CEOS NEWSLETTER
The Committee on Earth Observation Satellites
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European Commission chairs the Committee on Earth Observation Satellites for the first time

Philippe Brunet,
2018 CEOS Chair,
European Commission

The 32nd Plenary Meeting of the Committee on Earth Observation Satellites marked the culmination of the European Commission's year as Chair of CEOS. Held from 16-18 October 2018 in Brussels – the home of the Copernicus Programme and the European Commission – the event consisted of an inspiring 3 days of presentations, workshops, discussions and many other activities.

2018 has been an historic year for the EU in terms of space affairs. Whilst it has been a CEOS Member since 1994, this year was the first opportunity for the European Commission to serve a term as Chair of the organisation.

The Committee on Earth Observation Satellites (CEOS) is the mechanism that brings together multiple organisations from all over the world to coordinate international Earth Observation efforts that benefit society.

Over the past three decades, CEOS has significantly contributed to the advancement of space-based Earth Observation community efforts. CEOS Agencies communicate, collaborate, and exchange information on Earth Observation activities, spurring useful partnerships such as the Integrated Global Observing Strategy (IGOS).

The European Commission's role as Chair of CEOS has offered a remarkable opportunity to further advance CEOS priorities. The European Commission worked with the past chair USGS, the 2018-2019 Chair of the Strategic Implementation Team, NOAA, and the relevant stakeholders to ensure substantive and timely continuity of CEOS activities.

Brussels as the home of both the Copernicus Programme and European Commission has brought together a great mix of expertise both in terms of policy and implementation, while gathering the CEOS membership to deepen awareness of and support for its Earth Observation missions, data, and activities, their global relevance and benefits.

The European Commission specifically pursued two dedicated priority initiatives during its mandate:

1. To lay the foundation for an international greenhouse gas (GHG) monitoring system; and
2. To highlight the benefits of Future Data Architectures, identifying new targets

The 32nd CEOS Plenary marked the successful accomplishment of the Commission's role as Chair of CEOS. The meeting was a true success with 90 attendees representing a large number of CEOS Agencies and associates from across the globe.

Highlights from the plenary include:

1. The National Institute of Environmental Research, Korea (NIER) and United Arab Emirates Space Agency (UAESA) were accepted as the newest member agencies of CEOS
2. The CEOS Plenary endorsed the 'Statement reporting on progress by the Committee on Earth Observation Satellites (CEOS) and the Coordination Group for Meteorological Satellites (CGMS) on Coordinated Response to UNFCCC Needs for Global Observations' for submission at COP-24
3. The CEOS Plenary endorsed the report 'A Constellation Architecture for Monitoring Carbon Dioxide and Methane from Space.'
4. The Plenary confirmed CEOS interest in establishing a dedicated coordination mechanism for GHG monitoring, with adequate resources and activities based on the identified roadmap Forward chapter of the report 'A Constellation Architecture for Monitoring Carbon Dioxide and Methane from Space.'
5. Major advancements have been presented around the Data activities with a lot of interested and development demonstrated on Analysis Ready Data and Datacubes, with all of the implication for these of the interoperability of different agencies datasets.
6. The CEOS Working Groups and Virtual Constellations have continued to demonstrate substantial amount of important activities, which provide the foundations for many of the priorities to be addressed.

The presentations from the plenary can be found at: http://ceos.org/meetings/32nd-ceos-plenary

The 32nd CEOS Plenary meeting in Brussels, Belgium was a great success!

2018 CEOS Strategic Implementation Team Technical Workshop: Outcomes and Aspirations

Dr. Stephen Volz,
2018-2019
CEOS SIT Chair

In early September, the CEOS community traveled to Darmstadt, Germany for the 2018 Strategic Implementation Team Technical Workshop (SITTW). On behalf of CEOS and the SIT Chair team, I offer sincere thanks to EUMETSAT for welcoming over 60 participants and serving as a gracious host for this meeting. This "City of Science" backdrop provided the perfect forum for participants to discuss and identify existing and potential collaboration opportunities in all areas of CEOS activities, to examine the efficiency of current organizational structures, and to prepare for the upcoming CEOS and Group on Earth Observations (GEO) Plenaries.

Prior to the start of the SITTW, representatives from the Virtual Constellations (VCs), Working Groups (WGs), and *ad hoc* Teams (AHTs) gathered for coordinated discussions framed around the thematic areas of Data, Oceans and Water Cycle, and Climate. These conversations continued into the first day of the Workshop, which allowed for discussion among the entire body on outcomes from the previous day's sessions and their potential impact on the broader intra-CEOS working relationship. One example of the outcomes from these efforts was the identification of potential to combine ocean VC activities focusing on coastal research and observations. This work highlighted the need for direct access to in situ data and the potential to target specific projects in the coastal zones. The Ocean Surface Topography (OST) VC noted future links between OST and other observables such as sea surface temperature and ocean color will be important for sustainability.

The goal to enhance cross-collaboration on the working level was further supported on the second day as conversation turned to improving processes across CEOS entities and enhancing the productivity of the organization. To better support the ongoing work of CEOS, participants discussed various processes, including: the lifecycle of *ad hoc* teams; monitoring progress in the CEOS Work Plan to provide feedback to CEOS Principals throughout the year and at the Plenary in particular; and leveraging key partnerships to achieve strategic goals. These conversations highlight SIT's aspiration for consistent and tangible outcomes from ongoing efforts of the CEOS community.

The Workshop provided the opportunity to review the progress of Future Data Architecture *ad hoc* Team and Land Surface Imaging (LSI) VC in the successful development of CEOS Analysis Ready Data for Land (CARD4L). Analysis Ready Data (ARD) are no longer just the desire of global users but are becoming a requirement and an expectation. It is clear that space agencies need to make it easier for global users to get ARD to continue their increased application of satellite data products.

Workshop participants welcomed the white paper *A Constellation Architecture for Monitoring Carbon Dioxide and Methane from Space.* Over the course of the last 18 months, a dedicated team of researchers, space agency representatives, and scientists from across CEOS defined the key characteristics of a global architecture for monitoring atmospheric CO_2 and CH_4 concentrations and their natural and anthropogenic fluxes from instruments on space-based platforms. Discussion at the SITTW focused on developing a roadmap for taking the next steps in outlining the observing system development recommendations within CEOS, and for submitting the paper to the CEOS Plenary consideration.

Participants highlighted the opportunities for cross-cutting cooperation among a number of WGs and VCs in the ongoing plans for the GEO/LEO case studies related to flood mapping and land surface applications. This SIT Chair and SIT Vice Chair priority has gained significant interest across the CEOS community.

Looking ahead, we see an increased focus in the international community on the oceans and coastal areas, some of our most vulnerable and densely populated areas. The United Nations Decade of Ocean Science for Sustainable Development commences in 2021 and the Intergovernmental Oceanographic Commission is developing the Global Ocean Observing System 2030 Strategy that will identify "a truly global ocean observing system that delivers essential information needed for our sustainable development, safety, wellbeing, and prosperity." This past October, countries converged in Bali, Indonesia for the Our Ocean 2018 Conference "Our Ocean, Our Legacy" and identified 305 tangible and measurable commitments that covered almost all ocean basins, many focused on fragile coastal-marine areas and associated upland ecosystems. At that meeting, commitments were also announced to support the third decadal "Ocean Obs'19" Conference in September 2019, which will highlight progress on ocean observations from space to deep sea. Through synchronized efforts, CEOS can develop strategies for an integrated approach to better observe our oceans. In 2019, leading up to the Ocean Obs'19 conference and the 2019 SIT Technical Workshop, the SIT will emphasize the importance of our oceans and continue our dialogue from the 2018 Technical Workshop on possibly developing a CEOS Coastal Strategy.

As oceans will be a key thread in our updated strategy for this year, it is only fitting that we extend our invitation to the CEOS community to join us in Miami, Florida from April 1-5, 2019 for the 34th meeting of the Strategic Implementation Team. Here we intend to reiterate our commitment to supporting our coastal zones and further develop coordinated strategies.

SIT Technical Workshop in Darmstadt, Germany

Report of CEOS Executive Officer

Steven Hosford,
ESA

With more than one year of my CEOS Executive Officer mandate already gone, the end of this two year mandate is now closer than the beginning, presenting an ideal occasion to take stock of experience gained and look forward to 2019. The past year, thanks to the able leadership of the European Commission, has been one of significant progress, particularly on the two CEOS Chair priority areas: coordination of the space infrastructure required to measure carbon from space and; moving forward space agencies's understanding of the changes and opportunities in the increasingly digital economy we all operate in. On the first hand in addition to the June Ispra workshop[1], the "Architecture for monitoring Carbon Dioxide and Methane from space" white paper was completed and endorsed by CEOS Plenary in October. The focus on the second priority area has been manifested primarily by a growing awareness of the opportunities available by harnessing cloud technologies for access to and analysis of the substantial EO datasets that are now being generated. However, it is becoming increasingly apparent that a transformation in the role of space agencies, at least for certain types of measurement, may also, ultimately, be a much more lasting and profound impact of the digital transformation. The digital economy means an increasingly digital literate society who understand terms like "data" and "algorithms". Catering to their information needs is the objective of many "new space" companies today and their welcome development is thus shifting the cursor in private/public investments.

The CEOS Chair priority in 2019 is a Mekong datacube for forestry and agriculture and focuses on a regional demonstration of some of the new approaches that we have been working on collectively within CEOS over the past number of years (Analysis Ready Data, Datacubes, etc,). It represents an excellent opportunity to test, on a real case, our ability to provide the data, algorithms and data processing environments that we hope will, in the coming years, transform Earth Observation from a specialist niche to an integral part of our modern economies.

As each of our agencies face this period of change at different speeds and with a focus on different aspects, the CEOS culture of openness, exchange of ideas and collaboration will, I am confident, continue to provide value as the fertile subsoil of international collaboration in Earth Observation.

(Note)

1) Interfaces between CEOS agencies and the GHG monitoring system (https://tinyurl.com/y8p3z39v)

12 Years of the CEOS Systems Engineering Office

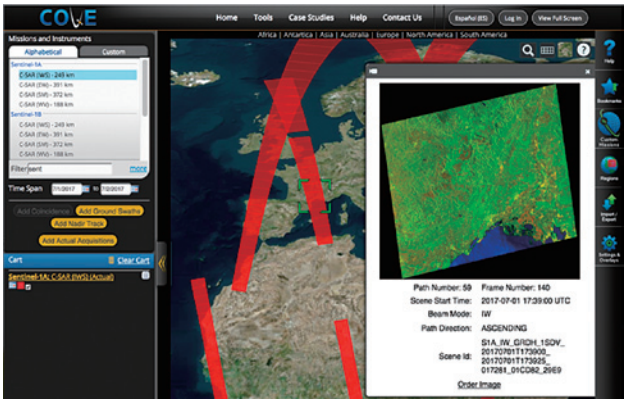
Brian Killough,
CEOS Systems Engineering Office

The Committee on Earth Observation Satellites (CEOS) Systems Engineering Office (SEO) was established in April 2007 and is now in its 12th year of operation. Funded by NASA as a contribution to CEOS, the SEO team formally reports to the Strategic Implementation Team (SIT) Chair, and its annual work plan is coordinated with the SIT Chair and the CEOS Chair. The SEO provides systems engineering leadership and support to CEOS through technical and management services and the development of tools and products that facilitate systems engineering solutions. The following is a short summary of the SEO's current and future technical and management services.

The SEO has led the development of a number of systems engineering tools that support CEOS internal groups and the general earth science community and public. These tools include the CEOS Visualization Environment (COVE) tool (http://ceos-cove.org), the initial Essential Climate Variable (ECV) database (now transitioned to the CEOS/CGMS Working Group on Climate), and the CEOS Data Policy Portal (http://www.ceos-cove.org/en/data_policy/). In addition to these tools, the SEO team works with the European Space Agency (ESA) to annually update the CEOS missions database tool (http://database.eohandbook.com) and add new features for enhanced functionality and user queries. The SEO also conducts data acquisition planning studies in support of the Global Forest Observation Initiative (GFOI) and the Group On Earth Observations GLobal Agricultural Monitoring (GEOGLAM) Initiative teams and supports the development of measurement requirements; mission coverage and gap assessments; data volume assessments; cloud cover analyses; and data policy assessments. Most recently, the SEO invested a significant portion of its time and resources to the development of the Open Data Cube (ODC) initiative (http://opendatacube.org), including an online public user interface and associated tools and algorithms that promote the use of CEOS Analysis Ready Data (ARD) and efficient time series analyses. These new ODC tools are becoming quite popular and have resulted in nine countries with operating data cubes, 14 countries with data cubes in development, and another 30+ countries with data cube opportunities under review. In the coming year, the SEO plans to develop new gap analysis tools in support of the CEOS Land Surface Imaging Virtual Constellation (LSI-VC) team and develop a new training resource database for the Working Group on Capacity Building and Data Democracy (WGCapD).

In addition to its technical work, the SEO invests in many management functions focused on efficient operation of the CEOS infrastructure and increased public awareness of CEOS work. This work includes managing CEOS website content (over 20,000 visitors annually), engaging across multiple social media channels (Twitter: @ceosdotorg, Facebook: @socialceos), maintaining mailing lists, hosting and managing a database of annual CEOS deliverables and tasks, and supporting education, outreach, and training at international conferences and meetings.

The SEO is proud of its role within CEOS and the global impact of its technical and management products and looks forward to many more years of SEO operation.



The CEOS Visualization Environment (COVE) tool (http://ceos-cove.org) is a popular web-based mission analysis tool with over 130 missions for searching, analyzing, and visualizing actual and potential satellite sensor coverage.

Working Group on Calibration and Validation (WGCV)

Cindy Ong, *CSIRO , WGCV Chair*

The Working Group of Calibration and Validation held its 43rd plenary meeting between 10th to 13th April 2017 in Sao Jose dos Campos, Brazil and was hosted by INPE. 17 delegates representing 11 agencies attended the meeting. The meeting was a joint initiative between WGCV and WGISS where the joint WGISS/WGCV activities included reports from the GEO Secretariat, CEOS SEO and CEO, and participation by WGCV in the WGISS-organized workshop on FDA and DIAS. A key element of the joint meeting was an afternoon spent on joint activities related to FDA and ARD; quality indicators in metadata; WGCV LPV Supersites for data cube studies; and standards developments. The WGCV-only portion of the meeting saw wide support from the team to improve WGCV communication of results to the broader community, continue efforts to work closely with other WGs and VCs, and, address key CEOS topics such as CARD4L and GHG validation.

The key outcomes of the WGCV-43 were

1) The approval of the recommendation of the IVOS RadCalNet Admission Panel that four test sites (Baotou, China; Gobabeb, Namibia; La Crau, France, and Railroad Valley, USA) be admitted to RadCalNet. This recommendation included the opening of RadCalNet Website to the public.
2) Acceptance of the proposed solar irradiance spectrum and the report to be made available on the Cal/Val portal;
3) Identification of an organizing committee to organize a workshop on pre-flight calibration techniques; and,
4) Identification of leads to develop a cloud mask inter-comparison using the ACIX approach as a model.

The WGCV-44 meeting was hosted by EUMETSAT in Darmstadt, Germany between 28th – 31st August 2018. 31 delegates attended representing 13 agencies. The agenda took advantage of the presence of WGClimate Chair, multiple VC representatives, and GSICS leads. Key topics discussed during the meeting included WGCV's role within CARD4L, GHG and biomass product validation, and WGISS/WGCV joint activities.

At this meeting, the nomination of Akihiko Kuze (JAXA) to the CEOS Plenary as new Vice Chair was unanimously agreed upon. WGCV-44 also served as the informal WGCV handover of the Chair position of Kurt Thome (NASA) to the incoming chair Cindy Ong of CSIRO with the official changeover taking place at the CEOS Plenary in Brussels.

The key outcomes of the meeting included

- Acceptance of the summary of the recently published peer-reviewed results from the Atmospheric Correction Intercomparison Experiment (ACIX). This will be placed on the WGCV website;
- The organising committee of the pre-flight calibration techniques is working towards a June 2019 workshop;
- The work on the WGCV and subgroup websites over the past 12 months now completes the updates for the website;
- The solar irradiance spectrum model was selected and is now available on the cal/val portal.

Delegates who attended the joint WGCV/WGISS plenary 10th to 13th April 2018 in Sao Jose dos Campos, Brazil.

Working Group on Information System and Services (WGISS)

Mirko Albani
ESA,
WGISS Chair

The overall purpose of WGISS is to facilitate CEOS agencies in managing Earth observation data, and to promote collaboration in the development of systems and services that manage and supply these observatory data. WGISS activities focus on Data Discovery and Access, Data Preservation and Stewardship, Interoperability and Data Use, Future Data Architectures and Technology Exploration.

The 46th WGISS plenary was hosted by the German Aerospace Center (DLR) in Oberpfaffenhofen, Germany on October 22-25, 2018. The meeting included a one-day workshop addressing interoperability aspects between WGISS and the Global Earth Observation System of Systems (GEOSS) taking stock of the recent development in the frame of CEOS Future Data Architectures and related topics (e.g. Data Cubes, Exploitation Platforms, Copernicus DIAS). There were also dedicated sessions on Technology Exploration focusing on Cloud Computing and Artificial Intelligence, on Data Stewardship focusing on research results reproducibility and sharing and data usage metrics, as well as a session on Capacity Building with the participation of WGCapD representatives.

WGISS continues its efforts to facilitate CEOS agencies data discovery and access in the international context through interoperable standards and systems. The "WGISS Connected Data Assets Infrastructure (CDA)" provides a single entry point to CEOS agencies space data and is today widely used to search and access thousands of collections and hundreds of millions of products through external clients like the GEOSS Platform and Portal. Additional data collections and products from CEOS Agencies are continuously added to this integrated system lately including Essential Climate Variables (ECVs) in cooperation with WGClimate. WGISS is also progressing in its activities in the frame of Future Data Architectures (FDA) with the aim to assess the potential of new technologies and approaches to bridge the gap between the huge volumes of Earth observation (EO) data and the users developing applications to tackle key environmental, economic, and societal challenges.

Cooperation activities with the Working Group on Calibration and Validation (WGCV) are progressing with regular joint virtual meetings, as well as coordination with WGCapD, WGClimate, Virtual Constellations and the COVERAGE initiative. WGISS is also implementing a prototype carbon data portal in coordination with the CEOS Carbon Team, to facilitate the discoverability and accessibility of ECV products and space-borne Climate Data Records for the carbon science community of both CEOS and GEOSS. The portal will be opened to a wider user community at the beginning of 2019.

The 47th WGISS plenary will be hosted by the National Oceanic and Atmospheric Administration (NOAA) in Silver Spring, Maryland USA on the week of April 29, 2019. During this meeting WGISS will convene a dedicated workshop on FDA elements demonstration and interoperability analysis as well as dedicated working sessions on Cloud Services, Artificial Intelligence and Machine Learning applied to EO, and on EO ontologies.

All material, information and contacts can be found at: http://ceos.org/ourwork/workinggroups/wgiss/

Working Group on Capacity Building and Data Democracy (WGCapD)

***Prakash Chauhan**, ISRO, WGCapD Chair*

Our 7th Annual Meeting was hosted by National Institute for Space Research (INPE), Brazil, during 6-8 March, 2018 in São José dos Campos, Sao Paulo state, and was represented by 16 in-person and 22 virtual attendees from 22 organizations. The meeting focused on techonology, tools and methods adopted for capacity building programs. Discussions also focused on supporting GEO regional capacity building initiativesfor Asia Oceania (AOGEOSS), Africa (AfriGEOSS) and the Americas (AmeriGEOSS) regions. The role of CEOS WGCapD in strengthening capacity in using Earth observations for sustainable development goals (SDGs), disasters, forest and carbon mapping, land cover land use change (LCLUC) and agriculture in support of GEOGLAM was discussed also. Other activities, onsite and online, carried out by our group included

- AmeriGEOSS regional workshop (August 6-10, 2018, Brazil): The WGCapD-offered training, one of several parallel training events, was jointly conducted by ESA and INPE. ESA trained the INPE trainer and INPE led the training. INPE's TerraMA2 Platform was used for monitoring, analysis and alert of environmental extremes, and CBERS-4 optical imagery was used for disasters response studies including forest fire burned area assessment along with ESA Sentinel -1 imagery for flood area mapping.
- AfriGEOSS regional workshop (June 22–25, 2018, Gabon): The workshop was conducted by ESA, NASA, and UK National Centre for Earth Observation. Training on SAR applications and Google Earth Engine (GEE) was provided. Use of Google Earth Engine for image visualization and processing was also demonstrated.
- Short course offered during the Brazilian Symposium on Geoinformatics, GEOINFO 2018, held on December 5-6, in the city of Campina Grande, Brazil, the same offered during AmeriGEOSS Week: "Remote Sensing Images Processing for Disasters Response – Use of CBERS-4 and Sentinel images and INPE's and ESA's Tools". Around 14 participants had a chance to be acquainted with digital image processing techniques for identifying damages and producing maps in support of disaster response.

At the CEOS Plenary (Belgium, October 2018), the Chair presented Work Plan updates and a Proposed Implementation of the Training Calendar also used by VLab and WMO Global Campus for endorsement. A common training calendar is beneficial as it presents activities on a standardised calendar with consistent information, and allows training participants to more easily find, participate, and learn from training activities to use Earth observations for their needs. The Plenary endorsed the Training Calendar Implementation Plan.

We continue to engage with other CEOS Working Groups and Virtual Constellations to serve as a training/capacity building resource to them, providing expertise on recommendations, guidance on translating needs into capacity building activities and best practices. Participation in and collaboration discussions at the 46th meeting of WGISS led to a joint WGCapD/WGISS/SEO organization of the first SAR training course in Vietnam during Feburary 2019.

Finally, we are glad to inform you that the 8th WGCapD meeting will be hosted at Indian Institute of Remote Sensing, Indian Space Research Organisation (ISRO), Dehardun, during March 6-8, 2019. Hope you can join us!

Working Group on Disasters (WGDisasters)

***Simona Zoffoli**, ASI , WG on Disasters Chair*

After concluding the flood, seismic and volcano pilots in 2017, the past year has seen the start of new activities like the Geohazards Laboratory, the Seismic Hazard and Volcano demonstrators and the new multi-hazard GEO-DARMA (Data Access for Risk Management) initiative.

In particular, the Geohazards Laboratory, approved at the 31st CEOS Plenary, already accomplished several important achievements in 2018. The platform is able to access data collections provided through CEOS WG Disaster activities alongside with open and free EO data sources such as Landsat and the Sentinels. It also provides processing tools to support geohazard risk assessment and e-collaboration capabilities to animate the user community.

During 2018 new collaborations have been discussed. As an example, the WG Disasters held a joint session at the 9th meeting, hosted by the European Commission in Brussel, with the International Working Group of the Satellite Emergency Mapping (IWG-SEM).

The 2018 was also an opportunity to consolidate ongoing work. The Landslide pilot is moving forward in Nepal, Africa, and China, with a distinct multi-hazard focus on cascading impacts and risks. At the 10th meeting of the Group in September, hosted by INGV in Naples, the Coordinators for the Italian Volcanoes Supersite, the Virunga Supersite, and the Iceland Supersite were able to share their results. Satellite data from CEOS agencies have allowed for the production of new scientific products that are used to better understand the risk posed by volcanoes. Hearing back from the science teams about their interaction with civil protection agencies allowed agencies to better understand how satellite data may be used in the future.

The end of 2018 also marks the halfway point of the Haiti Recovery Observatory (RO). Triggered by CEOS in December 2016 after the devastating impact of Hurricane Matthew in Haiti, the RO is an innovative pilot that brings together satellite agencies, international Disaster Risk Management Stakeholders like the World Bank and the United Nations Development Programme, and local partners, in this case the Centre national d'information geospatiale (CNIGS), the Comité interministériel pour l'aménagement du territoire (CIAT), and the Observatoire national de l'environnement et de la vulnerabilité (ONEV). This partnership has led to the development of thematic recovery products for monitoring of built areas, agriculture, coastal zones, watersheds, and protected areas such as Macaya Park, Haiti's largest biodiversity reserve. The WG has recently begun an early assessment of the RO. In parallel, an ad hoc team was created in late 2018 with the World Bank, the Global Facility for Disaster Risk and Recovery, the United Nations Development Programme, and the European Union, to take stock of how satellite data is used for recovery and make recommendations on how to replicate positive experiences by instituting a "generic" Recovery Observatory.

At the March 2019 meeting, hosted by Harokopio University in Athens, the WG will examine its existing initiatives, and articulate lessons learned from pilots and demonstrators, to make recommendations on future activities.

As the Group formulates its input to the CEOS Work Plan, it is conscious of a need to ensure strong benefit from the investments made, and to foster sustainable activities with partners outside CEOS. Satellite data make exceptional contributions to every phase of the risk management cycle, and the WG is committed to ensuring these successes are showcased for the international risk reduction community.

The fall 2019 meeting, hosted by the University of Iceland, will be held in Reykjavik, Iceland, the week of 23 to 27 September 2019.

GEO Week 2018 looks to the digital economy for Earth observation data and technology

Maddie West, *GEO Secretariat*

The international Earth observations community must reduce barriers to access and use of planetary data if they want to achieve global environmental and sustainable development goals. This was a key message emerging from the Group on Earth Observations (GEO) annual gathering, held in Kyoto, Japan from 29 October - 2 November 2018.

Over 500 people came together for GEO Week 2018 to share their experiences on the use of Earth observations for the benefit of society. The week's events focused on GEO's three priority engagement areas: the Sendai Framework for Disaster Risk Reduction, the Paris Climate Agreement, and the United Nations 2030 Agenda for Sustainable Development.

South Africa stepped into the role of GEO Lead Co-Chair for the GEO-XV Plenary, a position previously held by the United States of America.

Looking toward the 2019 GEO Ministerial Summit in Canberra, Australia, Mr. Mmboneni Muofhe, Deputy Director General of South Africa's Department of Science and Technology, said "As GEO moves towards its 5th Ministerial in 2019, it is important to emphasize the diversity and inclusivity of its vision through the active engagement of the Global South. GEO can only be effective if all regions are contributors to this vision, particularly the youth and entrepreneurs located in the Global South. We envisage a results-orientated GEOSS as an enabling platform to this end."

On the transition, GEO Secretariat Director Gilberto Camara said "I welcome the opportunity for closer engagement with South Africa and the African GEO caucus over the coming year, in line with our focus on increasing the value of Earth observation activities and services for developing countries."

The value of Earth observations and the challenges related to their use for the achievement of the Sustainable Development Goals was a key focus of the event. During the Plenary, a diverse lineup of speakers and panelists called on the GEO community to urgently open and make use of Earth observation data and technologies, in order to address the fundamental challenge of our time: providing food, water, and energy for 9.4 billion people, while minimizing the impacts of climate change and protecting our planet's biodiversity.

In support of this vision, a new joint initiative from GEO and Amazon Web Services (AWS) was announced. The GEO - Amazon Earth Observation Cloud Credits Programme will provide up to $100,000 of AWS cloud credits to eligible parties for projects that support environmental and development goals. AWS will provide cloud services to help host, process and analyse large geospatial data sets for non-commercial purposes, prioritizing projects that make use of open satellite data and align with the engagement priorities of GEO.

GEO Week 2018 marked an important transition for GEO, as it solidifies its vision of a results-based GEO ahead of the 2019 Ministerial Summit, where Ministers from GEO's 105 Member Countries are expected to come together from 4 - 9 November in Canberra, Australia to discuss global issues and accelerate delivery of GEO's Strategic Plan.

Explore the GEO Week 2018 website for GEO-XV Plenary and side event session recordings, photos, documents, presentations, and official statements from Member Countries and Participating Organizations: bit.ly/GEOWEEK2018

Read the **2017-18 GEO Highlights Report** here: http://bit.ly/GEOhighlights18

For more information please contact Maddie West at mwest@geosec.org

Follow GEO on Twitter @GEOSEC2025

Photo: (L-R) Mmboneni Muofhe, South Africa; Wei Huang, China; Patrick Child, European Commission; Stephen Volz, USA; Gilberto Camara, GEO Secretariat; Keiko Nagaoka, Japan; Kimiya Yui, Japan; Mami Mizutori, UNISDR. Group on Earth Observations 2018

Asia Oceania GEO

David Hudson, *Geoscience Australia (GA)*

Asia Oceania GEO (AOGEO), formally AOGEOSS, is GEO's regional network and platform to monitor the targets and indicators of sustainable development with Earth Observations for two thirds of the Earth population.

AOGEO brings together existing activities within Asia Oceania such as Asia-Pacific Biodiversity Observation Network (AP-BON), Asia Rice Crop Estimation and monitoring (AsiaRICE), GEO Carbon and GHG Initiative (GEO-C), Asian Water Cycle Initiative (AWCI), Asia Ocean, Coast and Islands and the GEOSS Asia Pacific Symposium. AOGEO has added several new tasks including user engagement, data sharing, data platforms, environmental monitoring, drought monitoringand finally Himalayan GEOSS. In Kyoto we also began planning for a new disaster resilience task.

AOGEO meets twice a year, early each year we hold a targeted AOGEO Workshop focused on cross cutting work plan issues and capacity building. Once a year we hold the AOGEO Symposium (formally the GEOSS-AP Symposium) , a forum to invite GEO communities including GEO Principals, report progress of tasks in the AOGEO and decide direction of activities, which is publishes as an Official Statement of the Symposium. In 2018, the 11th of which was held in Kyoto . In 2019 the 2nd AOGEO Workshop will be held in Jakarta focusing on the roll out of the Asia Oceania Data Hub and at the end of the year the 12th AOGEO Symposium will be held in Canberra adjacent to GEO Week.

Engagement with the CEOS community is critical to the success of AOGEO and we already have several CEOS member agencies on the AOGEO Coordination Board including GA, CSIRO, KARI and VNSC. AOGEO has eleven countries involved and is always looking for more. Note countries do not need to be members of GEO to join AOGEO.

Our current priorities include establishing an integrated pilot across all AOGEO tasks over the Mekong basin, initiating a long-term disaster resilience task, developing ARD standards for ocean products under the CEOS standard and implementing the existing CARD4L standard for sensors within Asia Oceania.

We particularly look forward to working with CEOS on the Mekong basin pilot study where AsiaRiCE will cooperate with CEOS2019 Initiative

24 October 2018, Kyoto,Japan

SDCG for GFOI Report

***Osamu Ochiai**, CEOS Lead for GFOI*

***Stephen Ward**, CEOS Alternate Lead for GFOI*

SDCG has been busy defining and developing a new Work Plan designed to meet the needs expressed in the vision for Phase 2 of GFOI. The new Data Component will feature active contributions of World Bank and FAO alongside CEOS. We look forward to the opportunities that this new dynamic will bring.

CEOS agencies are planning a new generation of missions providing estimations of above-ground biomass that are of particular interest to the forest monitoring community, and to the policy communities engaged in financial incentives to avoid deforestation (such as World Bank). Moving to more accurate estimates of avoided carbon emissions – rather than just forest/non-forest area estimates – are a significant step towards increased policy-relevance for satellite Earth observations. SDCG is proposing to put significant emphasis on the promotion and communication of these new missions and their capabilities to GFOI countries and the related policy communities - so that we might accelerate this policy-relevance. We recognise the fundamental technical work underway within the Land Product Validation (LPV) group of Working Group Cal-Val and SDCG is in discussion with LPV on how best to elevate and promote their CEOS Biomass Protocol, which is due to be published in the first half of 2019.

LPV and SDCG will come together to plan the way forward at a special Biomass day around the SDCG meeting being hosted by NASA SEO in Virginia in the last week of March 2019. The SDCG meeting will focus on finalisation of the group's work plan for the coming years, including ensuring continuation of the global baseline coverage required for GFOI, as well as the introduction of new missions like NISAR, BIOMASS, GEDI, and MOLI.

SDCG is very pleased to welcome the return of a USGS Co-Chair. Tom Maiersperger from USGS EDC has been very kindly supported by USGS SilvaCarbon to participate actively in SDCG as of a few months ago. We very much look forward to Tom's contribution and to the work ahead in representing CEOS in GFOI.

GEOGLAM Improving EO Data Requirements through Holistic Assessment

***Dr. Alyssa K. Whitcraft**, GEOGLAM Secretariat*

In 2016, GEOGLAM and CEOS identified that the GEOGLAM community needed to take a holistic approach to requirements to enhance EO data usage in operational monitoring settings, and empower decision, policy, and action towards a more food secure world. This meant tracing information needs to product needs to data needs, and along the way consider computational, connectivity, technical, institutional, and human capacity requirements in order to fulfill the requirements.

To support this, GEOGLAM convened a "Workshop on Data and Systems Requirements for Operational Agricultural Monitoring", held 17-18 April 2018 at the European Commission Joint Research Centre. The meeting was attended by 40 participants from around the world, including representatives from national ministries of agriculture, regional and global monitoring programs, private industry, and those supporting operational monitoring through data acquisition, product development, and data services. The overarching objective was to understand and tighten the connections between those collecting, processing, and providing data, and those utilizing it to generate information. It provided an opportunity to work with CEOS representatives, including data and service providers in the context of advancing operational EO usage for agricultural monitoring. The objectives of the meeting included:

- Characterizing the state of use of EO data by operational users, identifying current gaps and challenges in acquisition, access, and use of EO data and analytical tools; and,
- Providing feedback to CEOS on EO data acquisition requirements, access considerations, pre-processing levels, and interactions with CEOS working groups.

The workshop included presentations on the state of science and state of use by agricultural monitoring actors, review of community requirements surveys deployed by GEOGLAM and RAPP in advance of the meeting, and results-oriented breakout sessions. Key feedback to CEOS included:

- The relationship with CEOS around data acquisition has been effective, and GEOGLAM identified priorities for data continuity and observations;
- The lack of continuous access to in situ data is a critical challenge for operational uptake of EO, and requires discussion across our communities;
- Developing relationships around access and utilization are new frontiers in the CEOS-GEOGLAM relationship:
  - A potential joint effort on data documentation and data quality standards;
  - Continued coordination on ARD;
  - Increased efforts toward "Applications Ready Data" (ARD+) and standard agricultural products in support of global policy frameworks ("Essential Agricultural Variables for GEOGLAM");
  - Enhancing coordination on capacity development activities.

A full workshop report can be found here: https://ec.europa.eu/jrc/sites/jrcsh/files/20180821-geoglam_ispra_2018_summary_final2.pdf

And, GEOGLAM's requirements will be published in the first quarter of 2019.

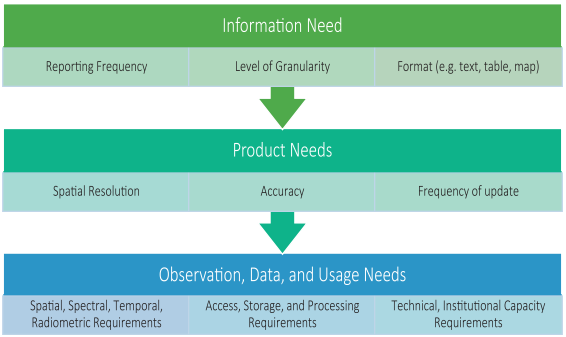


Figure 1: A diagram showing the flow from information needs through product needs and eventually data needs, as well as associated capacity requirements. This describes the holistic approach to requirements taken by this workshop, and GEOGLAM in general.

Figure 2: Participants in the GEOGLAM Workshop on Data and Systems Requirements for Operational Agricultural Monitoring

2019 CEOS Chair Message

***Dr. Pham Anh Tuan**, CEOS Chair for 2019, VAST-VNSC*

The Vietnam National Space Center (VNSC) is a branch of the Vietnam Academy of Science and Technology (VAST), which has been a CEOS Member since 2012. VNSC employs approximately 150 staff members across several locations throughout Vietnam. These centres undertake various satellite design, ground control, administration, and research and development projects.

In 2012, as a non-spacefaring nation at the time, Dr. Pham Anh Tuan – Director General of VNSC (2019 CEOS Chair) realised the important role that international cooperation can play in improving space technology and capabilities, not only through learning from spacefaring nations, but also by contributing to the international community and activities. CEOS provides the perfect platform for international cooperation and collaboration. Beyond the Chair role, VNSC actively engaged in WG Climate, WG Disasters, WG CapD, and ad hoc teams.

Now, as CEOS Chair for 2019, VNSC is embracing the idea of collaboration and cooperation, and intends to pull together a number of ongoing CEOS initiatives, including work on Analysis Ready Data, support to GFOI and GEOGLAM, Open Data Cube, and Future Data Access and Analysis Architectures under the banner of the Vietnam Data Cube in support of forest and rice crop monitoring for the Mekong Delta region.

By putting the focus on this specific region, the CEOS Chair hopes to enhance the contribution and cooperation of CEOS Agencies in the region, identify new Earth observation users, and to respond effectively to their needs through integration across the full range of Earth observations by promoting the sharing of CEOS Agency data and algorithms, and by improving access to and the use of such data via modern data architectures. Integrating existing CEOS thematic acquisition strategies and making data and algorithms available to the international community will enable studies and applications in relation to forests and agriculture, as well as disasters, climate, carbon, and water.

To focus efforts on end user needs and enhance information exchange within the region, VNSC has recently signed a Memorandum of Understanding with the Mekong River Commission, an inter-governmental organisation which works with the governments of Cambodia, Lao PDR, Thailand and Vietnam to jointly manage water resources and development in the Mekong Basin.

The 2019 Chair Initiative concept is one of a regional observatory, which is intended to continue beyond the 2019 CEOS Plenary and also be extended to other hotspot regions.

The 33rd CEOS Plenary will be held from the 14th to the 16th of October 2019, during which the results of the VAST-VNSC CEOS Chair Initiative will be shared. We look forward to welcoming all CEOS Agencies to Hanoi, and to sharing the outcomes from the year. The 2019 CEOS Plenary will be complemented by a technical tour to Ha Long Bay on the 17th of October, following the conclusion of the meeting. We hope that all attendees will be able to extend their stay and visit this impressive region.

I wish everyone in CEOS all the very best for 2019, and look forward to working with you all over the coming year.

November 28, 2018, Ha Long City

Meeting Calendar

As of February 2019

Activities	2019 February	March	April	May	June	July	August	September	October	November
CEOS Plenary and CEOS SIT (Strategic Implementation Team)			▲2–4 **SIT-34** Miami, USA					△ **SIT-TW** Hawaii, USA	▲14–16 **CEOS 33rd Plenary** Hanoi, Vietnam	
CEOS WGs, VCs, AHTs. Others	▲14–15 **LSI-VC-7** Hanoi, Vietnam	▲4–8 **WGCapD-8** Dehradun, India ▲5–7 **WGDisasters-11** Athens, Greece ▲18–19 **CEOS-CGMS WGClimate-10** Marrakech, Morocco ▲26–28 **SDCG-15** Hampton, USA	▲29–2 **WGISS-47** Silver Spring, USA	▲19–24 **CGMS-47** Sochi, Rusia		▲15–19 **WGCV-45** Perth, Australia		△ **LSI-VC-8/GEOGLAM/SDCG-16** Hawaii, USA	▲30–4 **WGDisasters-12** Raykjavik, Iceland	
GEO related Activities (Group on Earth Observations)	▲7–8 **GEO-PB-12** Geneva,Switzerland ▲19–20 **GEO-ExCom-47** Geneva,Switzerland		▲23–25 **GEO-DP-WS-4** Viena,Austria	▲27–29 **2019 GEO Sympo** Geneva,Switzerland		▲23–24 **GEO-ExCom-48** Geneva,Switzerland				▲4–8 **GEO Week 2019** Canberra, Australia
Others	▲12–19 **Open Data Cube 2019** Canberra, Australia		▲8–12 **IPCC-49** Kyoto, Japan ▲13–17 **ESA Living Planet** Milan, Italy	▲3–5 **IWGGMS-15** Hokkaido, Japan		▲28–2 **IGARSS 2019** Yokohama, Japan				△11–22 **UNFCCC/COP-25** Chile

▲: determined △: to be determined (Date, Host organization/Location) CEOS–related meetings are open only to designated participants.

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Japan Aerospace Exploration Agency (JAXA)
Satellite Applications and Operations Center (SAOC)
Tsukuba Space Center,
2–1–1 Sengen, Tsukuba City,
Ibaraki Prefecture, 305–8505, JAPAN
For inquiry:
CEOSNL@restec.or.jp
Y. Haruyama

For further information contact in each area allocated:

[Asia, Pacific]
O. Ochiai
JAXA
TEL:+81–50–3362–6960
FAX:+81–29–868–5987
ochiai.osamu@jaxa.jp

[North & South America]
C. Bognar
NASA
TEL:+1–202–358 2066
FAX:+1–202–358 2919
christine.mcmahonbognar@nasa.gov

K. Sawyer
NOAA
TEL:+1–301 713 7074
FAX:+1–301 713 2032
kerry.sawyer@noaa.gov

[Europe, Africa]
I. Petiteville
ESA/ESRIN
TEL:+39 06 94 180 567
FAX:+39 06 94 180 353
Ivan.Petiteville@esa.int

P. Counet
EUMETSAT
TEL:+49–6151 807 603
FAX:+49–6151 807 866
Paul.Counet@eumetsat.int