

CEOS Newsletter

The CEOS Newsletter is published by JAXA on behalf of CEOS. It provides regular updates on the activities of CEOS, its agencies, Working Groups, Virtual Constellations, and Ad Hoc Teams.

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Canadian Space Agency, CEOS Chair 2024: “Space for Biodiversity”

At the conclusion of the 2023 CEOS Plenary hosted by the Geo-Informatics and Space Technology Development Agency (GISTDA) in November, the Canadian Space Agency (CSA) was honored to become Chair of the Committee on Earth Observation Satellites (CEOS) for 2024. As is customary for a CEOS Chair, CSA in consultation with CEOS members, has developed a set of priorities for the term as Chair.

In 2019, the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) noted in its Global Assessment Report that *“Around 1 million species already face extinction, many within decades, unless action is taken to reduce the intensity of drivers of biodiversity loss. Without such action, there will be a further acceleration in the global rate of species extinction, which is already at least tens to hundreds of times higher than it has averaged over the past 10 million years”*.

The application of satellite Earth observation for action on biodiversity conservation has long been recognised by CEOS, but the breadth of the field has hampered a focused CEOS response. In 2022, the same year that the Kunming-Montreal Global Biodiversity Framework (GBF) was adopted, CEOS established the Ecosystem Extent Task Team to assess the utility for mapping Ecosystem Extent using current and upcoming satellite Earth observation technologies. Ecosystem Extent mapping was judged to be a pragmatic and manageable aspect of the biodiversity area for initial focus by CEOS.

Through the theme “Space for Biodiversity”, the CSA aims to structure the CEOS contribution by:

1. Exploring a longer-term CEOS response to biodiversity;
2. implementing the CEOS Ecosystem Extent Task Team (EETT) recommendations;
3. Encouraging addition of specific actions/deliverables in the 2025-2027 CEOS Work Plan, that reflect a multi-year plan and implementation strategy for CEOS on biodiversity;
4. Supporting the progress of the EETT Demonstrators and seek opportunities to promote them;
5. Achieving a strong understanding of CEOS Agencies’ biodiversity activities, datasets, and investments;
6. Seeking to strengthen the pool of biodiversity expertise available to CEOS; and
7. Preparing a recommended position for a CEOS Plenary 2024 discussion on potential CEOS commitment to a broader biodiversity strategy.

As noted by the UN Convention on Biological Diversity (CBD) Secretariat, CEOS Agencies have been producing datasets and time series for many years that have great potential to support biodiversity monitoring and countries’ implementation of the GBF. Better connecting this data to policy processes and decision-making, as well as ensuring it is fit for purpose while addressing current gaps, will maximise the utility and societal benefit of this data.

The CSA will use its CEOS Chair year to assist in the establishment of stronger linkages between CEOS and the policy community, including in leveraging its co-location in Montreal with the Secretariat of the UN Convention on Biological Diversity (UN CBD). The CSA specifically aims to:

1. Establish more formal ties between CEOS and the UN CBD Secretariat, UN System of Environmental-Economic Accounting (SEEA) and the Group on Earth Observations Biodiversity Observation Network (GEO BON), IPBES, etc.
2. Explore the potential of a collaborative biodiversity agenda between CEOS, UN CBD, UN SEEA, and GEO (GEO BON, EBVs, GBiOS; Global Ecosystems Atlas);
3. Gather user requirements for this domain to inform how CEOS can most effectively contribute;
4. Promote key CEOS biodiversity-related activities (from global to local scale), datasets, and investments (individual and collective); and
5. Increase the visibility of EO's potential contribution to biodiversity and the Global Biodiversity Framework (GBF).

The CSA is also strongly committed to CEOS leadership continuity and continuous improvement. As such, the CSA will support CEOS teams in advancing the workplan and finalizing any outstanding actions from the priorities set by the previous CEOS Chairs. The CSA is committed to working closely with JAXA, the new CEOS SIT Chair, continuously striving for efficiency in the vibrant, global collaborative community that is CEOS.

I wish to express my gratitude to the CEOS community for the opportunity to serve as Chair and for entrusting CEOS leadership to the CSA team for the coming year. CEOS Chairs consistently strive for CEOS member organisations to collectively create an even greater positive impact for society, and we are committed to build on this legacy.



Eric Laliberté
CEOS Chair
Canadian Space Agency



From 2023 towards 2024 Focus on Open Data and Open Knowledge workshop to GEO week

Following the great success of the Data Providers Workshops held in 2016, 2017, 2018 and 2019, the GEO Community was ready in 2020 to participate to the 1st Open Data and Open knowledge Workshop in China; Covid didn't allow it and therefore in 2023 the 1st GEO Open Data Open Knowledge workshop (ODOK) was held at the WMO Building, Geneva (Switzerland), from 15th to 16th June 2023. The Data Working Group, GEOSS Platform Team and GEO Knowledge Hub Team organized the ODOK workshop with overall coordination by the GEO Secretariat.

Being a workshop widely supported by the GEO community, in two days of the event, ODOK counted 17 sessions (Thematic and practical), totalizing 38 hours of content. To fill these sessions, 95 speakers from 76 different organizations from 5 continents participated. With this large amount of available content, ODOK created the perfect atmosphere for sharing content and knowledge related to Open EO Data and Open EO Knowledge practices. As a result, ODOK had approximately 400 participants, 193 in person and nearly 200 online.



The Open Data and Open Knowledge Workshop aimed to facilitate dialogue on Open Data and Open Knowledge within various sectors of the Group on Earth Observations (GEO) community. To achieve the objectives of the workshop, nine thematic sessions were conducted, focusing on specific areas of interest.

- Space-based data and data cubes
- Very-high resolution data
- Cloud providers and Open Data and Knowledge
- In Situ Data
- Capacity development

- Youth community of practice
- Open Data & Knowledge principles and Data Licensing aspects
- Private sector contributions to the Open Data and Open Knowledge
- Role of Regional GEOs
- GEO Infrastructure

Additionally, to cultivate Open Knowledge practices, for the very first time, during the workshop, practical sections were held to allow GEO Work Programme Activities to present to the GEO community how the data, tools, and knowledge produced in their initiatives can be used. Those sessions covered various topics:

- In situ data management
- Knowledge preservation and sharing
- Data Cubes applications
- Water management and forecast services
- Crop analysis
- Spatiotemporal analysis using open-source tools.

Following the Open Data and Open Knowledge concept, all presentations and extra materials presented during the ODOK 2023 are freely and openly available on the [GEO Knowledge Hub](#). The Impact Report for ODOK 2023 available [here](#) is published to summarize all the actions that

GEO Community identified during the event that will also inform the GIDTT in the way towards a new infrastructure. This report contains an event overview of the community, content and future actions. The Impact Report is available on the GEO Knowledge Hub and can be accessed by the following [DOI](#).

The workshop follows the endorsement of the GEO Statement on Open Knowledge in 2021, with the goal of incorporating open knowledge practices into all GEO Work Programme initiatives. This facilitated discussions within the GEO community on the advantages, prospects, and challenges associated with Open Data and Open Knowledge endeavors across a diverse range of topics.

Based on this broad community interaction, various initiatives had the opportunity to interact and realize that joint efforts among the various GEO Stakeholders/Working groups are needed and are possible. This emphasizes the value of disseminating all knowledge, not only data, produced by the GEO Work Programme Activities. These interactions are anticipated to generate novel joint projects and activities within the GEO community.

Following the ODOK 2023 success, the new ODOK 2024 is planned for 23-27th September in China!

Save the Dates and see you there!



the ODOK organizing committee members

The UAE Space Agency... An Inspiring Journey Towards Achieving Sustainability at COP28

Through its exceptional leadership, the UAE Space Agency succeeded in leading the first Space Pavilion in the 28th Conference of the Parties of the UNFCCC (COP 28), which was held from 30 November to 12 December, 2023, at Expo Dubai. Held under the slogan 'Space for Sustainability', the Space Pavilion attracted wide local, regional, and international participation, and highlighted the UAE's unwavering potential in promoting progress and international cooperation through a series of pioneering recommendations and initiatives. These recommendations support building a more sustainable and prosperous future for generations to come.

The 13-day conference witnessed inspiring leadership, pioneering events, fruitful workshops, eye-opening discussions, and strategic partnerships. With a futuristic vision in line with the UAE leadership's goals, the UAE Space Agency succeeded in spreading awareness on the role of space in achieving sustainable development goals and addressing major global challenges.

During the conference, the UAE Space Agency signed a series of Memorandums of Understanding (MoUs) with leading international space agencies. These MoUs underline the UAE's commitment to boosting international cooperation in space to confront global environmental and climate challenges. These agreements were made with the Food and Agriculture Organization of the United Nations (FAO), which aims to use remote sensing technologies and satellite data to monitor climate changes, Milo Space Science Institute at Arizona State University, and the Rwandan Space Agency.

Furthermore, the UAE Space Agency announced the launch of the operational phase of the Space Data Center's Geo-Spatial Analytics Platform, on the sidelines of its leadership in organising the Space Pavilion's first participation at COP28. The platform includes three services: obtaining space images through international space agencies and a number of

world-leading private companies, obtaining software and algorithms based on Artificial Intelligence (AI) to analyse satellite images, and a marketing platform for space services and applications.

The UAE Space Agency also organised Hack4Climate: Space for Sustainability, which attracted more than 50 experts, programmers, and researchers, and witnessed exceptional effort and dedication from participants over the course of 4 days. The participating teams reviewed 9 solutions on the final day of the hackathon to the challenges of monitoring and tracking water pollution as a result of oil spills, monitoring air quality by monitoring NO₂, reducing loss and damage as a result of forest fires, monitoring flood conditions, providing guidance to rescue teams, and monitoring vegetation to combat climate change.

Additionally, the UAE Space Agency highlighted the Geo-Spatial Analytics Platform, and the results of the Space Analytics and Solutions (SAS) Program. This included food security, in cooperation with Planet Labs, and Greenhouse Gases (GHG), in partnership with Farmin, which constitute innovative systems to meet global sustainability challenges and develop applications in the field of Earth observation and remote sensing. The UAE Space Agency also presented a loss and damage atlas in cooperation with Planet Labs.





Giving presentation by UAESA Team at Space Pavilion

Stemming from the UAE Space Agency's belief in the importance of dialogue, the Space Pavilion hosted more than 60 panel discussions, sessions, and seminars with the participation of an elite group of speakers, specialists, space agencies, international organisations, and decision-makers. The Space Agencies Leaders' Summit ended with a Space Sector Pledge for Enhancing Space-Based Climate Initiatives to transform and accelerate climate action through financing climate programs and strengthening climate research to meet the commitments the world has made in the Paris Agreement in 2015. This created a collective commitment to support efforts

to address climate change, enhance the exchange of scientific data and climate research, promote sustainable space activities, and finance space-climate programs.

All in all, these inspiring milestones underscore the UAE's strategy and vision to foster innovation and international cooperation by investing in the future and combating global challenges with innovative solutions.

UAESA Team

39th CEOS Strategic Implementation Team Meeting

The Japan Aerospace Exploration Agency (JAXA) hosted the 39th CEOS Strategic Implementation Team (SIT-39) meeting on 9-11 April 2024 in Tokyo, with cherry blossoms in full bloom. SIT-39 was the first meeting hosted by JAXA since becoming the SIT Chair, supported by NASA as the Vice SIT Chair, following the term of the

European Space Agency (ESA) which ended in November 2023. JAXA has committed to two priorities for its term, detailed below, and this meeting was an important opportunity to hear from CEOS members and discuss the way forward, setting a course for the next two years.



Participants at CEOS SIT-39 Meeting (Tokyo April 2024)

JAXA's SIT Chair Priorities for 2024-25:

1. **Climate Policy Impact of Satellite Data** – addressing obstacles and opportunities for CEOS agency data, particularly AFOLU/Biomass map datasets, to have maximum impact in the key climate policy processes such as the Global Stocktake of the Paris Agreement.
2. **Greenhouse Gas (GHG) Observations from Space** – addressing coordination for data continuity challenges ahead and developing good practices so that operators of all kinds may contribute to societal needs.

Climate Policy Impact of Satellite Data

In support of the first UNFCCC Global Stocktake (GST1), CEOS provided pilot top-down methane and carbon dioxide emission estimates by sector and country (<https://ceos.org/gst/ghg.html>), published a dedicated edition of the Earth Observation Handbook (<https://eohandbook.com/gst/>), and collaborated with partners including WMO and the Global Climate Observing System (GCOS) on a variety of activities. However, challenges persist, such as the limited use of CEOS-derived global products in forest reporting to UNFCCC (<https://iopscience.iop.org/article/10.1088/1748-9326/acba31>) and perceived user confusion due to complementary and evolving products from numerous agencies. Pilot national GHG products developed for GST1 had minimal traction compared to IPCC inputs. To begin to understand the issues, the JAXA SIT Chair invited guest speakers from IPCC, UNFCCC Secretariat and the Institute for Global Environmental Strategies (IGES) to get their opinions and guidance for a renewed CEOS Global Stocktake strategy and actions. Charting a new course for CEOS engagement in these processes with a view to increasing the impact of CEOS Agency data will be a headline feature of the SIT Chair term, and JAXA will continue to coordinate the discussion around the strategy for climate policy impact, engaging all CEOS entities and experts, as well as external stakeholders.

Greenhouse Gas (GHG) Observations from Space

Regarding GHG observations, transparent, traceable, space-based GHG measurements are more critical than ever to support science and policy action. On national and regional scales, space-based GHG measurements can provide a transparent way to develop national inventories, assess collective progress towards national GHG emission reduction goals, and track changes in natural sources and sinks due to human activities and climate change. We invited speakers from WMO and the International Methane Emissions Observatory (IMEO) to explore new partnership opportunities. CEOS will update its Greenhouse Gas Roadmap to incorporate new interfaces and actions identified and the JAXA SIT Chair will also facilitate the coordination of the CEOS GHG, AFOLU, and Aquatic Carbon Roadmaps as three pillars of a complete strategy.

In addition to the discussions above, SIT-39 made some other important decisions, such as the establishment of a new Coastal Observations Applications Services and Tools (COAST-VC). COAST-VC will address the important land-ocean boundary and new product development needs not being addressed in other fora and providing a focal point for related work already happening across CEOS.

I would like to express my deepest gratitude to the CEOS members who participated in SIT-39. The meeting was a critical opportunity to set the stage for the next two years, with lively and fruitful discussions involving both CEOS agencies and external partners. I appreciate all of the valuable inputs we received and look forward to the activities that will follow.



Hironori Maejima
CEOS SIT Chair, JAXA

COAST Becomes the Newest CEOS Virtual Constellation

The Coastal Observations, Applications, Services and Tools (COAST) Ad Hoc Team was approved to transition to a permanent Virtual Constellation (VC) during the SIT-39 meeting held in Tokyo, Japan, due to its success in carrying out its mission and its added value to developing and demonstrating new collaborative coastal products for the remote sensing community.

Since inception in late 2019, COAST-VC has been co-led by the United States' National Oceanic and Atmospheric Admin-

istration's (NOAA) Paul DiGiacomo and the Indian Space Research Organisation's (ISRO) Rashmi Sharma and well supported by Merrie Beth Neely (Global Science & Technology). With the advent of becoming a VC, COAST welcomes France's Centre National d'Etudes Spatiales (CNES) Aurelien Carbonniere as a third co-lead. [Terms of Reference](#) and [Implementation plan](#) are now posted on the updated [COAST VC webpage](#). COAST is also CEOS' contribution to the UN Ocean Decade.



NOAA/NESDIS/STAR's Paul DiGiacomo presents the COAST Ad Hoc Team proposal to transition to a VC at the SIT-39 meeting from April 9-11, 2024 in Tokyo, Japan.

With this transition, COAST-VC will encourage broader utilization of Earth observations and other CEOS capabilities for societal benefits within coastal zones. As emphasized in the mission statement: "The focus of COAST-VC remains the user-driven value chain, to facilitate targeted work and engagement on priority coastal

observations and applications within CEOS, addressing the identification, extension/expansion, integration and transformation of multi-sensor observations into fit-for-purpose information supporting existing and emerging stakeholder requirements."

Both co-design of new product development and collaboration across the breadth of other CEOS-VCs and Working Groups on common interest work areas and challenges are central to COAST's approach., COAST-VC can help realize "downstream" synergistic benefits from integrating across parameter-focused VCs in a trans-parameter, ecosystem-based approach through trans-boundary work across the land-sea interface, and perhaps most importantly, facilitate a trans-disciplinary approach by bridging the environmental and social sciences to realize valuable societal outcomes and benefits for the coastal zone. Forthcoming efforts will focus on Blue Carbon, as well as extending current products to high-latitude regions such as the Arctic.

COAST-VC, through its cross-cutting nature, emphasizes collaboration across WGs and VCs. Most recently, COAST-VC collaborated with WG Climate to update the status of a coastal element within the GCOS 2022 Implementation Plan, and, under ISRO's leadership, spearheaded the ambitious agenda of invited speakers and discussion of the Coastal SST workshop held on June 14, 2024 at the 2024 GHRSSST meeting in Montreal. COAST also contributed a representative to WGISS efforts updating the Interoperability Handbook 2.0.

COAST relies heavily on the CEOS Analytics Lab (CAL) for product development and testing, and is an engaged early adopter and enthusiastically supports the CEOS System Engineering Office's CAL training opportunities. COAST also continues to center stakeholder co-design in our approach, with new product demonstrations planned of the Habitat Suitability Index and Submerged Aquatic Vegetation products with Chesapeake Bay researchers next month.

Looking ahead to 2025, COAST-VC is striving to enable a UN Ocean Decade training opportunity and will kick off collaboration with another Decade activity, CoastPredict. COAST-VC is also excited by potential coastal product advancement opportunities from the Space for Climate Observatory Coastal Digital Twin Initiative, co-led by CNES, NASA, and NOAA.

The team continues to be energized in this coastal work, and welcome members from all CEOS agencies. Please email any COAST-VC co-lead to be added to the meeting invitation list. Congratulations to the COAST-VC co-leads and all members for this achievement!

by the COAST-VC co-leads on behalf of all members

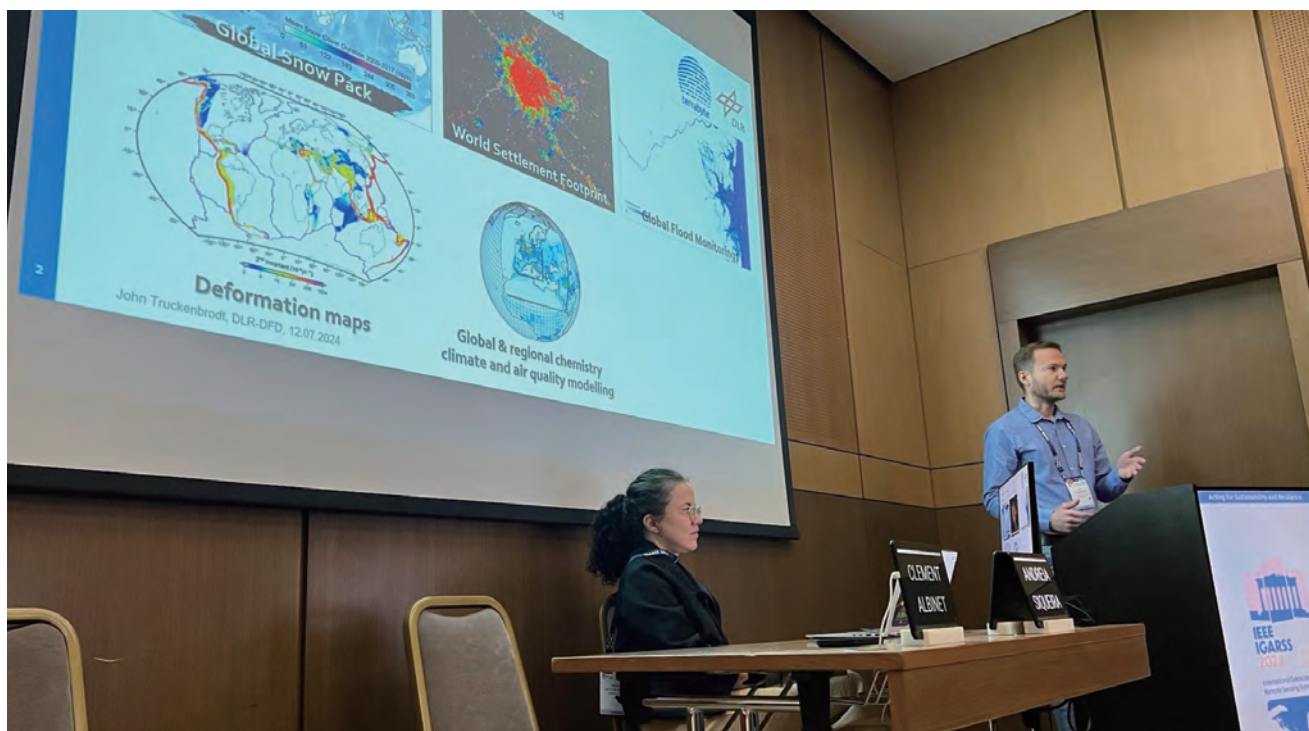
IGARSS 2024

CEOS had a strong presence at the 2024 International Geoscience and Remote Sensing Symposium (IGARSS). The Systems Engineering Office (SEO) sponsored an exhibition booth for the week. CEOS was also represented across the technical programme, with a number of presentations & posters by CEOS community members.

Dave Borges (NASA, SEO) presented a poster on the CEOS Analytics Lab. The poster highlighted the technical implementation of this resource, and attracted a number of questions.

David also presented a paper on behalf of his team about their ongoing work to develop “EO-GPT” – a generative AI architecture for Earth observation.

Andreia Siqueira (Geoscience Australia, LSI-VC Co-lead) & Clement Albinet (European Space Agency) chaired a Community-Contributed Session entitled “Analysis-Ready Data: The first step towards Interoperability” on behalf of CEOS. Presentations ranged from certifying datasets against the specifications, to applications of ARD.



A Scene of the “Analysis-Ready Data: The first step towards Interoperability” session.

At the exhibition booth, participants were attracted by the graphical wall that showcased the breadth of CEOS work, alongside satellite imagery from a number of CEOS missions. The booth also offered various stickers, including the special 40th Anniversary edition, and provided a small token for participants to take home with them. Additionally, the team distributed a [flyer](#) highlighting some of the activities of CEOS and postcards promoting the SDG EO Support Sheets.

Some common questions from visitors to the booth included:

- What is CEOS? How can I be involved?
- Where can I access data? Do you provide data?
- What is CEOS doing for climate, disasters and/or biodiversity?

There was also some interest from national space agencies who were interested in learning more about how to join CEOS and benefit from the international community expertise and engagement.



Steven Ramage (CEOS Executive Officer) & Gilberto Camara (INPE)

The booth included a presentation screen, where content from across CEOS was displayed. WGDIs contributed some [slides about their activities](#) which proved interesting for attendees. The promotional video for the [2023 EO Handbook](#) was also shown, alongside the [2022 SDG video](#) and some slides about [recent](#)

[mission launches](#). We also included the video interviews received to date from USGS, AEM and ECMWF for the CEOS 40th anniversary video. These videos allowed for a more people-centric approach to be presented, and the team looks forward to receiving the remaining video submissions.



Libby Rose (SEO) & Irena Drakopoulou (CEOS Executive Officer Team)

David Borges
Director, Systems Engineering Office

The Recovery Observation(RO)

The Recovery Observatory (RO) is a key activity of the Committee on Earth Observation Satellites (CEOS) Working Group on Disasters, aiming to provide satellite-maps and information for disaster recovery. It was set up as a pilot in December 2016 to support the monitoring of recovery and rehabilitation in the areas of southwest Haiti affected by hurricane Matthew.

Through time, the RO evolved to a generic and scalable CEOS activity ready to support other events by replicating the efforts initially seen for hurricane Matthew.

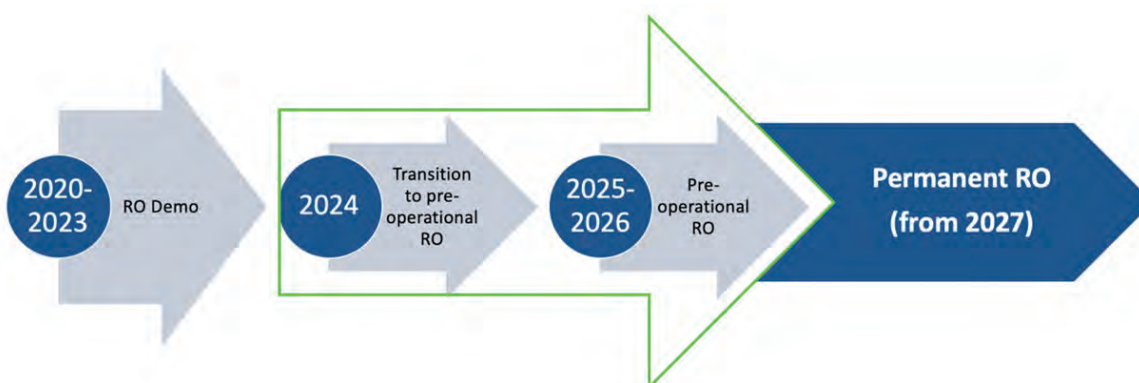
From 2020 to 2023, the RO Demo activity, led by the French Space Agency-CNES and the World Bank/GFDRR (Global Facility for Disaster Reduction and Recovery), was activated for 5 events by Tripartite Agreement partners:

- The Lebanon explosion (Beirut Port) in August 2020
- Hurricanes Eta and Iota in Central America late 2020
- The Haiti earthquake in August 2021
- The historic Pakistan floods in September 2022
- The Libya floods in September 2023

To help with planning and monitoring after disasters, CEOS and the RO have been working collaboratively with the United Nations Development Programme (UNDP), the European Union Service for Foreign Policy Instruments (FPI), and the World Bank GFDRR. This teamwork and the existing Tripartite agreement among these partners support the completion of Post-Disaster Needs Assessments (PDNAs) and helps create effective plans for rebuilding and recovery after a disaster strikes.

Building upon the experience gained through these activations, the RO recently began its transition to a pre-operational phase. In November 2023, CEOS approved a new project, the pre-operational RO, that started in 2024 and aims to become permanent by 2027.

1. **2024 (First Year):** The project began with a transition year. During this year, the leadership shifts to international disaster recovery partners.
2. **2025-2026 (Next Two Years):** The project will enter a pre-operational phase to prepare for becoming permanent in 2027.



Recovery Observatory (RO) evolution and planning

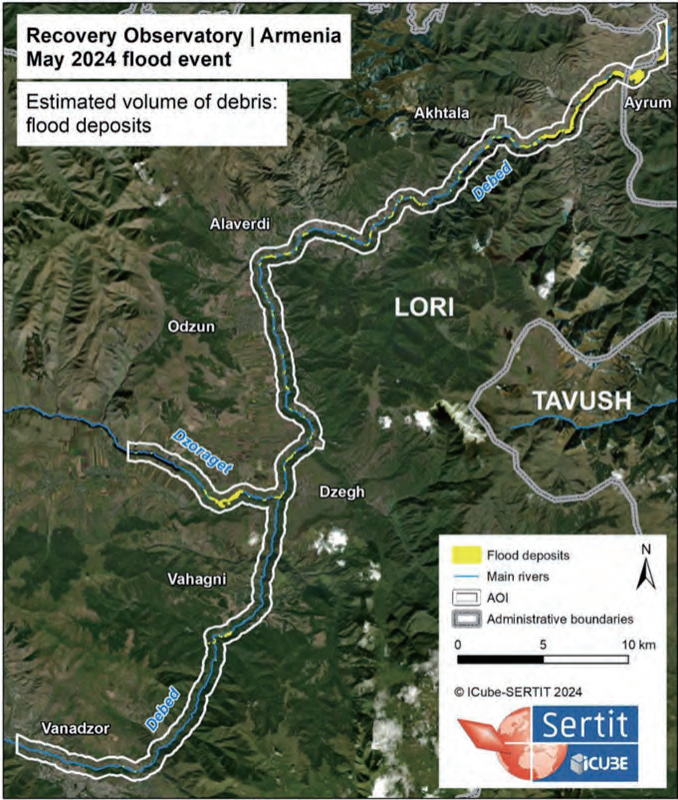
The main goal for 2024 is to get the international partners ready to lead and support the project during the planned activities.

Recently the pre-operational RO was activated by UNDP for floods in Armenia. In May 2024, heavy rainfall and consequent floods hit northern Armenia, particularly Lori and Tavush Provinces, where the rivers Debed, Aghstev, and Tashir all burst their banks washing away roads, bridges, parts of a railway and flooding towns and villages located along them. The International Charter ‘Space and Major Disaster’ and the Copernicus EMS Risk and Recovery have also been activated for disaster response and assessment of post-flood landslide risk, respectively.

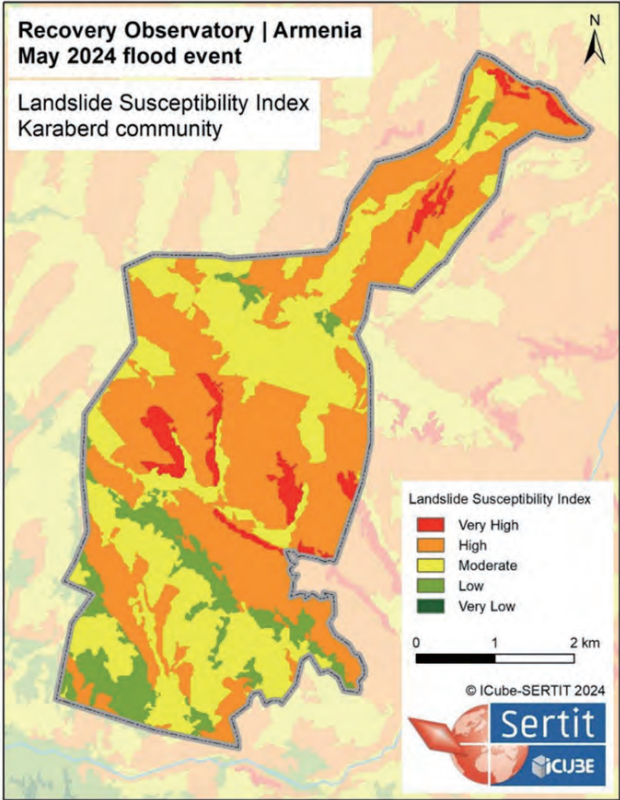
The Regional Image Processing and Remote Sensing Service (SERTIT, Strasbourg University) worked closely with the Armenian government on behalf of the RO Team to provide information about:

- The localisation, qualification and quantification of debris;
- The estimation of the flood propagation as well as flood simulations in the river basins;
- The potential of future landslides.

The transition to a permanent status by 2027 promises to enhance the Recovery Observatory’s capacity to deliver timely and accurate information, ultimately contributing to more effective and resilient recovery strategies in the face of future disasters.



Estimation of debris volume from flood deposits.
Credits: ICube-SERTIT



Landslide susceptibility assessment in Karaberd, one of the communities most exposed to landslide risk.
Credits: ICube-SERTIT

RO team

2024 CEOS Strategic Implementation Team (SIT) Technical Workshop

The CEOS Strategic Implementation Team (SIT) Technical Workshop (TW) was held in Sydney, Australia on 17-19 September 2024. The meeting was organized by the Japan Aerospace Exploration Agency (JAXA) as the SIT Chair and hosted by the Commonwealth Scientific and Industrial Research Organisation (CSIRO) and the Geoscience Australia (GA).

Approximately 80 participants (50 in person and 30 online) attended the two-day hybrid meeting and the side events held the day before. The workshop provided an opportunity to discuss strategic and technical issues and to prepare the information for decision-making at the CEOS Plenary next month.



Participants to the 2024 SIT-TW in Sydney, Australia

The meeting was also an important opportunity to discuss the two SIT Chair priorities – **Climate Policy Impact of Satellite data and Greenhouse Gas (GHG) Observations from Space**, which JAXA committed to when it assumed the chairmanship in November 2023.

Climate Policy Impact of Satellite Data

This priority addresses obstacles and opportunities for CEOS agency data to have maximum impact in the key climate policy processes such as the UNFCCC Global Stocktake (GST) of the Paris Agreement. As a core activity of the priority, lessons learned from the first GST in 2023 were shared during the meeting.

WGClimate reported that our pilot atmospheric flux CO₂ and CH₄ budgets delivered to GST1 were not widely used by the national inventory community to compile or validate national inventories and that there is a need to engage national inventory communities/compilers in the development of future products. The WG also noted that CEOS needs to work closely with UNFCCC to stay informed and help them understand how to use the top-down flux datasets together with the bottom-up datasets.

Greenhouse Gas (GHG) Observations from Space

Another priority addresses coordination for GHG observation continuity challenges ahead and developing good practices so that operators of all kinds may contribute to societal needs. To advance this priority, GHG Roadmap Issue 2 has

been developed by the CEOS GHG Task Team together with colleagues from the Coordination Group for Meteorological Satellites (CGMS). The major updates include classification and refinement of short- and long-term goals, and stakeholder engagement including UNEP's International Methane Emissions Observatory (IMEO) and WMO's Global Greenhouse Gas Watch (G3W). In addition, CEOS recognizes the importance of linking the GHG Roadmap with the AFOLU and Aquatic Carbon Roadmaps. As SIT Chair, JAXA undertakes to ensure that coordination.

The developing GHG Best Practices Document focuses on facility scale measurements and incorporates the results of discussions with commercial companies that operate their own GHG satellites. This effort will be the first step in standardizing data for users, which can also support data providers outside the CEOS Agency.

In Sydney, we also discussed the important issue of biodiversity, which is the 2024 CEOS Chair theme. As CEOS Chair, the Canadian Space Agency (CSA) proposed to form a Biodiversity Study Team to look in detail at how CEOS can continue to contribute in this area. A discussion and decision will be made at the 2024 CEOS Plenary.

I would like to thank the CEOS members who participated in the 2024 SIT-TW for their valuable contributions and discussions. The meeting was fruitful and an important opportunity to set the stage for important decisions at the 2024 CEOS Plenary. I would also like to express my deepest gratitude to CSIRO and GA for hosting us so generously.



Hironori Maejima
CEOS SIT Chair, JAXA

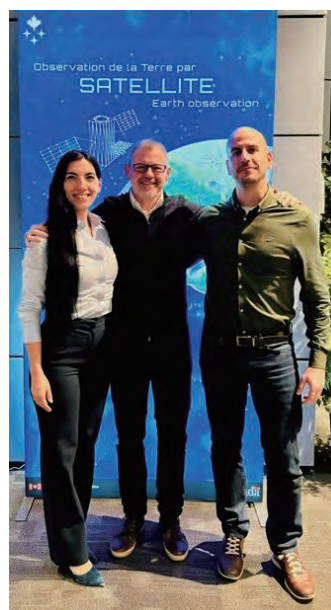
Meet the CEOS Executive Officer team

For the first time, the CEOS executive office is being led by a team instead of one person. At the 2022 Plenary, according to a rotation of responsibilities in terms of ensuring CEO support, Europe agreed to take its turn to provide for this position. EUMETSAT and ESA agreed to take responsibility for the time period of 2024-2027, and organised a consortium of European Agencies to contribute towards the cost.

Following an extensive tender process, EUMETSAT selected Steven Ramage (Réseau Consulting) and Lefteris Mamais (Evenflow) to jointly support the role for 2024-2025, with a possibility to extend for another 2-years. Steven is the CEOS Executive Officer (CEO), with CEO support provided by Lef and his team, notably Irena Drakopoulou who has been compiling inputs to the CEOS Work Plan and supporting other activities in collaboration with Lef and Steven.

The CEO team has the responsibility to collaborate with Working Groups, Virtual Constellations and others to ensure contributions and track deliverables for [the CEOS Work Plan](#). In addition, the CEO team supports the CEOS Chair and Strategic Implementation Team (SIT) Chair, including representing CEOS at meetings of CEOS partners and stakeholders upon request of the CEOS Chair and CEOS SIT Chair. The team also works closely with the CEOS Systems Engineering Office (SEO) on topics ranging from cloud-native geospatial applications to communication of CEOS community activities (refer to CEOS [CEO Terms of Reference](#)).

The CEO is a member of the Group on Earth Observations (GEO) Programme Board addressing GEO Work Programme activities in support of the CEOS SIT Chair. The CEO recently represented CEOS at the GEO Symposium and Open Data Open Knowledge workshop in Hangzhou, China.



CEO team at CEOS Plenary in Montreal, CANADA

Regular engagement and communication with the CEOS Working Groups has been very important in terms of supporting the CEOS Work Plan, but also for understanding in greater depth the extensive contributions to CEOS by space agencies and other stakeholders.

The CEO team is responsible for updating [events on the CEOS website](#), so the team is always interested in updates from the community for forward planning and to include international events on the [CEOS website](#). The same is true for the CEOS mailing and contact lists, so please let them know about any changes in your contacts for CEOS.



Steven Ramage
CEOS Executive Officer

CEOS 40 Years of Achievement and Legacy

Since its establishment in 1984, CEOS has evolved and adapted to meet the changing needs of society and to continue to fulfill its important role. This article celebrates the 40th anniversary of CEOS and looks back at the achievements and legacies of CEOS decade by decade.

1984~

The founding function of CEOS was to coordinate and harmonize Earth observations among its member space agencies. CEOS initially focused on interoperability, common data formats, the inter-calibration of instruments, and common validation and inter-comparison of products. In its founding year of 1984, the Working Group on Calibration and Validation (WGCV) was established to enhance coordination and complementarity, to promote international cooperation and to focus the calibration and validation of EO for the benefit of CEOS members and the user community. CEOS also established the Working Group on Data (WGD) and they created the CEOS Data Format to facilitate access and use of EO data by the user community. This has long served as the primary format for Earth observation satellite data and a foundation for data use.

1995~

Since the late 1980s, the international community put greater emphasis on the importance of integrating satellite-based observing systems with ground-based networks to establish global-scale observations. As international strategic planning of observations was essential to avoid duplication and to fill gaps in observational networks, the Integrated Global Observing Strategy (IGOS) Partnership was established. CEOS provided analysis and inputs to a number of the major international coordination events, including the 2002 World Summit on Sustainable Development in Johannesburg, and the Earth Observation Summits in Washington, DC, Tokyo and Brussels. CEOS played an influential role in the establishment of GEO in 2005 and has since served as the space arm of the Global Earth Observation System of Systems (GEOSS).

2005~

In support of GEO objectives and in order to harmonize efforts among space agencies to deploy Earth observation satellites with the aim of closing data gaps, in 2006 CEOS established four Virtual Constellations (VCs), being: Land Surface Imaging; Ocean

Surface Topography; Atmospheric Composition; and Precipitation. VCs merge or integrate data and derived information for measurement and analysis by coordinating the operation of existing satellites across CEOS agencies and seek to optimise planning of future missions. The number of VCs has now grown to eight, suggesting that this approach has been effective and beneficial. In parallel, CEOS put greater emphasis on thematic applications of EO and established a Working Group on Climate (WGClimate) in 2010 and a Working Group on Disasters (WGDisasters) in 2013. CEOS also established a Working Group on Capacity Building and Data Democracy (WGCapD) in 2012 to increase the capacity of less developed countries for effective use of EO data for the benefit of society and to achieve sustainable development. These movements, coupled with the effects of open data policies which CEOS has long supported, have brought tremendous benefits to the user community as well as the expansion of the community itself.

2015~

As the user community expands, the international community's expectations for Earth observation satellites, and thus for CEOS, are higher than ever. In 2015, the following three important international frameworks were successively adopted as CEOS priorities, and CEOS has since focused on and actively contributed to these frameworks.

- The Sendai framework for Disaster Risk Reduction by UNDRR
- Sustainable Development Goals (SDGs) by UN
- The Paris agreement of the UN Framework Convention on Climate Change (UNFCCC)

CEOS engaged with these communities, helped them to understand satellite EO, and developed datasets for their purposes. Contributions to these frameworks remain major work in progress, and still more requests for CEOS support have been received from other communities – with increasing opportunities for cooperation are expanding. CEOS will continue to evolve with the times, mobilise the efforts of space agencies, and further expand the value of satellite EO.

Comments from the distinguished contributors to CEOS

In forty years CEOS has evolved from a technical cooperation among a small group of space agencies to a broad and diverse global partnership. CEOS has developed and embraced innovative mechanisms to serve its user communities through unimagined progress in EO satellite technologies for the benefit of humanity.



Stephen Briggs

Visiting Professor, Reading University,
Department of Meteorology, Cambridge University,
Department of Chemistry

The proposal for a CEOS was not widely popular with the space community. However, largely due, at that time, to the Canadians, the proposal started to gain support. The success over the years owes much to the solid Japanese support. CEOS has earned its place as an important player in the field of remote sensing



Roy Gibson

In 1992, a permanent CEOS Secretariat was established with members from Europe, the United States, and Japan. NASDA (now JAXA) of Japan actively promoted CEOS activities as a member of the CEOS Secretariat. I am pleased to have had the opportunity to develop close relationships with people from various countries through CEOS activities.

As part of the Secretariat's work, the CEOS Newsletter has been published since 1993. The CEOS Newsletter has included reports on CEOS Plenary meetings and CEOS-SIT meetings, activity reports on WGs and VCs, and reports on CEOS contributions to IGOS, GEOSS/GEO, and UN activities (SDGs, disasters, climate issues). We are pleased that the CEOS Newsletter has enabled us to widely publicize CEOS activities and record the results of CEOS activities.



Yukio Haruyama

Congratulations to CEOS and CEOS colleagues for its 40th Anniversary!

CEOS is truly an excellent model for international cooperations and coordination. I was raised by CEOS and it has been always a great place to learn and consider the future of the Earth.



Chu Ishida

For millennia, humans have used horses in Central Asia, river boats in Egypt, outriggers in Polynesia, and sailing ships from Europe to explore the earth. In seeking what was there, they became aware of who was there. Now it is the satellite's turn. CEOS symbolizes the 20th century's contribution to the historical movement towards globalization. The immediate beneficiaries have been resource management and global change research, but the long-lasting bonus is the friendships among national leaders who find common humanity in sharing a goal beyond the reach of any country



Charlie Kennel (about 40 years ago)

Distinguished Professor and Director Emeritus,
Scripps Institution of Oceanography,
University of California San Diego, La Jolla, CA, USA
Member, Centre for Science and Policy
Fellow Commoner, Christ's College,
University of Cambridge. Cambridge, UK

It has been a great honor to have been part of creating CEOS in 1984 when I led the international affairs office at NOAA/NESDIS. Stimulated by the potential benefit for users to be able to easily access and integrate Landsat and SPOT data, CEOS has grown to be so much more. The fact that CEOS continues and thrives forty years later demonstrates that space agencies have found value in working together toward common goals on behalf of our shared planet. May CEOS continue to serve as a model for international cooperation and collaboration for many years to come



Lisa R. Shaffer

Former Director, NOAA/NESDIS International
and Interagency Affairs, and former Director,
NASA Mission to Planet Earth International Office

I congratulate CEOS on the occasion of its 40th anniversary, as commemorated at the recent 2024 Plenary in Montreal. As a young NASA International Affairs Specialist I participated with other international partners in the 1984 creation of CEOS as an outgrowth of the Group of Seven Economic Summit's Panel of Experts on Remote Sensing from Space. Moving by 1988 to NOAA, I joined in 1992 the newly-created CEOS Secretariat, witnessing over the course of my career the marked growth and expansion of CEOS as the focal point for international coordination of space-related, Earth Observation activities—this through the addition of member space agencies and key organizational affiliates; the creation of the CEOS Strategic Implementation Team; and the establishment and active engagement of working groups focusing on systems and services, calibration/validation, global climate change, data exchange, education/capacity building, and disasters, as well as the identification of thematic virtual constellations. Measures of the value of CEOS have been its key involvement in connection with UN Sustainable Development Goals, its important role as the “space arm” of the Group on Earth Observations/GEO’s Global Observing System, and its key partnership in the Earth Observation activities of the International Astronautical Federation/IAF. It has truly been my honor to be involved in the development of CEOS and many of its activities. Together with you, I celebrate CEOS and its legacy



Brent Smith

CEOS has created a special movie to commemorate its 40th anniversary.

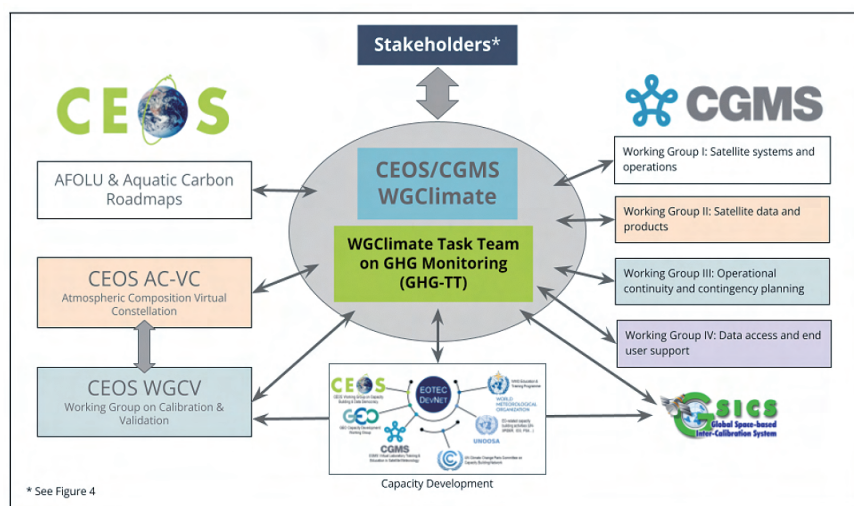
Please hear from the Principals of CEOS Agencies regarding the past, present and future of CEOS.



Updated CEOS-CGMS Greenhouse Gas Roadmap

The Committee on Earth Observation Satellites (CEOS) and the Coordination Group on Meteorological Satellites (CGMS) recognize that high-quality, systematic observations of atmospheric carbon dioxide (CO₂) and methane (CH₄) from a constellation of space-based sensors can make critical contributions to an integrated global greenhouse gas (GHG) observing system. They therefore directed the joint CEOS-CGMS Working Group on Climate (WGClimate) to formulate a roadmap to implement a constellation architecture

for monitoring CO₂ and CH₄ from space. The primary objective of this GHG Roadmap is to coordinate efforts across CEOS and CGMS agencies to maximise the quality, utility, transparency and continuity of space-based GHG products for science and policy applications. Its ultimate goal is to facilitate the development of fit-for-purpose operational systems that integrate space-based GHG estimates with ground-based, airborne and shipborne observations of CO₂ and CH₄ to address the needs of a diverse range of stakeholders.



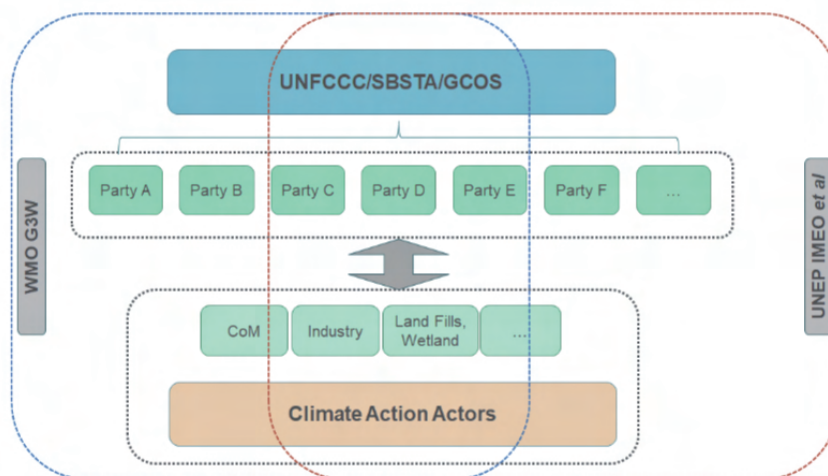
CEOS, CGMS and WMO GSICS entities currently included in the task team.

The first issue of the CEOS/CGMS GHG Roadmap focused on delivering space-based CO₂ and CH₄ products to support the Paris Agreement's Global Stocktakes (GSTs). This issue of the roadmap continues to support that goal, but has been updated to accommodate lessons learned from the first GST. Its scope has also been expanded to support the rapid evolution of the international GHG science, inventory, policy and regulatory communities. Changes include:

- An enhanced focus on engagement and co-development with stakeholders in the international science, inventory, policy, and regulatory communities;

- Ongoing efforts to engage with new partners, including the World Meteorological Organization Global Greenhouse Gas Watch (WMO G3W) and United Nations Environment Programme International Methane Emissions Observatory (UNEP IMEO);
- An updated summary of the evolving requirements and capabilities for space-based measurements that can quantify CO₂ and CH₄ concentrations and support flux estimation;
- Updates to the space-based CO₂ and CH₄ monitoring architecture, broadening the focus from regional-scale, global mapping missions to include both public sector and non-governmental (New Space) missions that can monitor emissions at facility scales;

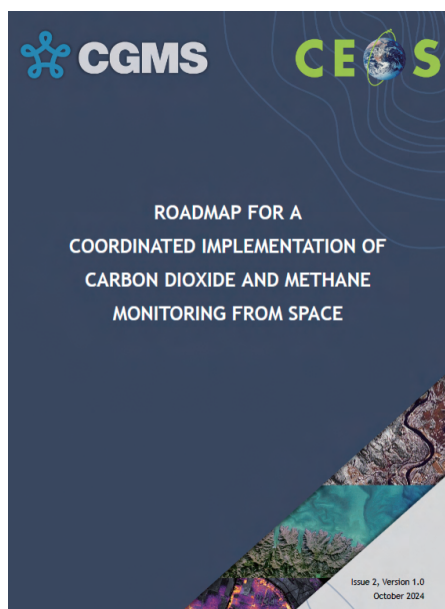
- A brief review of the research needed to derive CO₂ and CH₄ concentrations from space-based measurements, validate these results against internationally recognized standards, and then use them to derive budgets of CO₂ and CH₄ on spatial scales spanning individual facilities to nations;
- Efforts needed to foster the transition from research to operations (R2O) to support the development of an operational GHG Monitoring and Verification Support (GHG MVS) system that serves stakeholders in the science, inventory, policy and regulatory communities; and
- An explicit focus on capacity building to foster the use of space-based GHG products.



Stakeholders and their interactions.

The updated roadmap describes specific thematic areas where CEOS and CGMS are working with stakeholders and partners to co-develop improved, fit-for-purpose space-based GHG products. It then summarises the relative roles of the joint CEOS-CGMS WGClimate GHG Task Team and other CEOS and CGMS teams in its implementation. As in the first issue,

detailed activities and action items, which are continuously evolving, are described in an Annex. With these changes, the GHG Roadmap should foster the coordination of space-based GHG products that better address the needs of an increasingly diverse stakeholder community and be more resilient to the future evolution of this rapidly evolving field.



We are now pleased to announce that at the recent 38th CEOS Plenary, the principals have unanimously endorsed this update to the Greenhouse Gas Roadmap. Several CEOS agencies explicitly recognized the remarkable team effort that made this swift update possible and it was commented as “CEOS at its best!”.

Simultaneously, in coordination with the CGMS Secretariat, endorsement was requested from the CGMS principals. We are delighted to share that also CGMS unanimously endorsed the update on the same day as CEOS. With endorsements from both CEOS and CGMS, Issue 2 is now fully approved and officially released to the public. We stimulate you to share the roadmap within your network and community. The final version is now available [here](https://ceos.org/publications-key-documents/), which can be found under two public CEOS pages:

<https://ceos.org/publications-key-documents/>
<https://ceos.org/ourwork/workinggroups/climate/ghg-tt/>

We look forward to implement the efforts needed to transition the current framework from research to operations. This will support sustained and operational GHG Monitoring and Verification Support systems that serve stakeholders across science, inventory, policy, and regulatory communities, including a focus on the required capacity building promoting the wider use of space-based GHG products.



Yasjka Meijer (ESA)
GHG Task Team Lead in WGClimate

38th CEOS Plenary



Participants to the 38th CEOS Plenary in Montreal, Canada

On October 22-24, the Canadian Space Agency had the honour to host the 38th Plenary meeting at its Headquarters located in St-Hubert, Québec. The meeting chaired by Eric Laliberté, the CSA 2024 CEOS Chair, was attended by 85 participants onsite, with 28 attendees joining virtually. To highlight this unique occasion, CSA invited the 38th CEOS Plenary to support the [Montreal Statement](#), a document essentially renewing our collective desire to collaborate on

global challenges at the occasion of CEOS 40th anniversary.

The year 2024 marked the 40th anniversary of CEOS. This important milestone was celebrated throughout the meeting, but more specifically during a special evening held at the historic Château Ramezay, downtown Montreal; an evening during which Canada's French heritage was showcased.



The past, current, and future CEOS Chair celebrated the 40th Anniversary of CEOS.

Most decisions submitted to the CEOS Principals had been prepared during the SIT Technical Workshop held in Australia in September. In particular, the mandate of the Ecosystem Extent Task Team (EETT) created 2 years ago was formally recorded as completed. As next steps, CEOS Plenary agreed to establish a Biodiversity Study Team (BST) as an evolution of the EETT to undertake a one-year mandate to consider the best options for CEOS to address the broader topic of biodiversity in the years to come. The new BST is to be led by the existing co-leads of the CEOS EETT and supported by other interested CEOS members.

In addition, CEOS Plenary endorsed the following: (1) the [Issue 2 of the CEOS-CGMS Greenhouse Gas \(GHG\) Roadmap \(2024\)](#), (2) the [CEOS Analysis Ready Data Strategy 2024](#), (3) the 2024 update to the CEOS Strategic Guidance document, and (4) the 2024 update of the Terms of Reference of the Working Group on Information

Systems and Services (WGISS). The Plenary also agreed that the WGDisasters and its EW4All subgroup should lead the CEOS response to the UN's Early Warnings for All (EW4All) initiative.

In addition to a Canadian digital showcase of biodiversity activities presented over the 2 days of the Plenary, the CEOS Chair presented a summary of the biodiversity priority and highlighted the main actions taken to move the priority forward. These include wide consultations with CEOS members, the organization of a 2-day workshop with international biodiversity players (UNCBD, GEO, GEOBON, FAO, UNDP) leading to a draft *Joint Communiqué* on biodiversity (still to be reviewed by all parties), and the development of a proposal to explore appropriate organizational structure for continued efforts on biodiversity in CEOS.



A scene at the 38th CEOS Plenary 2024

In the area of CEOS governance and leadership roles, Medhavy Thankappan of Geoscience Australia was confirmed as Vice Chair of the Working Group on Calibration and Validation (WGCV) and Vincent-Henri Peuch of the European Centre for Medium-Range Weather Forecasts (ECMWF) was confirmed as Vice Chair of the CEOS/CGMS Working Group on Climate (WGClimate). In addition, CEOS agencies interested to contribute to an 18-month Essential Agriculture Variables (EAV) stock take and LSI-VC Subgroup on GEOGLAM scoping effort were asked to identify points of contact. The same request was made to entities willing to assist with the detailed assessment of the CEOS External

Request Process for the UNCCD support request.

Furthermore, the CEOS principals welcomed UKSA as 2025 CEOS Chair whose priority focus is two-fold: (1) attracting youth to the EO sector, and (2) to study how EO data can be better used for the provision of public services. Finally, the CEOS Plenary endorsed the nomination of the Commonwealth Scientific and Industrial Research Organization (CSIRO) as 2026 CEOS Chair, to be supported by Geoscience Australia and the Australian Bureau of Meteorology, in representation of the Asia-Pacific region.



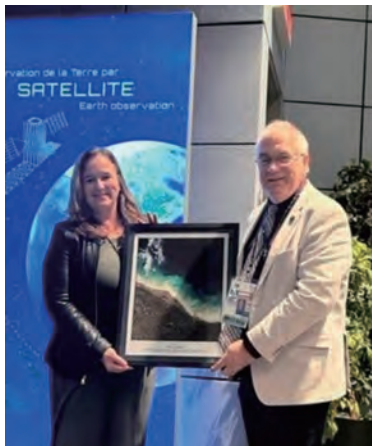
In addition to the CEOS 40th anniversary celebration, participants also had the chance to experience firsthand Indigenous history and contribution to today's Canadian society during an evening at *La Maison autochtone*.



The Beautiful garden of historic La Maison autochtone

CSA was privileged to chair CEOS in 2024 and to welcome CEOS representatives at our headquarters, some for the last time. As they have now retired, we are pleased that the

valuable contributions of Charles Wooldridge (NOAA) and Eric Laliberté (CSA) made over the course of their respective careers were highlighted during the meeting.



CSA wishes to thank all CEOS entities that have contributed to CEOS activities and to the success of this Plenary, as well as the Symbios team for the continuous support

throughout the year. Special thanks to JAXA for their friendship and professionalism as SIT Chair. We wish UKSA a productive 2025 chairmanship year!



The CEOS Chairmanship was handed over from the CSA Team to the UKSA Team

-CSA 2024 CEOS Chair team