for their leadership, as well as all agencies for supporting the foundational data quality work of the WGCV. Selma also noted the progress in WGCV on TIRCalNet (Thermal Infrared Calibration Network), which was proposed during the CNES CEOS Chair term in 2022.
- Jonathon Ross (GA) recognised the necessity of WGCV activities to every part of CEOS and agency activities. Without the foundational trust provided by cal/val and the WGCV, we wouldn't be able to see other parts of CEOS flourish. Quality assessment will only become more important in future, as the Earth observation market expands. Philippe and his ESA team have taken great care to steward all elements of WGCV. GA is pleased to nominate Medhavy Thankappan as Vice Chair, and he has GA's full support to keep this important Working Group running. WGCV is taking some of the most pragmatic steps to engage with the private sector and New Space, approaching engagement through the lens of how to complement the activities of the commercial sector. The New Space quality assessment tool/hub will help users and the private sector understand and improve their data. GA looks forward to supporting and enhancing this work going forward.
- Julie Robinson (NASA) also acknowledged the robust and broad group in WGCV. Philippe's leadership has been exemplary, noting that he has actively looking at other areas of CEOS and considering how WGCV can provide support. This should be a best practice in CEOS. NASA also endorses the nomination of Medhavy Thankappan as the next WGCV Vice Chair.
- Eleni Paliouras (ESA) echoed all of the supportive comments for Philippe, noting that he has been an amazing chair for the Working Group and ESA is proud to support his work. ESA is also pleased to endorse the nomination of Medhavy Thankappan.
- Pakorn Apaphant (GISTDA) thanked Philippe for welcoming GISTDA to join the Working Group. GISTDA will continue working with and supporting WGCV activities.
- Philippe Goryl noted that the Very High-resolution Radar and Optical Data Assessment (VH-RODA) 2024 Workshop will be held in ESA-ESRIN, Frascati, Italy, on 2-6 December 2024. VH-RODA could be considered the European counterpart to the aforementioned JACIE Workshop, and there is close collaboration. Both forums have been instrumental in working with New Space, with the Match-up Database proposal being a result of these discussions.
- WGCV works closely with metrology institutes, including National Physical Laboratory (UK), National Institute of Standards and Technology (U.S.) and Physikalisch-Technische Bundesanstalt (Germany) and has been actively trying to reinforce those connections in recent years. A metrology for climate action session will be organised at the ESA Living Planet Symposium in June 2025. Liability of data is

an important aspect and something we need to work on. That is how can the data we are providing be somehow 'certified', confirming authenticity of data and fitness for certain purposes.

#### Decision 38-04

CEOS Plenary endorsed the nomination of Medhavy Thankappan of Geoscience Australia as Vice Chair of the Working Group on Calibration and Validation (WGCV) for two years (2025-2026), followed by WGCV Chair for two years (2027-2028).

### 3.3: Working Group on Disasters (WGDisasters) [[slides](#)]

Presenter: Laura Frulla (WGDisasters Chair, CONAE)

Main points:

- The UN's Early Warnings for All (EW4All) initiative is built on four pillars to support countries in building and operating effective and inclusive multi-hazard early warning systems. These are: (1) Disaster risk knowledge; (2) Detection, observation, monitoring, analysis, and forecasting; (3) Warning dissemination and communication; and (4) Preparedness and response capabilities.
- WGDisasters has been exchanging information since earlier this year with a view to understanding which ongoing initiatives within WGDisasters might make a contribution to EW4All or are related, and to which pillars. The assessment has shown that pillars 1 and 2 are the most relevant. A dedicated EW4All subgroup has been established under WGDisasters to manage the study of the opportunity of EW4All. WGDisasters has multiple activities of relevance and value to EW4All.
- There is an opportunity for CEOS to adopt a much more ambitious role in the coordination of satellites to collect information in areas where gaps have been identified by EW4All. This requires resources, especially for value added product generation, the scope of which may be substantial and beyond normal CEOS scope.
- In 2025, WGDisasters will meet in Italy (March) and Argentina (September).

*Discussion*

- Laura Candela (ASI) agreed with the conclusion presented by WGDisasters regarding EW4All. Operational capabilities are needed to expand on the activities developed by the Working Group. The type of information required by EW4All is quite different to that of the type usually provided by WGDisasters activities.

### 3.4: Follow-on Discussion: Broader CEOS Engagement with the United Nations' Early Warnings for All (EW4All) Initiative [[slides](#)]

Presenter: Osamu Ochiai (SIT Chair Team, JAXA)

Main points:

- SIT Chair had an action to confer with the WGDisasters Chair and Vice Chair regarding potential CEOS contributions to the UN's Early Warnings for All (EW4All) initiative.
- EW4All is striving for global early warning coverage by 2027 for hazardous weather, water, and climate events.
- There are four pillars of EW4All with 1 and 2 being of most relevance to CEOS. (1) Disaster risk knowledge and management (led by UNDRR); and (2) Detection, observation, monitoring, analysis,



and forecasting (led by WMO). An action plan for pillar 2 has been received, and area 1B and 2B are of direct relevance to satellite data.

- The WMO Secretariat sent a letter to CEOS and CGMS Agencies in September 2023 to solicit a response to the data call for the EW4All initiative in relation to satellite products and applications. This was not a direct request of CEOS as an organisation, rather individual CEOS agencies. WGDIsasters was requested to prepare a response.
- The broader nature of EW4All led to the action on the SIT Chair to consider a whole of organisation CEOS response / approach. After further analysis and participation in the WGDIsasters-22 meeting, it has been concluded and agreed with WGDIsasters that while the scope of EW4All is broader than WGDIsasters, WGDIsasters is best placed to lead the CEOS response. WGDIsasters has already created a subgroup to have these discussions and members from relevant CEOS teams should be included in the subgroup.

#### *Discussion*

- Julie Robinson (NASA) noted a challenge regarding the scope of EW4All and the cross over with meteorological early warnings. This relies on the expertise of the operational meteorological agencies in CEOS to navigate. Furthermore, much of the activity for EW4All is related to capacity development, so WGCapD needs to be closely engaged. NASA agrees with the proposal for WGDIsasters to lead the activity within CEOS.
- Albert Fischer (WMO) thanked the SIT Chair and WGDIsasters for taking on this topic. There has been a shift in focus from global coordination to building capacity in EW4All. While the initial scope was limited to 30 countries, WMO is now targeting all developing countries. WMO's main emphasis is on weather hazards. The biggest task in relation to EO is analysing the gap between available products and the needs of regional user groups. WMO has already identified the need for visualisation tools and capacity development programs. WMO welcomes CEOS contribution to this gap analysis.
- Phil Evans (EUMETSAT) noted that 30% of the global population is not covered by early warning systems, and these people are also the most likely to be impacted by hazards. Operational agencies are already quite active in this space, especially in Africa. EUMETSAT supports the recommendation for CEOS engagement via WGDIsasters, while noting that WGCapD or some other mechanism is needed to help CEOS clearly understand the real needs of less developed countries.
- Klaus Schmidt (DLR) recognised that WGDIsasters is well placed to undertake the coordination role within CEOS, but the team should be sure to reflect on what is already available including via the International Charter on Space and Major Disasters and the national meteorological agency capabilities within each country. DLR recommends that this activity remain at high visibility within CEOS, at the SIT and Plenary level. Osamu Ochiai (SIT Chair Team, JAXA) agreed that this activity should continue to be followed at the SIT level.
- Mark Dowell (COM) noted that often CEOS Agency members are already working on these types of activities with other counterparts. For example, in the European Commission there is an EU Africa space flagship program that is developing capabilities related to EW4All as well as undertaking related capacity development. EUMETSAT and ECMWF are also involved in the implementation.
- Steve Volz (NOAA) concurs that WGDIsasters is the right focal point for EW4All in CEOS. There are many places where operational agencies are already engaging and these need to be considered. NOAA received a request related to EW4All directly and has since provided a summary of relevant projects. CEOS will need to be sure not to duplicate efforts.

- Eric Laliberté (CEOS Chair, CSA) recommended that others beyond the usual WGDIsasters membership be welcomed to the EW4All subgroup. It was requested that the current tasks and membership of the subgroup be shared so that Principals can review them.
- Laura Frulla (WGDIsasters Chair, CONAE) noted that the EW4All subgroup is yet to meet, and the tasks will be confirmed at the first meeting. Laura agreed that SIT Chair support will be necessary to ensure continued visibility across CEOS.

<b>CEOS-38-04</b>	WGDIsasters Chair to provide an overview of the current tasks and composition of the EW4All subgroup so that CEOS Principals can assess additional nominations and resourcing for the subgroup.	<b>CEOS SEC-329</b>
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<b>Decision 38-05</b>	<p>CEOS Plenary agreed that the WGDIsasters and its EW4All subgroup should lead the CEOS response to the UN’s Early Warnings for All (EW4All) initiative, coordinating with the CEOS Secretariat, Working Groups, Virtual Constellations, and other CEOS entities as needed to address the breadth of topics.</p> <p><i>Note: CEOS Agencies were asked to consider nominations to the WGDIsasters EW4All subgroup beyond the usual participation in WGDIsasters, since broader engagement and expertise (e.g., capacity development) will be critical to addressing EW4All. The SIT Chair team will ensure that EW4All remains on the agenda for CEOS leadership-level meetings.</i></p>
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### 3.5: Working Group on Information Systems and Services (WGISS) [[slides](#)]

Presenter: Tom Sohre (WGISS Chair, USGS)

Main points:

- WGISS is asking CEOS Plenary to endorse a small update to the WGISS Terms of Reference, with the most substantive updates being to the stakeholder section. The purpose and objectives were reviewed, and the existing text remains consistent with the current goals of WGISS.
- The WGISS Interoperability Handbook 2.0 is progressing and available on GitHub [here](#). WGCV and LSI-VC have offered support to lead chapters, with WGCapD, the CEOS Executive Officer and SEO also supporting the work.
- WGISS has completed the v1.0.0 release of the *CEOS STAC EO Collection and Granule Discovery Best Practice* document and is performing a final review prior to publishing.
- A *CEOS Collections Management Best Practice* is in development, with completion planned in 2025.
- A survey of CEOS is being conducted to gather feedback on the current state and use cases for Artificial Intelligence and Machine Learning (AI/ML) in relation to Earth observation. The AI/ML White Paper will be kept open as a living document in GitHub, due to the rapidly evolving nature of the sector.
- Future WGISS meetings are planned in Bangkok, Thailand (March 24-28, 2025) and Oberpfaffenhofen, Germany (October 13-17, 2025).
- CEOS Agencies are invited to participate in any of the WGISS Interest Groups:

- Data Preservation and Stewardship (POC: [mirko.albani@esa.int](mailto:mirko.albani@esa.int))
- Interoperability and Use (POC: [nitant@sac.isro.gov.in](mailto:nitant@sac.isro.gov.in))
- Discovery and Access (POC: [damiano.guerrucci@esa.int](mailto:damiano.guerrucci@esa.int))
- Technology Exploration (POC: [ikehata.yousuke@jaxa.jp](mailto:ikehata.yousuke@jaxa.jp))
- CEOS Agencies are invited to nominate for the next WGISS Vice Chair position (and subsequently Chair), which would have a term beginning at the 2025 CEOS Plenary.
- Contributions to WGISS work can be made via [GitHub.com/ceos-org](https://github.com/ceos-org).

#### Discussion

- Tim Stryker (USGS) noted the joint WGCV and WGISS meeting held last week at USGS EROS and the encouraging discussions that took place there on topics related to interoperability. Interoperability is a core function of CEOS and Tim encouraged broad participation in the Interoperability Framework / Handbook to ensure it is comprehensive.
- There were no objections to the update of the WGISS Terms of Reference and it was endorsed.

#### Decision 38-06

CEOS Plenary endorsed the 2024 update to the Terms of Reference of the Working Group on Information Systems and Services (WGISS).

### 3.6: CEOS/CGMS Working Group on Climate (WGClimate) [[slides](#)]

Presenter: Jeff Privette (WGClimate Chair, NOAA)

Main points:

- The Essential Climate Variable (ECV) Inventory is the only international compendium of current and future Climate Data Record (CDR) metadata. It is accessible at <https://www.climatemonitoring.info>. Version 5.0 (November 2024) will add 45 previously submitted records. A new and simplified version of the Inventory is coming in May 2025. In addition to user interface updates, the new Inventory will be continuously updated, with reference versions issued as needed. It will be referred to as the Satellite Agency Climate Data Record Inventory (SACDRI) going forward.
- The related ECV Inventory gap analysis identifies shortcomings for climate monitoring in the current and future space architecture and aims to identify opportunities to improve CDR production for GCOS ECVs and Fundamental CDRs. The 2024 Gap Analysis Report and Coordinated Action Plan is now available. It is based on ECV Inventory v3.0 and v4.1. It will be released to the CEOS community for a review period of 4-6 weeks, after which a virtual endorsement process will be initiated. Endorsement could also be targeted for SIT-40 in April 2025 if preferred by the CEOS community.
- The Space Agency Response to the Global Climate Observing System (GCOS) Implementation Plan (2022) describes needs/gaps and is produced every 5-6 years. Inputs for the next revision have been collated and are now being synthesised. GCOS will review the document from January 2025, and it is planned to be distributed to CEOS for endorsement at SIT-40. GCOS will start working on its next Status Report in early 2026.
- The CEOS-CGMS Statement to SBSTA 61 is presented to CEOS Plenary for endorsement, ahead of its communication by the UK delegation to SBSTA 61. Prior years statements focused broadly on space agencies' climate-related activities, accomplishments, and advocacy. The 2024 Statement instead focuses on satellite-enabled climate advances and understanding, as well as support to recent Greenhouse Gas initiatives.

- WGClimate provided theme ideas for the UNFCCC COP29 Earth Information Day (EID) as well as inputs for the EID Information Note (covering Issue 2 of the CEOS Greenhouse Gas Roadmap and the Global Stocktake Lessons Learned activity).
- The Greenhouse Gas Task Team under WGClimate is active and progressing the Global Stocktake Lessons Learned and Greenhouse Gas Roadmap.
- The nomination of Vincent-Henri Peuch of the European Centre for Medium-Range Weather Forecasts (ECMWF) as Vice Chair of the CEOS/CGMS Working Group on Climate (WGClimate) for two years (2025-2026), followed by WGClimate Chair for two years (2027-2028), is presented for endorsement by the 2024 CEOS Plenary.
- Wenying Su (current WGClimate Vice Chair, NASA) rotates to the Chair position at the conclusion of the 2024 CEOS Plenary, following the completion of Jeff Privette’s term as WGClimate Chair for NOAA.

*Discussion*

- Paul Bate (UKSA) thanked WGClimate for coordinating and delivering the CEOS-CGMS Statement to SBSTA 61. The Statement in its current form has been communicated to the UK delegation. UKSA hopes to have the Statement reflected into the conclusions/proceedings of the SBSTA meeting and help bring Earth observation to a higher level of visibility within UNFCCC.
- Karen St. Germain (NASA) endorsed Vincent-Henri Peuch as the next WGClimate Vice Chair. NASA is pleased to support Wenying Su as WGClimate Chair for the next two years.
- Mauro Facchini (COM) noted Vincent-Henri Peuch’s long history of support to the Copernicus Atmosphere Monitoring Service (CAMS). Mauro supported the nomination of Vincent-Henri as the next WGClimate Vice Chair.
- Jonathon Ross (GA) welcomed the change in structure and focus of the CEOS-CGMS Statement to SBSTA 61. The statement now tells a compelling story and is a great input for this key moment in the annual calendar. Jonathon hopes we can build on this momentum to encourage further exploitation of EO for adaptation and other aspects of The Paris Agreement.
- Eleni Paliouras (ESA) agreed that the CEOS-CGMS Statement to SBSTA 61 takes a good step forward in terms of its messaging. The Statement does a great job of communicating what the EO community offers. ESA supports the nomination of Vincent-Henri Peuch as the next WGClimate Vice Chair.
- Eric Laliberté (CEOS Chair, CSA) noted that the ECV Inventory Gap Analysis Report and Coordinated Action Plan were not submitted with the materials for the 2024 CEOS Plenary, so these will need to be distributed via email after the meeting and follow a virtual endorsement process or return to SIT-40 for endorsement.

<b>CEOS-38-05</b>	WGClimate Chair to circulate the merged gap analysis and coordinated action plan for the prior two Essential Climate Variable (ECV) Inventory analyses for CEOS review.	<b>29 October 2024</b>
<b>CEOS-38-06</b>	CEOS agencies to review the merged gap analysis and coordinated action plan for the prior two Essential Climate Variable (ECV) Inventory analyses and provide feedback to	<b>29 November 2024</b>

	the WGClimate Chair ahead of a planned virtual endorsement process.	
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Decision 38-07	CEOS Plenary endorsed the nomination of Vincent-Henri Peuch of the European Centre for Medium-Range Weather Forecasts (ECMWF) as Vice Chair of the Joint CEOS/CGMS Working Group on Climate (WGClimate) for two years (2025-2026), followed by WGClimate Chair for two years (2027-2028).
Decision 38-08	CEOS Plenary endorsed the <a href="#">Statement by the Committee on Earth Observation Satellites (CEOS) and the Coordination Group for Meteorological Satellites (CGMS) on Progress in Supporting UNFCCC Needs for Global Observations</a> to be presented to the 61 <sup>st</sup> Session of the UNFCCC Subsidiary Body for Scientific and Technological Advice (SBSTA) on 11 November 2024.

## Session 4: Carbon, Climate Policy Impact, Greenhouse Gas Observation Coordination

### 4.1: JAXA SIT Chair Overview of Session and their Climate Policy Impact and Greenhouse Gas Observation Coordination Themes [[slides](#)]

Presenter: Hironori Maejima (SIT Chair, JAXA)

Main points:

- CEOS and its agencies invest significant effort in the climate sphere and should assess and reflect on whether we are engaging with the right stakeholders, in the best way – or whether we might consider alternate or additional strategies.
- The Global Stocktake of the Paris Agreement is a data-driven policy exercise. It is the observation community’s opportunity to play a key role in the process.
- The SIT Chair has prioritised Climate Policy Impact and Greenhouse Gas Observation Coordination themes for their two-year term.

### 4.2: UNFCCC Global Stocktake (GST) Lessons Learned and CEOS GST Strategy Update [[GST Lessons Learned slides](#)][[GST Strategy Update slides](#)]

Presenter: Osamu Ochiai (SIT Chair Team, JAXA) and Wenying Su (WGClimate Vice Chair, NASA)

Main points:

- [Pilot atmospheric carbon dioxide \(CO<sub>2</sub>\) and methane \(CH<sub>4</sub>\) budgets delivered for the first Global Stocktake \(GST1\)](#) were not widely utilised by the national inventory community to compile or validate inventories submitted to GST1.
- CEOS, in collaboration with the WMO and GEO, developed the report titled “*The Role of Systematic Earth Observations in the Global Stocktake*” in early 2022. Despite the significance of space-based data, it currently plays no formal role in key UNFCCC processes, such as national communications, biennial reports, transparency reports, NDCs, or adaptation communications required under the Paris Agreement.
- There are three categories of lessons learned in the WGClimate analysis (below, with sample lessons in each case, refer to the [presentation](#) for the full set of lessons):

1. Lessons learned from inputs to the GST process, including Greenhouse Gas flux datasets and the Research and Systematic Observation (RSO) synthesis report.
    - For example, the need to reconcile GHG estimates between top-down and bottom-up approaches and to better quantify uncertainties in both methods.
  2. Lessons learned from engagement with the UNFCCC (including COP) and key stakeholders.
    - UNFCCC is the facilitator in the GST process and the COP delegations are the decision makers. CEOS worked very closely with UNFCCC points of contact who were strong advocates for the RSO community for the first GST, but did not have a close link with COP delegations to foster champions who can advocate for the RSO community.
    - Need to engage national inventory communities/compiler when developing the flux products.
  3. Lessons learned regarding communication gaps and the need to address them.
    - The GST process is still evolving and not fully understood, requiring close collaboration with the UNFCCC to stay informed.
- A number of points have been identified in relation to future GHG flux datasets.
  - The CEOS community is invited to provide feedback on these lessons learned and recommendations.
  - WGClimate, in collaboration with the SIT Chair Team, will summarise the lessons learned and recommendations in a concise report for endorsement at SIT-40 (April 2025) and will support the SIT Chair to update the CEOS GST Strategy in 2025.
  - The [CEOS Global Stocktake Portal](#) was updated for 2024.

<b>CEOS-38-07</b>	<p>CEOS agencies to provide feedback on the <a href="#">First UNFCCC Global Stocktake (GST) Lessons Learned Study</a> to the WGClimate Chair and the SIT Chair team. Where recommendations have already been addressed by agencies it would be helpful to flag these instances and outcomes.</p> <p><i>Note: WGClimate, in collaboration with the SIT Chair team, will summarise the lessons learned and recommendations in a concise report for endorsement at SIT-40. WGClimate will support the SIT Chair to update the CEOS Global Stocktake Strategy in 2025. As part of the lessons learned report, the SIT Chair hopes to compile information on what each agency did for GST1 as well as plans for GST2.</i></p>	<b>29 November 2024</b>
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*Discussion*

- Beth Greenaway (UKSA) looks forward to working with the SIT Chair Team to understand how to unlock these barriers during the 2025 CEOS Chair term. It is clear that we need a more direct route to the UNFCCC. While there is truth in the assessment presented, we should be careful not to create too negative of a picture – a lot of EO products are used in IPCC assessments, for example.

- Steve Volz (NOAA) recalled that it is the member states, not the UNFCCC who decides which data is ultimately used. CEOS Agencies should consider closer engagement with those that are responsible for their country's national inventories. NOAA has worked with the United States Environmental Protection Agency to understand their specific needs and tailor training packages to assist. These groups are the 'customers' we have to convince of the value of satellite EO.
- Karen St. Germain (NASA) suggested that CEOS Agencies should work within their own countries and establish examples of national inventory engagement and data uptake. In the United States, there is an initiative that is collective between the space agencies and the inventory agencies – the U.S. Greenhouse Gas Center, which is working to build the skills and confidence to advance and use these top-down estimates. With that said, it is also important for WGClimate to continue to engage at UNFCCC and SBSTA levels and establish clear communication channels.
- Selma Cherchali (CNES) recognised the upcoming launches of ambitious new missions like CO2M and Microcarb. The analysis notes the gap between top-down and bottom-up estimates and the potential advancements related to high resolution modelling. Missing from the assessment is an understanding of the accuracy/QA of current GHG products and the ability of upcoming missions to address the confidence of this data. Accuracy and QA of data for the GST and carbon/climate applications is paramount. Perhaps there could be a mechanism at CEOS level to address this, maybe through sharing examples.
- Selma added that these QA difficulties also extend to the Agriculture, Forestry and Other Land Use (AFOLU) domain, where there is a large and complex portfolio of products. Space agencies need a consolidated understanding of product accuracy.
- Mauro Facchini (COM) advocated for the importance of joint effort in this area. While engaging (as individual agencies) with national inventories is clearly needed, it is important we continue with collective efforts like those being coordinated via CEOS. Both angles are important. EO is increasingly referenced as a tool within climate policies; we are seeing a shift from a push to pull dynamic, and this has been achieved together.
- Mark Dowell (COM) noted that there have been efforts in CEOS and also in the GEO Climate Working Group to establish direct connections between space agency representatives and national inventory people. He agreed that it does seem to be something we need to do and compiling a list of external counterparts could be a good first step.
- The [SilvaCarbon](#) model has been very good in regard to the forest inventory community. This type of model for dedicated capacity building efforts is very important and could potentially be replicated for other focus areas.
- The emergence of the WMO Global Greenhouse Gas Watch (G3W) could potentially make a big difference when it comes to satellite EO data's impact on GST2. It should both increase dialogue at UN level and provide links to downstream users.
- Vincent-Henri Peuch (ECMWF) noted that G3W should represent a step change in terms of capacity to reach all countries of the world. Co-creation and establishing working capacity in-country is key.
- Steve Volz (NOAA) suggested that GEO and the regional GEOs could be a good partnership, given their connections to governments and ministers. That outreach capability could be helpful to broaden the conversation.
- Jonathon Ross (GA) is happy to share experiences working with agencies in Australia. Regional approaches can have mixed results.

- Julie Robinson (NASA) suggests that WGClimate tabulate what each CEOS agency did for GST1 and what is planned for GST2. This could then be used to select some demonstrators.
- Wenying Su (NASA) noted that in preparation for their next meeting in February, WGClimate has started reaching out to various external stakeholders. National inventory people will be invited to participate.
- WGClimate will also be working further with WMO and CAMS. WGCapD support would be welcomed to develop training materials in support of the future GST. The Asia-Pacific Regional Space Agency Forum (APRSAF) could be a useful regional opportunity to reach new communities of users.
- Albert Fischer (WMO) noted that the first GST was driven by the Parties, and it was a very political process. Statistical and environmental agencies are the ones in charge of the inventories. The scientific community was not so prominent in GST1. G3W will hopefully help to change this for future Stocktakes.

### **Welcome from Lisa Campbell, President of the Canadian Space Agency**

- The whole CSA team has been looking forward to this meeting. Thanks to everyone who helped prepare.
- It is encouraging to see the progress on biodiversity, which is a topic that also came up in the context of the International Astronautical Congress (IAC) recently.
- Over the past 40 years, CEOS has grown to have over 60 member agencies, all of which are contributing to the vital mission of CEOS.
- The Canadian Earth Observation Strategy was published in 2022, and the message of the benefits of satellite EO is propagating across the Canadian government as a result.

### **4.3: CEOS Aquatic Carbon Roadmap Update [[slides](#)]**

Presenter: Marie-Helene Rio (OCR-VC Co-Lead, ESA)

Main points:

- The Aquatic Carbon Roadmap is the third pillar of the CEOS Carbon Roadmaps, alongside the GHG Roadmap and AFOLU Roadmap. It aims to provide a framework and serve as a guiding vision for long term (15+ years) coordination of CEOS Agency observing programmes in support of the science and policy needs for aquatic carbon related information in the context of the CEOS Carbon Strategy.
- The Roadmap draft is in progress, with the outline now generally agreed, and contributors being sought.
- The Blue Carbon from Space Forum, held 14-17 May 2024, brought together coastal blue carbon experts from different fields (remote sensing, *in situ*, modelling), relevant stakeholders and international organisations to discuss the state of the art, challenges and opportunities regarding the use of satellite EO to advance blue carbon priority areas. The workshop summary and papers will directly contribute to the CEOS Aquatic Carbon Roadmap.
- The Ocean Colour Radiometry Virtual Constellation (OCR-VC) has proposed two aquatic carbon sessions for the ESA Living Planet Symposium next year, specifically on ocean carbon and coastal blue carbon.
- The development of the Roadmap will strongly benefit from interactions and coordination with other CEOS activities, in particular with the GHG and AFOLU Roadmaps.



#### 4.4: CEOS-CGMS Greenhouse Gas Roadmap Issue 2 [[slides](#)]

Presenters: Yasjka Meijer (WGClimate GHG Task Team Lead, ESA) and Wenying Su (WGClimate GHG Task Team Deputy Lead, NASA)

Main points:

- GHG Roadmap issue 1 was published in March 2020 and followed the recommendations in the preceding GHG White Paper. The Task Team made the decision to update the Roadmap in 2024 and publish an 'Issue 2'.
- Issue 2 has been established in coordination with WMO's Global Greenhouse Gas Watch (G3W) and UNEP's International Methane Emissions Observatory (IMEO). A new executive summary has been added. There is now a focus on co-developing activities with stakeholders. Section 3 covers "Stakeholders and their Requirements", which explicitly includes WMO G3W and UNEP's IMEO. Section 5a describes thematic activities for "Fostering Stakeholder Engagement"
- John Worden (NASA) is the GHG Task Team (GHG TT) contact for IMEO, and Vincent-Henri Peuch (ECMWF) is the GHG TT contact for G3W.
- The final Issue 2 was delivered on October 8, 2024, and CEOS Plenary was asked to endorse the document.
- The draft was also circulated to CGMS, and the Secretariat confirmed on October 23 that no issues have been raised, and it can be considered endorsed from their perspective.
- The GHG TT's focus will now be on updating the short-term actions described in online GHG Roadmap Annex C spreadsheet, which remains a 'living' document.
- Additional resources for specific new/larger activities will be reflected in the CEOS Work Plan and/or the CGMS High Level Priority Plan (HLPP).

#### *Discussion*

- Guennadi Kroupnik (CSA) recognised the recent increase in the amount of commercial GHG data. He asked what considerations have been given to integrating commercial players into the GHG Roadmap and CEOS activities.
- Yasjka Meijer (GHG Task Team Lead, ESA) noted this will be covered by the following item on best practices. The commercial sector is not always straightforward to work with. Recognising their importance, the GHG TT chose to reflect commercial missions in the [CEOS GHG Portal](#). The next step is to work towards more common products, improving traceability and consistency. CEOS has been working with IMEO, as well as MethaneSat and GHGSat specifically.
- Julie Robinson (NASA) congratulated the GHG TT for their effort, which was apparent through her involvement in some of the difficult discussions that took place on teleconferences. This work is at the cutting edge of how we're pushing sensing technology to meet a pressing environmental and policy need. The pace of development of the GHG measurement landscape as well as societal needs necessitated a significant rethink of the GHG Roadmap content to put us on good footing. Having an internationally agreed approach is a great start.
- Steve Volz (NOAA) endorsed Issue 2 of the GHG Roadmap, remarking that it is a step above what was envisaged just five years ago. He noted that a lot of the different measurements have different levels of maturity, and as such, different levels of research needed. It would be good to have a description of the levels of maturity for each type of measurement. National inventories are one of the user

groups and we need to have these people at the table to discuss. Having some recognition of these focal points would be helpful, and NOAA would be happy to provide some of those linkages.

- Yasjka Meijer noted that the maturity of data products really comes together with the refocus of the GHG Roadmap where the team is going back to focus on core data products and their fitness for purpose. This is why the team is prioritising co-development with entities that will use the data, such as G3W, IMEO, etc. The GHG TT is also looking to expand to national inventories and entities – inviting representatives from Denmark, Norway, and Germany to the WGClimate-22 meeting (February 11-13, 2025; Harwell, UK). We need to keep in mind that these are the entities that will integrate the data sources and CEOS should avoid moving too far into the domain of Level 4 products, however we need to maintain awareness and provide guidance to ensure they are of good quality.
- Wenying Su suggested that assessment of the maturity of data products could perhaps be addressed in the update of Annex C, and we could seek to include broader communities in that stage of the process if desired.

**Decision 38-09**

CEOS Plenary endorsed [Issue 2 of the CEOS-CGMS Greenhouse Gas \(GHG\) Roadmap \(2024\)](#).

#### **4.5: Greenhouse Gas Best Practices [[slides](#)]**

Presenters: John Worden (NASA/JPL) and Paul Green (NPL)

Main points:

- The Global Methane Pledge (signed by 155 countries) seeks to reduce methane emissions by 30% between 2020 and 2030. Fugitive emissions and high emitters (emissions greater than 100 kg per hour) represent a substantial fraction of emissions.
- Public and New Space observations of CO<sub>2</sub> and CH<sub>4</sub> are increasingly being used to identify high emitters for regulatory purposes (in addition to science) and are likely needed for functioning reporting obligations and carbon markets. We need a set of common practices for reporting facility-scale emissions so that producers of the data know what is expected by the community and users know how the data should be generated and reported, so that it can be trusted.
- Intended users of the Greenhouse Gas Best Practices are both producers of these datasets (to know what is expected from the community) and users of these datasets (to understand how it should be generated and used).
- The timeline for the Greenhouse Gas Best Practices foresees peer review and finalisation of version 1 by the end of 2025, with endorsement by CEOS planned at the 2025 CEOS Plenary (November 4-6, 2025; Bath, UK).
- Continued support by CEOS agencies is requested to help define these best practices for quantifying and reporting emissions. In time, this effort should be transferred to an appropriate operational organisation, after agreement between vested parties.
- The team has identified the need to extend the Best Practices to area flux mappers to better support the UNFCCC Global Stocktake and Global Methane Pledge, as well as diffuse point sources and other sectors.

- Producer engagement is currently good, but we need to increase user engagement beyond IMEO to ensure broad uptake.

#### *Discussion*

- Beth Greenaway (UKSA) stated that this work will underpin satellite EO's credibility in this space and drive uptake. UKSA's 2025 CEOS Chair theme on methane monitoring and the Global Methane Pledge is built around these best practices. UKSA is talking to different bodies within the UNFCCC regarding this work.
- Steve Volz (NOAA) pointed out that we are now seeing the potential of geostationary missions in this domain, noting that the GOES series has been shown to have utility for methane detection and monitoring.
- Osamu Ochiai (SIT Chair Team, JAXA) shared that the SIT Chair Team has been in discussion with the incoming UKSA CEOS Chair Team about how this work should be brought towards UNFCCC COP 30 (where an update of the Global Methane Pledge is targeted). Engagement needs to start this year at COP 29, perhaps with some specific country examples.
- We also need to look at how the best practices scale, in terms of both emission type and geographic scales.
- The best practices could put us in a position to support emission trading capabilities, however the frequency of observations would need to increase to sustain such monitoring.

#### **4.6: CEOS Agriculture, Forestry and Other Land Use (AFOLU) Roadmap [[slides](#)]**

Presenter: Osamu Ochiai (SIT Chair Team, JAXA)

Main points:

- The CEOS AFOLU Roadmap is a framework for long-term coordination of agency programmes in support of the needs of society for Agriculture, Forestry and Other Land Use (AFOLU) related information, with a particular focus on the needs and ambition cycle of the Global Stocktake of the 2015 Paris Climate Agreement.
- The CEOS AFOLU Roadmap was approved by CEOS Plenary in November 2023 and implementation actions were presented in draft form at SIT-39 in April 2024. The LSI-VC Forests & Biomass Subgroup has been progressing the actions since then, in coordination with the SIT Chair Team.
- Actions across all recommendations broadly fall into three categories:
  - o Those pertaining to **presently available data to support AFOLU procedures** as detailed in the 2006 IPCC Guidelines for National GHG Inventories volume 4, and their 2019 refinement.
  - o Actions to develop **new or improved products that would allow more accurate and/or easier implementation** of the IPCC Guidelines.
  - o Actions to facilitate **greater interaction with the GHG Roadmap and hence improve characterisation of land management emissions through Monitoring and Verification Systems (MVS)** based on satellite-based atmospheric inversions.
- Individual actions were shown as examples, along with details of the work behind them and underway in CEOS agencies. See [presentation](#) for details.
- Next steps for the AFOLU Roadmap are as follows:

- We need a final push from the co-leads (Inge Jonckheere (ESA), Lola Fatoyinbo (NASA), and Osamu Ochiai (JAXA)) to reach a consistent and complete set of actions which are well characterised, with due dates and suitable POCs.
  - The LSI-VC-16 meeting confirmed that LSI-VC will coordinate the annual update and reporting on the AFOLU Roadmap actions status, timed to support the annual CEOS Work Plan update.
  - CEOS Carbon Roadmap alignment is necessary, and LSI-VC is looking to the SIT Chair Team for coordination between the three Roadmap activities.
- The many contributors to the AFOLU Roadmap action development were thanked: Stephen Briggs, Ben Poulter, Lola Fatoyinbo, Inge Jonckheere, Frank Martin Seifert, Clement Albergel, Laura Duncanson, Neha Hunka, Joana Melo, Martin Herold, Ake Rosenqvist, Richard Lucas, Shaun Quegan, Sylvia Wilson, Daniele Requena, Yasjka Meijer, David Crisp, Sven Gilliams, Zoltan Szantoi, Vincent-Henri Peuch, and more.

#### **4.7: LSI-VC GEOGLAM Subgroup and Essential Agriculture Variables (EAVs) [[slides](#)]**

Presenter: Alyssa Whitcraft (NASA/UMD, LSI-VC GEOGLAM Subgroup)

Main points:

- Essential Agriculture Variables (EAVs) are satellite-based building blocks that support actionable, policy-required information on the state, change, and forecast of agricultural land use and productivity. There are approximately 40 EAVs, with around half relating to climate and weather and the other half more agricultural in nature.
- GEOGLAM wants to further develop the EAVs and achieve full characterisation of the variables and observation gaps, along with an understanding of how they might be closed.
- CEOS Agencies are asked to nominate relevant specialists who can engage in this process to become members of the LSI-VC GEOGLAM Subgroup. The subgroup is looking for people who have been mission scientists or directed research around missions, as well as people with agricultural applications expertise. A scoping workshop will hopefully be arranged in 2025. A kick-off teleconference will be planned in February. The proposed timeline is shown below.
- It is hoped that at the 2025 CEOS Plenary the scope and priorities of the LSI-VC Subgroup on GEOGLAM and their plans for EAV timelines and priorities can be presented.

**Specific Ask of Plenary: Designate a Representative for Telecon in February Led by JAXA SIT Chair Team**

SIT Chair Hosted Telecon	Stocktake and Scoping Workshop 2025	GEOGLAM EAV Workplan Meeting
<p><b>Objectives:</b></p> <ul style="list-style-type: none"> <li>▪ Engage agencies who are not currently participating in GEOGLAM activities</li> <li>▪ Determine best path/PoC for agency involvement in LSI-VC Subgroup on GEOGLAM</li> </ul> <p><b>Proposed Attendees:</b></p> <ul style="list-style-type: none"> <li>▪ JAXA SIT Chair Team</li> <li>▪ Agency Representatives</li> <li>▪ GEOGLAM Secretariat</li> </ul>	<p><b>Objectives:</b></p> <ul style="list-style-type: none"> <li>▪ <b>Stocktake</b> of past, current, and future EAV-related projects, activities, and missions/instruments               <ul style="list-style-type: none"> <li>◦ <i>No comprehensive record!</i></li> </ul> </li> <li>▪ Clarify and agree upon <b>CEOS-GEOGLAM "Scope of Work"</b> <ul style="list-style-type: none"> <li>◦ <i>Last done in 2019</i></li> </ul> </li> </ul> <p><b>Proposed Attendees:</b></p> <ul style="list-style-type: none"> <li>▪ <b>CEOS:</b> agency missions &amp; applications</li> <li>▪ <b>GEOGLAM:</b> stewards</li> </ul> <p><b>Precursors:</b></p> <ul style="list-style-type: none"> <li>▪ CEOS Agency PoCs ID'd (<b>SIT-39-05</b>)</li> <li>▪ Workshop support (<b>Plenary-38 Update</b>)               <ul style="list-style-type: none"> <li>◦ <i>Including a "chaser" to manage</i></li> </ul> </li> </ul>	<p><b>Objectives:</b></p> <ul style="list-style-type: none"> <li>▪ <b>Robust gap analysis:</b> <ul style="list-style-type: none"> <li>□ <i>Observations</i> (current, planned)</li> <li>□ <i>Methods</i> (Open? Transferrable? Scalable? Validated? Good?)</li> <li>□ <i>Dependencies?</i></li> </ul> </li> <li>▪ Establish a short- and mid-term <b>implementation plan for EAVs</b> <ul style="list-style-type: none"> <li>◦ Level of effort and funding needs for different EAV "work packages"</li> <li>◦ Decision points for CEOS and GEOGLAM leadership</li> </ul> </li> </ul> <p><b>Proposed Attendees:</b></p> <ul style="list-style-type: none"> <li>▪ <b>GEOGLAM:</b> stewards</li> <li>▪ <b>CEOS:</b> LSI-VC + select agency PoCs</li> </ul>

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*Discussion*

- Beth Greenaway (UKSA) supports the presented proposal and will explore UK participation in the subgroup. UKSA remains open to exploring the possibility of hosting a workshop later in 2025 but would like to make sure it is a cross-CEOS activity with broad agency participation.
- Julie Robinson (NASA) thanked the GEOGLAM team for bringing this important topic and opportunity forward to CEOS. It is important that CEOS re-engage with this area in light of recent developments and policy progression. Food security is closely tied to climate change and this topic aligns well with the SIT Chair themes. The end point of EAVs is a very compelling one.
- Alex Held recalled CSIRO's investment in the GEOGLAM Rangelands and Pasture Productivity (RAPP) component, which has significant overlap with Land Degradation Neutrality (LDN). CSIRO will aim to identify staff to support the work of GEOGLAM and the EAVs.

<b>CEOS-38-08</b>	<p>CEOS agencies to identify points of contact to contribute to an 18-month Essential Agriculture Variables (EAV) stocktake and LSI-VC Subgroup on GEOGLAM scoping effort. Nominations should be sent to: <a href="mailto:akwhitcraft@geoglam.org">akwhitcraft@geoglam.org</a></p> <p><i>Note: Ideal candidates are people who have been mission scientists or directed research around missions or people who have worked on agricultural uses of satellite data.</i></p>	<b>29 November 2024</b>
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**4.8: Session Close** [[slides](#)]

Presenter: Hironori Maejima (SIT Chair, JAXA)

Main points:

- The [CEOS Greenhouse Gas Portal](#) has been updated for 2024, including a new case studies section.
- Thanks to everyone that has contributed to the SIT Chair themes.

## Day 2: Thursday, October 24

### Session 5: CEOS Agency Reports #1

#### 5.1: CEOS Agency Reports

##### 5.1.1: National Oceanic and Atmospheric Administration (NOAA) [slides]

Presenter: Steve Volz

Main points:

- GOES-19 launched in June 2024 and is currently undergoing post-launch testing. GOES-19 includes a solar coronagraph.
- Near-Earth Orbit Network (NEON) is the next generation of NOAA's low Earth orbit satellite programme, which will be demonstrated by the QuickSounder mission, scheduled to launch in 2026.

##### 5.1.2: World Meteorological Organization (WMO) [slides]

Presenter: Albert Fischer

Main points:

- There is a shift to climate, water, and related environmental services necessitating an Earth system approach for the WMO Space Programme. Global Greenhouse Gas Watch (G3W) is one such climate/environmental service, which was adopted by the WMO Congress in 2023.
- WMO is looking to re-establish the Polar Space Task Group, for improved observations of the cryosphere in polar and high-mountain regions.
- WIGOS Vision 2040 update is planned for adoption by the WMO Congress in 2027.

##### 5.1.3: European Centre for Medium-Range Weather Forecasts (ECMWF) [slides]

Presenter: Vincent-Henri Peuch

Main points:

- Artificial Intelligence is having a significant impact on the way ECMWF forecasts weather for Europe.
- Starting the next global reanalysis (ERA6) in January 2025. Will be available later in 2025.

##### 5.1.4: Deutsches Zentrum für Luft-und Raumfahrt (DLR) [slides]

Presenter: Godela Rossner

Main points:

- X-band continuity mission, TerraSAR-FOX, is now in Phase 0 study. Phase A is funded and will begin in 2025.
- EnMAP is in routine operation, with the global background mission covering CHIME, IMEO, and PIC sites.
- To continue the joint US-German series of gravity missions, GRACE-C has completed phase B in 2024, with CDR scheduled for spring 2025.
- DLR issued a call for new mission concepts in September 2024.

- In addition to their own missions, DLR also supports a number of new space missions through ESA InCubed and data buys, including Ororatech, Constellr and Marble Imaging.

#### 5.1.5: Canadian Space Agency (CSA) [slides]

Presenter: Guennadi Kroupnik

Main points:

- A fourth satellite for the Radarsat Constellation Mission (RCM) is planned to launch as soon as possible to ensure longevity and resilience of RCM. A next generation system, RADARSAT+ is planned for the mid 2030s. This represents a total investment of CAD\$1.012 billion from the Canadian government.
- The HAWC (High Altitude Aerosols, Water Vapour and Clouds) programme covers three distinct projects: the Canadian TICFIRE Instrument to be flown on NASA's AOS-Sky Satellite, the Canadian satellite (HAWCSat) carrying two Canadian instruments (ALI and SHOW), and the development of downstream science applications. HAWCSat Phase 0 has just closed, with three proposals submitted.
- Digital Earth Canada will be a federated analytics environment to transform data into information for decision-making.
- There is a new satellite EO office within CSA, which brings together ECCC, NRCan, and CSA.

#### 5.1.6: Environment and Climate Change Canada (ECCC) [slides]

Presenter: David Harper

Main points:

- The Terrestrial Snow Mass Mission seeks to observe seasonal terrestrial snow mass and close a key observation gap via new spaceborne measurements. The preliminary design phase has been completed, but funding is not fully secured.
- The Arctic Observing Mission is a proposed Canadian-led international satellite mission to provide a better understanding of the effects of climate change in the North.
- Satellite EO references were included in Canada's 2030 Nature Strategy, which seeks to halt and reverse biodiversity loss in Canada.

#### 5.1.7: Canada Centre for Mapping and Earth Observation (CCMEO) / Natural Resources Canada [slides]

Presenter: Robert De Abreu

Main points:

- Natural Resources Canada (NRCan) operates a number of ground stations across Canada. These are undergoing renewal over the coming years to meet the needs of current and future missions.
- WildFireSat will be the world's first purpose-built operational satellite system for wildfire monitoring. This is closely tied to the work of CEOS WGDIsasters, through the Wildfire pilot.
- NRCan will soon provide 30m Radarsat Constellation Mission (RCM) Compact Polarimetric Data, processed to CEOS-ARD specifications, open and free for all users.

#### 5.1.8: Geo-Informatics and Space Technology Development Agency (GISTDA) [slides]

Presenter: Poramet Thuwakhom

Main points:

- The companion satellite for THEOS-2 will be launched in early 2025.
- GISTDA is working with Thai university students to develop SchoolSat, to transfer satellite development knowledge, cultivating a skilled workforce capable of satellite development in Thailand.

#### 5.1.9: European Organisation for the Exploitation of Meteorological Satellites (EUMETSAT) [slides]

Presenter: Phil Evans

Main points:

- MTG-I1 will be fully operational by the end of 2024, following its launch in December 2022. Products are now available on a pre-operational basis. There were some issues with the calibration mechanism, which have been resolved through cross-calibration with IASI (onboard the MetOp satellites) to achieve a similar level of accuracy of design.
- EPS-Sterna is a planned constellation of six microwave sounders, designed to complement existing sensors. Full approval is expected by June 2025 for the first launch in 2029.
- Pilot purchases of radio occultation data is underway from the private sector. Although value was demonstrated, capturing that value required a lot of work in operations and ensuring scientific quality – more so than with a EUMETSAT-owned and controlled satellite.
- EUMETSAT is moving towards more cloud services for data and looking at the integration and value of Artificial Intelligence approaches.

#### 5.1.10: USGS [slides]

Presenter: Jennifer Lacey

Main points:

- Landsat 7 will be decommissioned over the course of the next year, as the planned refuelling mission was cancelled.
- LandsatNext will continue to improve the 50+ year Landsat archive.
- DLR and Geoscience Australia have signed agreements with USGS as part of the Landsat 2030 International Partnership Initiative. These agreements will ensure robust global land imaging data is available to support CEOS initiatives.

*Discussion*

- Jonathon Ross reported that Geoscience Australia is excited to be the first of many partners with USGS on the Landsat 2030 International Partnership Initiative. Both governments have committed to strengthening their bilateral partnership, which also ensures broader partnerships, including those through CEOS, can get the best possible data.
- Steve Volz (NOAA) announced that Charles Wooldridge will be retiring from NOAA in a couple of weeks, after 38 years in the public service. He thanked Charles for his service and friendship throughout the years.
- Guennadi Kroupnik (CSA) noted that Eric Laliberté will also retire from CSA soon. He wished Eric a happy retirement.
- CEOS Plenary participants thanked Charles and Eric for their many years of support to CEOS and international engagement activities more broadly.



## Session 6: Other CEOS Priorities

### 6.1: CEOS Sustainable Development Goals (SDG) Coordination Group (CG) [\[slides\]](#)

Presenter: Flora Kerblat (CSIRO)

Main points:

- Support for the SDGs is the fourth strategic priority of CEOS, which was reaffirmed at SIT-39.
- The CEOS Deliverable Tracking Tool has been updated to include a field for SDGs relevance, to allow a mapping to SDG Goals, Targets and Indicators.
- There were seven SDG deliverables in the 2024-2026 CEOS Work Plan. Two are now complete, and four are in final draft form. One deliverable, the EO support sheet update for SDG Indicator 6.6.1, has been postponed until after the update of the Ramsar Convention on Wetlands Work Plan.
- All existing EO support sheets will be updated to a new template.
- CEOS contributed inputs for the UN-GGIM IAEG-SDG WGGI white paper on “*Rescuing the SDGs with Geospatial Information*”. The main message was to ensure satellite EO is referenced in future sustainable development frameworks that might follow the SDGs and to ensure satellite EO is no longer classed as a ‘non-traditional data source’.
- The SDG Coordination Group is looking at ways to contribute to the definition of the Post-2030 Sustainable Development Framework, in an effort to increase the impact of Earth observation data.
- The SDG CG will be working with WGClimate to expand CEOS efforts on SDGs to cover SDG13 (Climate Action), specifically Indicator 13.2.2 (total greenhouse gas emissions per year). Thanks to Wenying Su and WGClimate colleagues for their assistance on this.
- It has become clear that there needs to be more integration between the SDG CG and CEOS biodiversity efforts. The SDG CG welcomes further discussion with the Biodiversity Study Team on areas of collaboration.
- The SDG CG is the least actively supported of the headline CEOS priorities. It was suggested that we need to ‘de-silo’ efforts in CEOS and seek synergies between SDGs, climate and biodiversity to drive full and meaningful impact for end-users. The aforementioned support from WGClimate is a much appreciated example.

#### *Discussion*

- Eric Laliberté (CEOS Chair, CSA) suggested that labelling this a Coordination Group implies that there is a coordination of work being done elsewhere in the organisation. The CG should not have sole responsibility to deliver on CEOS’ headline priority of the SDGs. There are clear opportunities where the Working Groups and Virtual Constellations should be looking to engage on the SDG priority. He called on the WGs and VCs to tag activities as relevant to the SDGs, including in their inputs for the 2025-2027 CEOS Work Plan.
- There is increasingly an expectation on agencies to explain how they are contributing to the SDGs, and if we can do that within CEOS it will almost certainly help agencies’ internal reporting as well.
- There was a discussion on what happens after 2030 and whether we can anticipate what might come after the SDGs, and whether there are steps we can take now to increase the policy footing of satellite EO. It is still unclear, but this is one of the strategic justifications of CEOS contributing to UN-GGIM, ensuring that CEOS is close to the discussions at the UN level. By contributing to the white paper and being part of the community, the SDG CG can advocate for satellite EO in whatever comes

next. If we can also encourage some sort of input from national statistical agencies, that is another possible avenue of influence. Working with funding organisations, like the World Bank, which requires grantees to report against the SDGs, could be another influence mechanism.

- Julie Robinson noted that NASA has been committed to the SDGs through both CEOS and GEO activities. It is a really critical reporting activity. With a complexity like the UN, that report card element is really important. We have struggled in CEOS because the teams we've asked to work on it can't possibly cover the breadth of the topic. It's critical that we use this information about how the SDGs map to existing activities of the WGs and VCs and ask them to report to and engage with the SDG CG on these topics.
- Osamu Ochiai (SIT Chair Team, JAXA) noted that the SIT Chair commits to helping the SDG CG monitor these developments with regard to a post-2030 sustainable development framework. Domestically, JAXA is working with Japanese ministries that engage with SDG Custodian Agencies.
- It was recalled that there is now a mechanism through the CEOS Work Plan to map deliverables to SDGs. CEOS entities should be reminded and encouraged to add this information to their Work Plan submissions.
- Wenying Su (WGClimate Vice Chair, NASA) recognised the overlap of SDG 13.2.2 and CEOS' broader efforts on climate. In this instance, the metadata is focused on bottom-up inventory approaches, and the custodian is UNFCCC. This could be another mechanism for including satellite EO in the climate process and another connection to UNFCCC. The UNFCCC POC for SDG 13.2.2 is different to our normal contacts.
- Lóránt Czárán (UNOOSA) noted the focus on UN-GGIM regarding a post-2030 sustainable development framework, however we should also take into account other fora such as COPUOS, which will also have influence in the UN system. UNISPACE IV (2027) could be a good opportunity to present a clear message about the need for satellite EO in a post-2030 sustainable development framework.

<b>CEOS-38-09</b>	CEOS Chair, via the monthly CEOS Secretariat meetings, to facilitate a discussion with Working Group Chairs regarding connections (existing and potential) between Working Group activities and the UN Sustainable Development Goals, as contributions to the overall support by CEOS for the SDGs. Following these discussions, the SDG Coordination Group will issue a notification to CEOS member agencies and make a call for additional resources or nominations to Working Groups to carry out these identified deliverables.	<b>SIT-40</b>
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**6.2: Letter of Enhanced Cooperation from the United Nations Convention to Combat Desertification (UNCCD) Science, Technology, and Innovation Unit – Update on CEOS External Request Process Paper Progress (Step-B)**

Presenter: Satoshi Uenuma (SIT Chair Team, JAXA)

Main points:

- UNCCD is the UN Convention to Combat Desertification and mitigate the effects of drought through national action programs that incorporate long-term strategies supported by international cooperation and partnership arrangements.
- CEOS has supported UNCCD on SDG 15.3.1 through the SEO and the SDG Coordination Group for several years. The SDG Coordination Group was invited to participate in UNCCD COP 16 this year, and the SEO has confirmed attendance on behalf of the group.
- The CEOS Chair received a *“Letter of Enhanced Cooperation from the UNCCD Science, Technology, and Innovation Unit”* on May 22, 2024. The CEOS Chair, SIT Chair, SEO, and CEOS Executive Officer have since followed the CEOS External Request Process Paper and assessed the feasibility of the UNCCD requests.
- The letter requested additional support on several specific topics, such as data standardisation, biodiversity, and other domains.
- Step-B of the External Process Paper was completed at SIT Technical Workshop 2024 in September. Step-C of the process calls for a more specific assessment of CEOS activities and capabilities against the requests. CEOS agencies and entities are invited to contact the JAXA SIT Chair Team if willing to join this assessment.
- The SIT Chair Team will try to accelerate the process, to complete the assessment process within 2025.

*Discussion*

- Mark Dowell (COM) acknowledged that the responses provided by agencies highlight that there are a number of individual agency activities already underway in support of UNCCD and these are reportedly quite effective. Maybe it is sufficient enough to continue individual agency efforts while acknowledging the need to continue exchanging information with one another through CEOS. We should ensure that colleagues who are contributing to UNCCD related efforts are connected with David Borges (CEOS SEO, NASA) before his attendance at the UNCCD COP.
- Alex Held (CSIRO) highlighted the specific request on finding better ways to support Small Island Developing States (SIDS). The data referenced by the Good Practice Guidance documentation is too coarse for these islands. It would be good to understand which agencies can provide data at a finer resolution for these unique cases, from current or future missions.
- Steven Ramage (CEOS Executive Officer) recalled that a purpose of the letter to CEOS was to encourage a coordinated response, as UNCCD was having difficulty in getting responses from individual agencies.

<b>CEOS-38-10</b>	SIT Chair team to connect points of contact from CEOS agencies that identified they are contributing to UNCCD related activities (via Step-B of the External Request review) with the CEOS Systems Engineering Office (David Borges) to ensure coordination of representation and messaging for UNCCD COP16 (2-13 December 2024 in Riyadh, Saudi Arabia).	<b>15 November 2024</b>
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<b>CEOS-38-11</b>	<p>CEOS agencies or entities willing to assist with Step-C (Detailed Assessment) of the CEOS External Request Process for the UNCCD support request to contact the SIT Chair team.</p> <p><u>Note:</u> Step-C will assess the specifics of CEOS agency support, data needs, feasibility, priorities, and existing commitments.</p>	<b>8 November 2024</b>
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### 6.3: CEOS Virtual Constellation Updates – Synthesis Report [[slides](#)]

Presenter: Hironori Maejima (SIT Chair, JAXA)

Main points:

- CEOS Virtual Constellation (VC) leads have provided key updates to the SIT Chair in support of the annual synthesis report to CEOS Plenary.

#### Coastal Observations Applications Services and Tools (COAST-VC)

- Introduced several experimental products for Chesapeake Bay, Bay of Bengal, and other pilot regions. Products include Habitat Suitability Index, Marsh Mapping, Water Clarity, and satellite-derived bathymetry.
- Calling for additional members in COAST-VC. All are welcome and encouraged to participate.

#### Land Surface Imaging (LSI-VC)

- Will manage the implementation of the CEOS AFOLU Roadmap actions through the Forests & Biomass Subgroup.
- The LSI-GEOGLAM (Agriculture) Subgroup is looking to bolster membership to tackle Essential Agriculture Variables.
- LSI-VC is a key contributor to CEOS-ARD and the CEOS-ARD Strategy 2024.

#### Ocean Colour Radiometry (OCR-VC)

- Jeremy Werdell of NASA, PACE Project Scientist, joins as an OCR-VC co-lead.
- The Aquatic Carbon Roadmap is progressing to plan, with the Blue Carbon Workshop held in May 2024 providing useful input.
- Contributing to an update of the CEOS-ARD Aquatic Reflectance Product Family Specification to cover the oceans.

#### Ocean Surface Topography (OST-VC)

- 30 Years of Progress in Radar Altimetry Symposium was organised by ESA and CNES, with the support of EUMETSAT, on 2-6 September 2024.
- OST-VC is updating the “*Next 15 years of altimetry – OST Constellation User Requirement Document*” from 2009 to become “*A Coordinated International Satellite Altimetry Virtual Constellation: Toward 2050*”. The document is planned for finalisation in the first quarter of 2025.

#### Ocean Surface Vector Wind (OSVW-VC)

- Temporal gaps in scatterometer coverage still exist.

- The International Ocean Vector Winds Science Team (IOVWST) has identified a need for more observations in support of tropical cyclones.

#### **Precipitation (P-VC)**

- A low-inclination, wide-frequency radiometer (GMI/AMSR-class) is deemed imperative for cross-calibrating passive microwave radiometers from space agencies and commercial providers.
- There is a paucity of low frequency (sub-23 GHz) passive microwave observations, which are sensitive to precipitation (high frequency sounders sense temperature and humidity). There are no planned commercial low frequency missions.

#### **Sea Surface Temperature (SST-VC)**

- SST-VC and COAST-VC are collaborating on coastal SST coverage needs and will bring an update to the SIT-40 meeting in April 2025.
- The SST-VC Terms of Reference will be updated soon.

#### **Atmospheric Composition (AC-VC)**

- Harmonisation of tropospheric ozone datasets (CEOS Work Plan Deliverable VC-20-01) is progressing well.
- Validation and harmonisation of products from the air quality missions in orbit (TEMPO, GEMS and S5P/TROPOMI) is progressing well.

#### *Discussion*

- Jenn Lacey (USGS) was one of the original co-leads of LSI-VC when it was reinstated in 2015. It is great to see the accomplishments this team has made since her departure as a co-lead, especially with CEOS-ARD.
- Beth Greenaway (UKSA) would like to encourage more reporting from the VCs to the CEOS Secretariat during the UKSA term as CEOS Chair.
- Jonathon Ross (GA) thanked the JAXA SIT Chair Team for coordinating and enabling the work of the VCs. The VCs are an 'engine room' of CEOS. He would like to see continued and increased support for their work.
- Chris Kidd (P-VC co-lead, NASA) thanked agencies for their ongoing support to the P-VC. Many precipitation missions are on the horizon, and he looks forward to seeing these new contributions come online.
- Steve Volz (NOAA) suggested that perhaps more direction is needed from CEOS leadership to the VCs. NOAA will take a look at their strategic activities and see how they might be addressed within the VCs.
- Eleni Paliouras (ESA) appreciated the effort the SIT Chair Team puts into following and synthesising all of the work of the VCs. ESA is proud to continue its support of numerous VCs, including providing co-leadership to the AC-VC and the OCR-VC, as well as providing a lead for the CEOS-ARD Oversight Group, which comprises numerous VC representatives.

#### **6.4: CEOS Analysis Ready Data (CEOS-ARD) Oversight Group and CEOS-ARD Strategy 2024 [[slides](#)]**

Presenters: Ferran Gascon (CEOS-ARD Oversight Group Lead, ESA) and Matt Steventon (CEOS-ARD Oversight Group Secretariat)

## Main points:

- There is a lot of interest in CEOS-ARD from the commercial sector. Two commercial engagement workshops have now been held by LSI-VC alongside LSI-VC-15 (in Tokyo, Japan) and LSI-VC-16 (in Canberra, Australia).
- Recent CEOS-ARD Endorsements include:
  - ISRO EOS-04 (RISAT-1A) NRB (Combined SAR PFS v1.0) [2 April 2024]
  - JAXA ALOS-2 PALSAR-2 Normalised Radar Backscatter (NRB) (Combined SAR PFS v1.0 update) [17 April 2024]
  - Catalyst Sentinel-1 RTC product [17 October 2024]
  - Opera RTC S1 Products (NASA/JPL) [22 October 2024]
- The development of an Ocean Reflectance PFS is ongoing, in cooperation with OCR-VC. This is an evolution of the existing Aquatic Reflectance PFS. CEOS-ARD specifications for Greenhouse Gas flux products were also mentioned in the newly endorsed CEOS Greenhouse Gas Roadmap Issue 2. P-VC is also investigating CEOS-ARD specifications for Level 2 and Level 3 precipitation products.
- The 2024 update to the CEOS-ARD Strategy aims to reaffirm CEOS Agency commitment to CEOS-ARD, as well as reflecting on the progress to date, taking stock of future directions and needs, and confirming the plans for the coming years. The ultimate goal is to develop a broad portfolio of CEOS-ARD that is easily discovered, accessed and utilised.
- The Strategy activities are categorised into six broad themes:
  - CEOS-ARD Availability, Product Diversity, and Representation: Calls on agencies to review their datasets and consider self-assessment, especially at mission inception/design and archive reprocessing stages.
  - CEOS-ARD Framework and Specification Advancement: Embracing GitHub for broader community engagement and better version control, as well as modularisation of CEOS-ARD specifications.
  - Discovery, Access, Utilisation, and Interoperability: Embracing the CEOS Interoperability Framework and ensuring consistent discoverability and branding across data providers and cloud platforms.
  - Community Engagement: Continued communications and workshops and working with related efforts in the broader standards community.
  - Research, Test Cases, and Pilot Activities: Engaging with activities of the Virtual Constellations, Working Groups, and CEOS Agencies as opportunities to trial and gather feedback on CEOS-ARD specifications and datasets.
  - Commercial Engagement: Continued commercial engagement workshops and encouraging self-assessments of commercial datasets.
- The ISO/OGC ARD Standards Working Group will be paused due to lack of progress and consensus. CEOS will maintain leadership of the satellite Earth observation Analysis Ready Data concept through CEOS-ARD, which should serve as the basis for more formal standards at the appropriate time.
- Seeking endorsement of the [2024 CEOS-ARD Strategy](#) by CEOS Plenary.

## Discussion

- Beth Greenaway (UKSA) fully endorses the CEOS-ARD Strategy 2024. Enabling accessibility and usability of data aligns well with UKSA's CEOS Chair themes. Unlocking data for new users is key.
- Mark Dowell (COM) noted that he increasingly hears people talking about CEOS-ARD outside of the CEOS community. He is particularly interested in the notion of transitioning the CEOS-ARD concepts to higher-level products. The European Commission endorses the Strategy.
- Karen St. Germain (NASA) reported that NASA endorses the Strategy.
- Eleni Paliouras (ESA) endorsed the new Strategy and thanked everyone responsible for updating it.
- Jonathon Ross (GA) fully supports and endorses the Strategy and looks forward to supporting its implementation. GA would like to acknowledge Ferran Gascon and ESA's leadership of the CEOS-ARD Oversight Group. The demand to do more in this area is clear, especially from outside of CEOS. We need to make sure we retain leadership. He strongly supports enhanced engagement with the commercial sector. CEOS-ARD ensures users know what they are getting and builds trust.
- Jeff Privette (WGClimate Chair, NOAA) wondered whether many of the products in ECV Inventory, which could be considered 'ARD' to some degree, should be assessed as ARD. This would require the existence of a relevant CEOS-ARD Product Family Specification first, which would typically be the domain of the CEOS Virtual Constellations to develop. Ferran was glad to hear there is an interest in applying CEOS-ARD to ECV Inventory datasets and offered further discussion to explore the possibilities.
- Jenn Lacey (USGS) noted the close relationship between LSI-VC, WGCV, and WGISS on this topic. Future development of CEOS-ARD to further improve interoperability will lean heavily on the CEOS Interoperability Framework/Handbook. USGS supports and endorses the CEOS-ARD Strategy 2024.

### Decision 38-10

CEOS Plenary endorsed the [CEOS Analysis Ready Data Strategy 2024](#).

## Session 7: CEOS Agency Reports #2

### 7.1: CEOS Agency Reports

#### 7.1.1: European Space Agency (ESA) [[slides](#)]

Presenter: Eleni Paliouras

Main points:

- ESA has recently published its new [Earth Observation Science Strategy](#), which aims to orientate ESA in planning for future missions.
- Four missions have been launched this year to date (EarthCARE, Sentinel-2C, Φsat-2, Arctic Weather Satellite), with one more (Sentinel-1C) planned for December 2024. Six launches are planned for 2025 (Biomass, HydroGNSS, MTG-S1, MetOp-SG A1, Sentinel-1D, Sentinel-6B). Commissioning for all four satellites launched in 2024 is ongoing.
- ESA will host the Living Planet Symposium in 2025, in Vienna, Austria, on 23-27 June 2024.

### 7.1.2: European Commission [[slides](#)]

Presenter: Mauro Facchini

Main points:

- There are now over a million registered users of Copernicus data, with more than 500 products in the service portfolio.
- Five Copernicus Expansion Missions are planned for launch in the coming years, alongside the remaining first generation Sentinels.

### 7.1.3: National Institute of Environmental Research (NIER) [[slides](#)]

Presenter: Jaehoon Jeong

Main points:

- Korea's Geostationary Environment Monitoring Spectrometer (GEMS) mission provides hourly data on atmospheric pollutants and aerosols with high spatial resolution.
- NIER is preparing to launch a microsatellite constellation for greenhouse gas monitoring, with the first satellite planned for launch in 2027, followed by four more in 2028. NIER is also planning the next generation of GEMS.

### 7.1.4: Japan Aerospace Exploration Agency (JAXA) [[slides](#)]

Presenter: Hironori Maejima

Main points:

- EarthCARE, a collaborative mission of ESA and JAXA that measures global distribution of cloud and aerosol profiles, was launched in May 2024. It has already provided the world's first measurement of vertical cloud motion from space.
- ALOS-4 was launched in July 2024. It provides continuity for the L-band SAR measurements provided by ALOS-2.
- The Advanced Microwave Scanning Radiometer 3 (AMSR3) instrument will launch on board GOSAT-GW early next year. It will provide continuity for microwave radiometry measurements acquired by JAXA.

### 7.1.5: United Kingdom Space Agency (UKSA) [[slides](#)]

Presenter: Beth Greenaway

Main points:

- The UK rejoined the EU Copernicus programme in January 2024.
- Microcarb is a joint mission between CNES and UKSA which will characterise greenhouse gas fluxes and gauge how much carbon is being absorbed by oceans and forests. It will be launched in mid-2025.
- The TRUTHS mission will be a calibration lab in space. It will provide a benchmark reference of the optical radiation state of the planet. The mission is now in Phase B2, and work is focused on ground segment options and development of new use cases, especially for small satellite calibration.



### 7.1.6: National Aeronautics & Space Administration (NASA) [slides]

Presenter: Karen St. Germain

Main points:

- PACE was launched in February 2025 and is providing new information on phytoplankton and data to study atmospheric conditions.
- The NISAR launch window opens in February 2025.
- NASA's new Earth Science to Action strategy is available [here](#).

### 7.1.7: Agenzia Spaziale Italiana (ASI) [slides]

Presenter: Laura Candela

Main points:

- COSMO-SkyMed Second Generation satellites are now operational. Currently, three first generation and two second generation satellites are in orbit.
- PRISMA Second Generation Phase A activities have recently concluded.
- ASI will organise the GEO 2025 Global Forum, to take place in Rome on 5-9 May 2025, with support from the Italian government and European Commission.

*Discussion*

- The European Commission's Nature Restoration Law was discussed in the context of additional demand for Copernicus data. Generally, there are more frequent references to Copernicus in European legislation. The Nature Restoration Law is introducing much more specific references on how to use Copernicus and satellite Earth observation.

## **Session 8: Other Business**

### **8.1: CEOS Systems Engineering Office (SEO) Report [slides]**

Presenters: Libby Rose and Matt Steventon on behalf of David Borges (SEO, NASA)

Main points:

- The SEO is prioritising efforts around cloud native geospatial technology, through activities such as modular CEOS-ARD specifications based on STAC, the CEOS Interoperability Framework, WGCV open cal/val toolbox development, the CEOS Analytics Lab, and the CEOS Organisational GitHub.
- The CEOS Analytics Lab (CAL) is a cloud-based analysis platform designed to meet challenges of cloud-based, data-centric approaches to EO. It has similarities to the Digital Earth platforms. CAL is an SEO resource available to the entire CEOS community for ongoing projects and pilot activities.
- The SEO is undertaking a commercial data analysis project as recommended by the CEOS New Space Task Team. Eight commercial EO data sources have been examined. Findings are discussed at length in the [SEO's 2024 SIT Technical Workshop presentation](#).
- The SEO compiled the CEOS 40<sup>th</sup> Anniversary Video, which is available [here](#). Thanks to all agencies that contributed, particularly CEOS Principals for recording their messages.

- The SEO team continues to be extremely active on CEOS news and outreach via social media. Numerous CEOS website articles have been published on biodiversity, greenhouse gases, and other key topics. These articles can be found at [ceos.org/news](https://ceos.org/news)
- The SEO ran the IGARSS 2024 exhibition booth. These booths form a key part of CEOS outreach efforts and provide a chance to interact directly with the community outside of CEOS. Booths are planned for the following upcoming events: VH-RODA (ESA ESRIN, Frascati, Italy; 2-6 December 2024; Supported by ESA), GEO Global Forum (Rome, Italy; 5 - 9 May 2025), ESA Living Planet Symposium (Vienna, Austria; 23-27 June 2025), and potentially IGARSS 2025 (Brisbane, Australia; 3-8 August 2025). All CEOS entities are welcome to contribute content (flyers, presentations, videos, etc.).

### *Discussion*

- Eric Laliberté (CEOS Chair, CSA) added his thanks to everyone that contributed to the CEOS 40<sup>th</sup> Anniversary Video. He also thanked NASA for their continued commitment to the SEO, which is a critical component of the CEOS organisation, providing cross-CEOS connectivity and support. David has provided a great deal of support for the CEOS Chair throughout 2024.
- Paul Bate (UKSA) commended the work of the SEO and thanked David for his support. Paul appreciated the CEOS Impact Tiles. UKSA will aim to promote these when discussing CEOS with the community.

## **8.2: CEOS Missions, Instruments and Measurements (MIM) Database Report [[slides](#)]**

Presenter: Marie-Claire Greening (ESA)

### Main points:

- The Missions, Instruments and Measurements (MIM) Database is a long-term commitment from ESA in support of CEOS. The CEOS MIM Database provides information on satellites based on an annual survey of CEOS member agencies and represents the only official consolidated statement of agency programmes and plans.
- The user base consists of over 32,000 users from across the globe.
- Every year, the database undergoes an update process through tailored surveys to CEOS Agencies. The 2024 update is now complete and was published on 11 October 2024. Thanks to all agencies that contributed.
- The CEOS MIM Database team publishes quarterly activity reports summarising the latest mission updates and news, paired with information on recent and upcoming satellite launches. Past editions are archived [here](#).
- WMO operates a similar database, OSCAR, focused on meteorological missions. The teams work together to ensure coherence between the two.
- The MIM Database has been the principal reference for the ESA Science Strategy foundation study, similar to the role it played for the NASA Decadal Survey.
- The [EO Portal](#) is an independent 'sister site', with a broader scope than the MIM Database. The EO Portal metadata is powered by the MIM Database.

*Discussion*

- Beth Greenaway (UKSA) thanked ESA for maintaining this important resource for CEOS. Anecdotally, Beth has met a number of people who have credited the MIM Database as their gateway to the sector.
- Alex Held (CSIRO) noted that the MIM Database was used by CSIRO to design a virtual constellation for the AquaWatch initiative.
- Flora Kerblat (CSIRO) added that the MIM Database team shared the capabilities of the Database at the recent Advancing Earth Observation Forum in Adelaide, Australia. It was very useful for outreach to the community.
- Mark Dowell (COM) recalled that the CEOS Greenhouse Gas Portal is also powered by the MIM Database. He suggested that it would be good for CEOS to consider similar portals for other use cases. The compilation of missions that serve specific thematic purposes is very useful and helps cut through sometimes technical instrument and measurement specifications / descriptions.

**Session 9: CEOS Leadership Transitions and Closing Business**

**9.1: 2024 CEOS Plenary Montréal Statement**

Presenter: Eric Laliberté (CEOS Chair, CSA)

Main points:

- The Montréal Statement was reviewed at the side meeting on Tuesday, October 22. The [resulting edits](#) were presented to the CEOS Plenary.
- The document with the proposed changes was endorsed.

<b>Decision 38-11</b>	CEOS Plenary endorsed the <a href="#">38<sup>th</sup> CEOS Plenary Montréal Statement</a> .
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*Discussion*

- CEOS Plenary thanked Eric Laliberté (CEOS Chair, CSA) for his service as CEOS Chair in 2024 and wished him well for his retirement.

**9.2: Nomination for 2026 CEOS Chair**

Eric Laliberté (CEOS Chair, CSA) recalled the nomination received from the Australian contingent of CSIRO, Geoscience Australia (GA) and the Australian Bureau of Meteorology (BOM). CSIRO will be identified as the formal lead and CEOS Chair (Alex Held), with support provided by GA and BOM.

No objections were raised and the CEOS Plenary endorsed the nomination.

<b>Decision 38-12</b>	CEOS Plenary endorsed the nomination of the Commonwealth Scientific and Industrial Research Organisation (CSIRO) as 2026 CEOS Chair, to be supported by Geoscience Australia and the Australian Bureau of Meteorology, in representation of the Asia-Pacific region.
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Alex Held (CSIRO) made some remarks following acceptance of the nomination:

- 'Team Australia' are proud to contribute to CEOS, across many different activities throughout the organisation. They are firm believers in the importance of the work of CEOS, recognising that coordinated efforts will be a necessity in addressing the major challenges facing the world. These global challenges are particularly relevant in Australia's immediate neighbourhood, in the Pacific and South-East Asia. It is hoped that this term as CEOS Chair can be used to tackle some of the challenges facing these regions.
- The first priority for Team Australia will be to support UKSA as CEOS Chair for 2025 and JAXA, in their second year as SIT Chair.
- The team would also like to continue trying to build connections between CEOS and the climate policy community, with Australia bidding to host UNFCCC COP31 in 2026.

### 9.3: United Kingdom Space Agency (UKSA) 2025 CEOS Chair Themes Presentation [[slides](#)]

Presenter: Paul Bate (2025 CEOS Chair, UKSA)

Main points:

- Throughout their term as CEOS Chair, UKSA will focus on a theme of '*Unlocking Earth Observation for Society*'. This is divided into four headline activities:
  - Unlocking EO for Public Service: Identify strategies to better bridge the gap between EO data and services for the public sector. A short paper presenting findings on initiatives from across the CEOS community will be presented for CEOS Principal awareness at CEOS Plenary 2025.
  - Unlocking EO for the UNFCCC Global Stocktakes: Supporting the JAXA SIT Chair Team with the Global Stocktake (GST) Lessons Learned and update of the CEOS GST Strategy.
  - Unlocking EO for the Global Methane Pledge: Aiming to ensure the CEOS facility-scale methane best practices are included as a measurement standard in the framework of the Global Methane Pledge at UNFCCC COP30 (Brazil, November 2025).
  - 'CEOS In Schools' and Youth Summit: Piloting a CEOS mechanism to inspire global youth collaboration in Earth observation.
- 'CEOS in Schools' will include two international workshops in February and March, with students developing posters throughout March to June, 2025. These posters will be presented at a hybrid Youth Summit, alongside the CEOS Plenary in November 2025.
- The 39<sup>th</sup> CEOS Plenary and 1<sup>st</sup> CEOS Youth Summit will be held on 4-6 November, 2025, in Bath, United Kingdom.

*Discussion*

- Steve Volz (NOAA) supported the idea of the Youth Summit.
- Hironori Maejima (SIT Chair, JAXA) thanked UKSA for the support to the SIT Chair's themes of climate policy impact and greenhouse gas observation coordination. The methane best practices will provide a crucial linkage and support to the community outside of CEOS and space agencies.
- Mauro Facchini (COM) welcomed the close connection between the CEOS Chair and SIT Chair themes and supported the CEOS In Schools and Youth Summit theme. Satellite Earth observation is becoming a tool which can be used in everyday life and sharing these capabilities with students is a great way to drive future uptake and new uses. The European Commission would be keen to share relevant insights from their Knowledge Centre on Earth Observation (KCEO).

#### 9.4: Review of Preliminary Action and Decision Record [\[slides\]](#)

Presenter: Matt Steventon (CSA 2024 CEOS Chair Team)

Main points:

- Provided an overview of the headlines from each of the preceding sessions. See the slides for details.
- Reviewed the actions and decisions captured during the 38<sup>th</sup> CEOS Plenary.

#### 9.5: CEOS Chair Transition and Photos

Presenters: CSA 2024 CEOS Chair Team and UKSA 2025 CEOS Chair Team

Main points:

- The CEOS Chair role officially transitioned from CSA to UKSA (photo below).
- CEOS Plenary thanked CSA for their leadership in 2024 and welcomed UKSA as CEOS Chair for 2025.

<b>Decision 38-13</b>	CEOS Plenary welcomed the United Kingdom Space Agency (UKSA) as 2025 CEOS Chair.
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#### 9.6: Closing Remarks

Presenters: CSA 2024 CEOS Chair Team

Main points:

- There were many very meaningful and productive discussions held over the last few days. The CSA team thanked all participants for their contributions.
- There were a lot of discussions about impact, and perhaps this is something we need to look at more collectively as our user base expands and the demand for actionable information increases.
- Higher level products will be a challenge for the future. More needs to be done to understand the suitable division of responsibilities and how to best interact with the commercial sector.
- UKSA's 'Unlocking Earth Observation for Society' theme is a fitting focus to launch us into the next forty years of CEOS.
- The CSA team thanked everyone for their support to the CSA CEOS Chair Team throughout 2024.

## APPENDIX A: Attendees

### In-person

Organisation	Name	Organisation	Name
ASI	Laura Candela	European Commission	Mark Dowell
CCMEO/NRCan	Mathieu Benoit	European Commission	Mauro Facchini
CEOS Chair Team	Libby Rose	European Commission	Peter Strobl
CEOS Chair Team	Matthew Steventon	GA	Jonathon Ross
Executive Officer	Steven Ramage	GEOGLAM	Alyssa Whitcraft
Executive Officer Team	Eirini Drakopoulou	GISTDA	Pakorn Apaphant
Executive Officer Team	Lefteris Mamais	GISTDA	Poramet Thuwakhom
CNES	Sandra Luque	JAXA	Hironori Maejima
CNES	Selma Cherchali	JAXA	Mariko Harada
CSA	Ava Gardner	JAXA	Osamu Ochiai
CSA	Carmen Marcu	JAXA	Satoshi Uenuma
CSA	Catherine Boisvert	JAXA	Takeshi Hirabayashi
CSA	Denis Dufour	NASA	Christine Bogner
CSA	Emma Fernandes	NASA	Gary Geller
CSA	Eric Laliberté	NASA	Julie Robinson
CSA	Frederic Fournier	NASA	Karen St. Germain
CSA	Guennadi Kroupnik	NASA	Katelyn Kuhl
CSA	Helena van Mierlo	NASA	Michelle Hanssen
CSA	Hiba Jekki	NASA	Sid Boukabara
CSA	Isabelle Jean	NASA	Wenyng Su
CSA	Jordan Miller	NIER	Goo Kim
CSA	Lucie Viciano	NIER	Jaehoon Jeong
CSA	Marcus Dejmek	NOAA	Adria Schwarber
CSA	Myriam Plourde	NOAA	Charles Wooldridge
CSA	Philippe Descent	NOAA	Jeff Privette
CSIRO	Alex Held	NOAA	Katy Matthews
CSIRO	Flora Kerblat	NOAA	Stephen Volz
CSIRO	Shaun Levick	SIT Chair Team	Stephen Ward
DLR	Godela Rossner	UKSA	Beth Greenaway
DLR	Klaus Schmidt	UKSA	Harshbir Sangha
ECCC	Carla Schmitt	UKSA	Niall Bradshaw
ECCC	David Harper	UKSA	Patrick Gibson
ECCC	Jason Duffe	UKSA	Paul Bate
ECCC	Nathalie Morin	UNOOSA	Lóránt Czárán
ECCC	Shannon Kaya	USGS	Darcee Killpack
ECMWF	Vincent-Henri Peuch	USGS	Jennifer Lacey
ESA	Eleni Paliouras	USGS	Roger Sayre
ESA	Marie-Claire Greening	USGS	Timothy Newman
ESA	Philippe Goryl	USGS	Timothy Stryker

EUMETSAT	Paul Counet	USGS	Tom Sohre
EUMETSAT	Philip Cooper Evans		

### Online

Organisation	Name
AEM	Kesniel Humberto Bravo Carpio
CCMEO/NRCan	Roger De Abreu
CONAE	Laura Frulla
ESA	Ferran Gascon
ESA	Marie-Helene Rio
ESA	Yasjka Meijer
EUMETSAT	Robert Husband
European Commission	Astrid Koch
GA	Maggie Arnold
ISRO	Nitant Dube
JAXA	Hiroshi Suto
JAXA	Yuko Nakamura
MYSA	Fazuwan Fauzi
NASA	Christopher Kidd
NOAA	Paul DiGiacomo
Portuguese Space Agency	Hugo André Costa
USGS	Christopher Barnes
USGS	Kelly Bruno
VNSC	Nguyen Lam Dao
WCRP	Michael Sparrow

## APPENDIX B: Actions Record

No.	Action	Due Date
CEOS-38-01	<p>CEOS Executive Officer to consult the SIT Chair Team on the requirements and approach for the further level of analysis that was requested by the Plenary in order to close action SIT-39-01 (regarding an assessment of the level of activity of CEOS constituent groups).</p> <p><i>Note: The SIT Chair Team is responsible for the CEOS Virtual Constellations (VCs), and this additional analysis was primarily related to the VCs. The goal is to provide CEOS Principals with actionable information that can be used to direct the VCs more effectively.</i></p>	<b>SIT-40</b>
CEOS-38-02	CEOS agencies are asked to nominate individuals to the newly formed Biodiversity Study Team, via the former Ecosystem Extent Task Team co-leads.	<b>30 November 2024</b>
CEOS-38-03	CEOS Biodiversity Study Team to present its findings and recommendations to the 2025 CEOS Plenary, with a progress report at SIT-40 and (at least) quarterly updates to the CEOS Secretariat.	<b>CEOS Plenary 2025</b>
CEOS-38-04	WGDisasters Chair to provide an overview of the current tasks and composition of the EW4All subgroup so that CEOS Principals can assess additional nominations and resourcing for the subgroup.	<b>CEOS SEC-329</b>
CEOS-38-05	WGClimate Chair to circulate the merged gap analysis and coordinated action plan for the prior two Essential Climate Variable (ECV) Inventory analyses for CEOS review.	<b>29 October 2024</b>
CEOS-38-06	CEOS agencies to review the merged gap analysis and coordinated action plan for the prior two Essential Climate Variable (ECV) Inventory analyses and provide feedback to the WGClimate Chair ahead of a planned virtual endorsement process.	<b>29 November 2024</b>
CEOS-38-07	CEOS agencies to provide feedback on the <a href="#">First UNFCCC Global Stocktake (GST) Lessons Learned Study</a> to the WGClimate Chair and the SIT Chair team. Where	<b>29 November 2024</b>



	<p>recommendations have already been addressed by agencies it would be helpful to flag these instances and outcomes.</p> <p><i>Note: WGClimate, in collaboration with the SIT Chair team, will summarise the lessons learned and recommendations in a concise report for endorsement at SIT-40. WGClimate will support the SIT Chair to update the CEOS Global Stocktake Strategy in 2025. As part of the lessons learned report, the SIT Chair hopes to compile information on what each agency did for GST1 as well as plans for GST2.</i></p>	
<b>CEOS-38-08</b>	<p>CEOS agencies to identify points of contact to contribute to an 18-month Essential Agriculture Variables (EAV) stocktake and LSI-VC Subgroup on GEOGLAM scoping effort. Nominations should be sent to: <a href="mailto:akwhitcraft@geoglam.org">akwhitcraft@geoglam.org</a></p> <p><i>Note: Ideal candidates are people who have been mission scientists or directed research around missions or people who have worked on agricultural uses of satellite data.</i></p>	<b>29 November 2024</b>
<b>CEOS-38-09</b>	<p>CEOS Chair, via the monthly CEOS Secretariat meetings, to facilitate a discussion with Working Group Chairs regarding connections (existing and potential) between Working Group activities and the UN Sustainable Development Goals, as contributions to the overall support by CEOS for the SDGs. Following these discussions, the SDG Coordination Group will issue a notification to CEOS member agencies and make a call for additional resources or nominations to Working Groups to carry out these identified deliverables.</p>	<b>SIT-40</b>
<b>CEOS-38-10</b>	<p>SIT Chair team to connect points of contact from CEOS agencies that identified they are contributing to UNCCD related activities (via Step-B of the External Request review) with the CEOS Systems Engineering Office (David Borges) to ensure coordination of representation and messaging for UNCCD COP16 (2-13 December 2024 in Riyadh, Saudi Arabia).</p>	<b>15 November 2024</b>
<b>CEOS-38-11</b>	<p>CEOS agencies or entities willing to assist with Step-C (Detailed Assessment) of the CEOS External Request Process for the UNCCD support request to contact the SIT Chair team.</p>	<b>8 November 2024</b>

	<p><u>Note:</u> Step-C will assess the specifics of CEOS agency support, data needs, feasibility, priorities, and existing commitments.</p>	
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## APPENDIX C: Decisions Record

Decision 38-01	CEOS Plenary endorsed the 2024 update to the CEOS Strategic Guidance document.
Decision 38-02	CEOS Plenary recorded as formally completed the two-year mandate and tasks assigned to the CEOS Ecosystem Extent Task Team in 2022.
Decision 38-03	<p>CEOS Plenary agreed to establish a Biodiversity Study Team to undertake the mandate described in the <a href="#">CEOS New Initiative Proposal – Biodiversity Study Team (23 Oct 2024)</a> and to initially be led by the former co-leads of the CEOS EETT (exact leadership structure is still under discussion).</p> <p><i>Note: The multidisciplinary study team should include biodiversity experts and representatives who are knowledgeable of CEOS governance and processes.</i></p>
Decision 38-04	CEOS Plenary endorsed the nomination of Medhavy Thankappan of Geoscience Australia as Vice Chair of the Working Group on Calibration and Validation (WGCV) for two years (2025-2026), followed by WGCV Chair for two years (2027-2028).
Decision 38-05	<p>CEOS Plenary agreed that the WGDisasters and its EW4All subgroup should lead the CEOS response to the UN’s Early Warnings for All (EW4All) initiative, coordinating with the CEOS Secretariat, Working Groups, Virtual Constellations, and other CEOS entities as needed to address the breadth of topics.</p> <p><i>Note: CEOS Agencies were asked to consider nominations to the WGDisasters EW4All subgroup beyond the usual participation in WGDisasters, since broader engagement and expertise (e.g., capacity development) will be critical to addressing EW4All. The SIT Chair team will ensure that EW4All remains on the agenda for CEOS leadership-level meetings.</i></p>
Decision 38-06	CEOS Plenary endorsed the 2024 update to the Terms of Reference of the Working Group on Information Systems and Services (WGISS).
Decision 38-07	CEOS Plenary endorsed the nomination of Vincent-Henri Peuch of the European Centre for Medium-Range Weather Forecasts (ECMWF) as Vice Chair of the Joint CEOS/CGMS Working Group on Climate (WGClimate) for two years (2025-2026), followed by WGClimate Chair for two years (2027-2028).
Decision 38-08	CEOS Plenary endorsed the <a href="#">Statement by the Committee on Earth Observation Satellites (CEOS) and the Coordination Group for Meteorological Satellites (CGMS) on Progress in Supporting UNFCCC Needs for Global Observations</a> to be presented to the 61 <sup>st</sup> Session of the UNFCCC Subsidiary Body for Scientific and Technological Advice (SBSTA) on 11 November 2024.
Decision 38-09	CEOS Plenary endorsed <a href="#">Issue 2 of the CEOS-CGMS Greenhouse Gas (GHG) Roadmap (2024)</a> .

<b>Decision 38-10</b>	CEOS Plenary endorsed the <a href="#">CEOS Analysis Ready Data Strategy 2024</a> .
<b>Decision 38-11</b>	CEOS Plenary endorsed the <a href="#">38<sup>th</sup> CEOS Plenary Montréal Statement</a> .
<b>Decision 38-12</b>	CEOS Plenary endorsed the nomination of the Commonwealth Scientific and Industrial Research Organisation (CSIRO) as 2026 CEOS Chair, to be supported by Geoscience Australia and the Australian Bureau of Meteorology, in representation of the Asia-Pacific region.
<b>Decision 38-13</b>	CEOS Plenary welcomed the United Kingdom Space Agency (UKSA) as 2025 CEOS Chair.