CEOS NEWSLETTER
The Committee on Earth Observation Satellites
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Report from the Chair, CEOS Strategic Implementation Team (SIT): Outcomes of 34th Meeting of the CEOS SIT and Plans for 2019 SIT Technical Workshop

Dr. Stephen Volz,
2018-2019
CEOS SIT Chair

In the 51st CEOS Newsletter, I announced that we had "some ambitious objectives for the next 16 months" and that I looked forward "to not only identifying what CEOS can bring to its Members and Associates *but* what CEOS Agencies can contribute to our organization, to continue and expand the value of CEOS to our members and to those around the world who need and benefit from our activities." At the 34th Meeting of the CEOS Strategic Implementation Team (SIT-34) held in April in Miami, Florida, we considered further some ambitious objectives, including discussion of potential ways to continue CEOS' productivity and to expand our relevance to a world that is hungry for more and better information from our Agencies.

Over 70 attendees, in-person and virtual, from 20 CEOS Agencies actively participated in the discussions focused on these foundational issues for CEOS affecting our Virtual Constellations (VCs), *ad hoc* Teams (AHTs), and our Working Groups (WGs). We considered the results of the critical assessment of the Virtual Constellations (VC), including their ongoing activities, tangible outputs, management, continuity, and leadership rotation. For the AHTs, we discussed the approach for the initiation and the trajectory for our AHTs and options for the continuity and trajectory of existing AHTs. For the existing AHTs, we did not resolve the sustained plan for their futures, that will be a topic for the September SIT Technical Workshop as a lead up to the CEOS Plenary. However, we did consider the growing community of users looking for satellite data to satisfy their mission needs, and how to develop a roadmap for future AHTs or other CEOS approaches to meet those demands. The discussion benefited from the extensive dialog we have had within the CEOS community of VCs, WGs, AHTs, and Principals over the past 18 months, which now allows us to understand our current productivity and consider our ability to meet the growing community demand.

In advance of SIT-34, I provided the CEOS Community with a *Concept Paper for Restructuring CEOS Virtual Constellations and Creation of a New Working Group.* This Concept Paper proved to be a catalyst for discussions at SIT-34 on topics related to internal CEOS workings and external CEOS interface to the world of users. SIT-34 attendees were asked to consider how well the current VC/WG/AHT framing within CEOS supported CEOS Agency and external user needs, how existing CEOS structures position CEOS to support agency objectives, how agency commitments support the continued success of CEOS, and how to fulfill leadership of key CEOS positions. These were not easy conversations, as they addressed fundamental issues of both our organizational structure and our interactions with the external community, and at the meeting we did not come to conclusions on the broad subjects proposed in the Concept Paper. As SIT Chair and as NOAA Principal to CEOS, I see the discussion as an essential piece of organizational self-assessment, and I was gratified to see the active engagement by the CEOS membership throughout the meeting. We had lively discussions, integrating many differing points of view, which we have folded into the actions and outcomes of the meeting. I encourage all who are interested in learning more to refer to the SIT-34 website to access the Concept Paper and the Final SIT-34 Minutes (http://ceos.org/meetings/sit-34/).

Over the next few months, the CEOS community will focus efforts on proposals and actions from SIT-34. Two Study Teams – a Working Group Study Team and an Ocean Virtual Constellation Merger Study Team – have been created to assess the interest and feasibility of CEOS Agencies in the creation of a new Working Group to address multiple interests from external stakeholders in accessing CEOS Agency data and to consider if there is value in merging the four CEOS Oceans Virtual Constellations into one Ocean Virtual Constellation. Please contact the SIT Chair Team for the Study Team charters. Outcomes from these Study Teams will be presented to the SIT Technical Workshop for discussion and a consolidated response and recommended way forward from each Study Team may be forwarded to the 33rd CEOS Plenary for information and possibly for decision.

The world is becoming increasingly aware of how interconnected are the many different ecological, biological, and geographical regions of the planet. Leaders and decision-makers are realizing the potential value in understanding the interdependencies, and realizing that satellite data are critical to improving that understanding. Our challenge is to ensure CEOS operates as efficiently and effectively as possible to bring that information and knowledge to those who need it, to consider how to streamline how we do business, to ensure tangible outcomes from, and sustainable commitment to our CEOS entities, CEOS Agencies, and our global community.

34th SIT April, Maiami, Florida

2019 CEOS Chair Initiative report

2019 CEOS Chair Initiative Team, VNSC

In the last few years, CEOS agencies have made significant progress in making EO data free, open and sustained, along with the effort to remove complexity and difficulty of handling large and technical datasets through actions such as Analysis Ready Data, Open Data cube and Copernicus Data Information Access Services (DIAS), to support broad uptake of EO satellite data by the user community. Benefiting from the above activities of CEOS agencies, during last 2 years, VNSC has developed and operated the Vietnam Data Cube (VDC), a country scale system of ODC which focus on the SAR data since the fact that Vietnam are expecting its own SAR satellite in next few years. The VDC is currently collecting satellite data: Landsat, Sentinel-1 & -2, ALOS-2 from the USGS, ESA, and JAXA for research and monitoring purposes in fields such as forest monitoring, rice monitoring and water quality monitoring in Vietnam. Thanks to the valuable supports of international organizations (CSIRO, CESBIO - CNES, JAXA, etc.), in 2018, VDC has successfully developed two applications: forest monitoring and rice monitoring. This success is a very important premise for Vietnam to take the initiative in the 2019 CEOS Chair.

As 2019 CEOS Chair, initiatives seek to integrate many ongoing CEOS activities in regions most affected by climate change, with a focus on the tropical monsoon climates countries in South East Asia (Cambodia, Lao PDR, Thailand and Vietnam). Those countries are especially vulnerable because they have growing populations facing climate change and anthropogenic impacts. The VNSC initiatives focus on the application of satellite data on a regional basis. The selection of the Mekong basin region is a suggestion, not a binding part of the initiative. However, as a regional member, Vietnam, in particular, VNSC has better understanding of the region that could bring significant advantages in deploying the initiative on this area. On the other hand, to understand the climate vulnerability in the Mekong Basin region requires coordinated actions by all the member countries, as recognized by the Mekong River Commission.

To support the data sharing, in 2019 and beyond, the CEOS Open DataCube implemented at VNSC in Vietnam with the support of CSIRO will be expanded to users in the Mekong region. This regional approach can be considered as:

- Demonstration for space climate observatories for key global programs and initiatives as well as demonstration of how to downscale from global to regional to local applications;
- Incorporation of regional datasets (space-based and in situ) from regional observing systems and inclusion of national and regional users downstream who are not directly part of the CEOS community (e.g., AOGEOSS);

Among the thematic areas, VNSC focuses in 2019 on two following areas:

1. **Carbon Observations, including forested regions:** to coordinate EO observations to support the effective monitoring and management of the forests in the region, through its Ad Hoc Space Data Coordination group for GFOI, in support of the development of national forest monitoring and measurement, reporting and verification (MRV) systems. For the countries in the region (Vietnam, Thailand, Lao PDR, Cambodia, Myanmar) which have fast changes in their forests for conversion in agriculture, in industrial tree plantations, and in reforestation programs, there is a need to develop Near Real-Time Monitoring system with dedicated User needs assessment.

2. **Observations for Agriculture:** in line with the CEOS Ad Hoc WG on GEOGLAM, and within the GEOGLAM Asia-Rice regional network, a key focus will be addressed on the practical use of CEOS data, especially SAR for rice crop monitoring in Asia. At the SAR DataCube workshop in February 2019, demonstration of rice monitoring system has been done, in cooperation with CESBIO-CNES, JAXA&RESTEC. VNSC will pursue the rice monitoring activities for Vietnam.

The progress of initiative activities is as follows:

- Collecting and preprocessing of Landsat-8, Sentinel-1 and ALOS-2 ScanSAR data over Vietnam and 4 countries, and transfering ARD data to Vietnam data cube.
- Forest monitoring: VNSC and CESBIO & CNES develop algorithm. Test is being done in the Centre of Vietnam in 2018, 2019, using VNSC in-situ data. The algorithm will be selected and run the method over Vietnam in next step. VNSC is also developing other algorithm using optical data (Landsat-8). These algorithms are available now in the Vietnam Data Cube. The validation of the algorithms will be soon completed, expecting in June 2019.
- Rice monitoring: Algorithm developed by VNSC for the Mekong Delta and Red River Delta have been validating by using in situ data and extending to whole country. CESBIO & CNES analyses the Sentinel-1 backscatter time series for different rice ecosystems and tests the ESA GEORICE rice mapping algorithms in 4countries. JAXA & RESTEC analyses the ALOS-2 backscatter time series with JAXA's rice crop monitoring tool named "INAHOR" NEO (machine learning version) and generating prototype of rice crop map in 2018 rainy season using available ground observation data and statistical information for 4 countries in cooperation with 4 countries related organizations. Consult with 4 countries for their review, and validated rice crop maps generated by VNSC, CESBIO & CNES and JAXA&RESTEC will be shared for cross-validation in the next step.

On February 19, the SAR DataCube workshop was held at VNSC, Hanoi. This is the first in a series of international workshops organised under the framework of the Geoscience Australia/CSIRO SAR Data Cube collaborative project. The objective of this workshop is to review the State of the Art of Data Cube technologies with emphasis on SAR data; to identify challenges to utlilisation and/or implementation; discuss best practices; as well as opportunities for future developments. The workshop also aims to build relationships with the VNSC and other international Data Cube expert groups that are processing SAR Analysis-Ready Data and developing SAR Data Cubes, to stimulate further collaboration in the future.

Along with the SAR DataCube Workshop, a SAR training course has been organized on 20th – 22nd February 2019, with support from CEOS's Working Group for Capacity Building and Data Democracy (CapD) focused on SAR data processing VNSC has proposed SAR training courses for Vietnamese space data users and researchers to take advantage of contribution from SAR experts from other space agencies (CNES, CSIRO, DLR), The first technical training was on 'Synthetic Aperture Radar applied to Rice and Forest monitoring' gathered 40 participants with SAR experts from CNES and CESBIO.

GEO Announces 21 projects of Earth Observation Cloud Credits Programme

***Theadora Mills**, Communications Officer, GEO Secretariat*

The Group on Earth Observations (GEO) is proud to announce the 21 projects from 17 developing countries that will be awarded $1.5 million USD worth of cloud services, grants and technical support through the Earth Observation Cloud Credits Programme.

Under the Amazon Sustainability Data Initiative (ASDI), this programme will enable Earth observations to support sustainable development across a wide range of applications. The GEO Secretariat was pleased to have a review team from CEOS involved and providing good feedback on the applications that were received.

This engagement with the Amazon Web Services (AWS) team is one of the approaches that the GEO Secretariat has taken to work with the commercial sector. There is now a membership category available for private sector organisations to become Associate Members of GEO. More information can be found here.

In addition to the launch of the Cloud Credits Programme, the GEO community has concluded two events in the last quarter including a Data Technology Workshop and the annual GEO Symposium to advance Earth observation data for impact.

The GEO community met in Geneva, Switzerland from 27-29 May 2019 for the 2019 GEO Symposium. Representatives from GEO's 70+ Work Programme activities shared their progress, knowledge and their Implementation Plans to maximise the impact of Earth observations for sustainable development. All of the presentations are available for viewing here.

The GEO Symposium also helped to advance the GEO Work Programme. The first draft of the GEO Work Programme for 2020-2022 is now available for comments here. The Work Programme development and implementation is a joint effort of the GEO Secretariat and GEO Members countries, Participating Organizations, research institutions and commercial sector contributors.

The GEO Data Technology Workshop, hosted in Vienna, Austria by the UN Office for Outer Space Affairs (UNOOSA) from 23-25 April 2019, provided broad perspectives on the role that technology is playing in changing how Earth observations are used. These technologies are changing the way we work, including commercial sector applications, and spurred discussion on the social and legal impacts of new technologies.

Emerging from the workshop we feel the cautious excitement of the GEO community in embracing new and evolving data technologies. While recognising the possibility for increased global impact of Earth observations from these technological advances, we acknowledge the challenges and risks involved, and the need to be inclusive in accessing their benefits.

The importance of cloud services was highlighted as a priority for Earth observation data to be fully accessible. "Analysis Ready Data is no longer a desire but an expectation. We need to pre-process data and make it globally available in the cloud," said Brian Killough from the NASA CEOS office.

GEO Secretariat Director Gilberto Camara called on the Earth science community to make all results reproducible, through open access to products, services, methods, code, models and source data.

"New technologies are changing the way we do business. We need to develop and promote solutions that are not vendor-dependent, to ensure the playing field is not distorted towards a single vendor and to make our community more resilient to changes and policies in the commercial sector," said Camara.

More information about GEO activities can be found here.

Upcoming GEO Week 2019 will advance Earth observations for economic growth #GEOWeek2019

From 4-9 November, GEO Week 2019 will work to ensure data about our planet becomes a core input to strategic economic decision making and integrated into day-to-day business, environmental and development decisions. Working together, the GEO community will ensure that Earth observations drive productivity and inclusive growth across our economies.

As digital technologies are changing the way we work and live, they offer new opportunities to deliver sustained and inclusive economic growth and address the shared and unique challenges that we face in our countries, regions and as a global community. The integration of Earth observation data into the digital economy is critical for this to happen.

Ministers from GEO's 105 members, business leaders, heads of international organizations and leading experts will meet in Canberra, Australia for GEO Week 2019 and the GEO Ministerial Summit. We welcome continued input from CEOS here too.

We want as many EO professionals as possible to be there, to share their experiences and learn from others as we explore how investments in Earth observation can deliver major returns to our economies and communities.

With targeted tracks for Industry and Small, Medium and Micro-sized Enterprises, Youth, Indigenous community members and more, this year's GEO Week aims to bring diverse groups together to realize the benefits of Earth observation data.

The Exhibition will provide a range of networking spaces, including a 'collaboration hub' where potential partners and customers can come together to discuss scalable solutions. In fact, Canberra means 'meeting place' in the local indigenous language.

GEO Week is an unparalleled opportunity to explore the GEO Work Programme to learn about the vast and varied Flagships, Initiatives and Community Activities being implemented by the GEO community around the world.

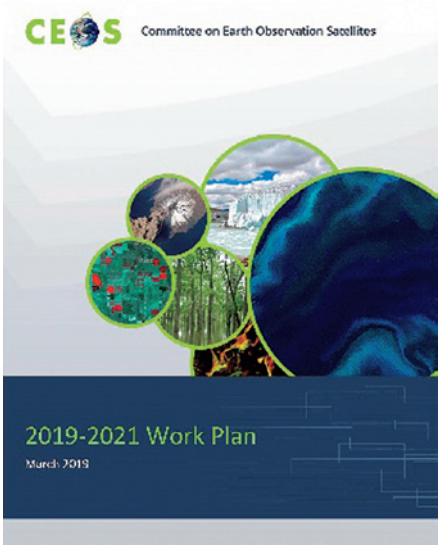
Watch a video to learn more about the event: https://www.youtube.com/watch?v=jon2jrK5Snw

We look forward to seeing you in Canberra this November.

For more information please contact Theadora Mills, Communications Officer: tmills@geosec.org

Follow GEO on Twitter @GEOSEC2025

CEOS Work plan 2019-2021 report



Steven Hosford,
CEOS Executive Officer(CEO), ESA

With the 2019-2021 CEOS Work plan endorsed by CEOS Principals on the 22nd March, this CEOS newsletter is the ideal opportunity to shed some light on the long and challenging process that a CEO must steer to reach this annual milestone. As a 3 year rolling document renewed annually, each year the CEOS community takes a long look at what they had planned to do, what they have done and what they hope to do in the coming period in order to update the CEOS Work Plan. This document currently captures over one hundred separate CEOS deliverables scheduled over the three year life of the plan and beyond, and represents the reference definition of what the CEOS community is achieving collectively. The Work Plan, defined in the February/March period, is now completed by the CEOS Work Plan Progress Report, delivered for the first time at the 32nd CEOS Plenary in Brussels, which provides an exhaustive status of these 100+ deliverables as recorded on 30th September.

In order to facilitate searching and updating of the contents, the Work Plan is accompanied by an online deliverables database that records Work Plan deliverables and associated tasks that make up the deliverable. This tool allows for quick and easy consultation of all CEOS deliverables past and present and provides a straightforward interface for the people responsible for these deliverables to update the status and information held on them. The ceos-deliverables.org tool is currently being upgraded, and from mid-summer 2019 will additionally provide a summary "dashboard" with tailor-made information for each CEOS entity chair to facilitate the steering of the deliverables and tasks which are the responsibility of their entity.

This year's CEOS work plan has gone through some changes reflecting an evolution in the spread of the workload across the organisation and an evolving focus from one-off "project like" activities to providing services for the EO community. A new chapter focused on "CEOS Services" has been added to reflect a set of ongoing "Service" tasks which CEOS provides for the benefit of the wide EO community. Two such example services are the WGISS Connected Data Assets service which provides a catalog service for all CEOS agency data and the RadCalNet service which provides a calibration infrastructure for optical data. In addition, where previously Working Groups WGISS, WGCalVal and WGCapD were grouped into a single chapter, the work done by these three pivotal WGs has been separated out into three distinct chapters.

Since the introduction of the CEOS Work Plan in its current form in 2014, this document has served as a reference point around which CEOS entities, on one hand, have defined and steered their collective action, and CEOS leadership, on the other, has been able to monitor progress and hold CEOS entities accountable. This function has become critical in the working practices of CEOS as an organisation and must continue to be a priority for future CEOS leadership.

Joint CEOS/CGMS Working Group on Climate

Jörg Schulz,
EUMETSAT, Joint Working Group Climate Chair

Albrecht von Bargen,
Joint Working Group Climate Vice Chair

CEOS established the Working Group on Climate in 2010 and it is now in its 9th year of existence. Sharing the same goals with respect to climate monitoring, CEOS and CGMS formed for the first time a joint working group in 2013. The major objectives of the Joint CEOS/CGMS Working Group on Climate (JWGC) are:

- Provision of a structured, comprehensive and accessible view as to what Climate Data Records are currently available and planned from existing and future satellite missions of CEOS and CGMS members or their combination;
- Creation of the conditions for delivering further Climate Data Records, including multi-mission Climate Data Records, through best use of available data;
- Optimisation of the planning of future satellite missions and constellations to expand existing and planned Climate Data Records, both in terms of coverage and record length, and to address possible gaps with respect to GCOS requirements.

The first objective has led to the now annually updated comprehensive inventory of climate data records for Essential Climate Variables (ECV) (https://climatemonitoring.info/ecvinventory) as defined by the Global Climate Observing System (GCOS) with many CEOS and CGMS agencies have contributed to. The Joint CEOS/CGMS Working Group on Climate continuously analyses the Inventory content to optimise the use of past and current satellite data and to identify Earth observation measurement gaps that may appear in the future, thus potentially interrupting the continuity of climate data records. This analysis is traceable to Earth observation data products and satellite instruments. CEOS and CGMS agencies use this resource to inform their planning for both mission and product generation to avoid Earth observation measurement gaps in the future.

JWGC has built strong relations to stakeholders as the United Nations Framework Convention on Climate Change (UNFCCC), GCOS, GEO, WMO Global Framework on Climate Services, WMO Space programme, and the world Climate Research Programme. The JWGC is regularly reporting to these stakeholders on the progress

(to be continued on page 5)

Atmospheric Composition Virtual Constellation (AC-VC) Report

***Jay Al-Saadi**, NASA Langley Research Center*

The fifteenth meeting of the Atmospheric Composition Virtual Constellation (AC-VC) was most graciously hosted by JAXA in Nakano, Tokyo, 10-12 June 2019. Seventy participants representing approximately 40 space agencies and research institutions held discussions regarding AC-VC activities supporting the three current AC-VC deliverables to the CEOS work plan and two new prospective focus areas.

The work associated with existing deliverables is progressing on schedule. Members are actively involved in the development of a roadmap for implementation of a greenhouse gas (GHG) monitoring system by Q32019 (CMRS-25) in association with Working Groups for Climate and Calibration-Validation. AC-VC members will review and provide comments on the roadmap first draft over the next month. The air quality (AQ) constellation coordination activity (VC-3) is on schedule to provide a white paper documenting validation needs for consistent constellation products associated with the upcoming geostationary Earth orbit (GEO) missions GEMS, TEMPO, and Sentinel-4 and their interoperability with low-Earth orbiting instruments. AC-VC members will provide a final review of the document over the next month, leading to its planned submission to CEOS SIT for consideration of Plenary endorsement this year. Now that the ozone dataset harmonization effort (VC-2) is successfully producing operational total ozone products, it is evolving to a focus on consistency of tropospheric ozone products. Given the emergence of several satellite tropospheric ozone products and the utility of these products for health and air quality, the AC-VC strongly endorsed this direction and also made plans to coordinate with community activities including the IGAC-led tropospheric ozone assessment report (TOAR).

Membership continued to focus on two new activities proposed as formal CEOS deliverables. One activity is associated with co-benefits of AQ and GHG observations. A primary example is the use of coincident NO_2 observations to aid identification of anthropogenic CO_2 emissions sources, as demonstrated with observing system experiments that leverage high-resolution model simulations previously coordinated within AC-VC. Several future mission concept studies are now considering co-manifested measurements of GHG, NO_2, and aerosols. Discussions focused on how AC-VC may consistently support such studies. The second new activity focuses on air quality associated with aerosol. This is a ripe AC-VC opportunity given the new generation of operational GEO and LEO meteorological satellites, the upcoming GEO AQ missions, and multi-angle and polarimetric satellite instruments. The accurate and consistent inference of surface aerosol concentration is an ultimate though challenging goal of this activity.

AC-VC, one of the four original virtual constellations, has remained vibrant by continually assessing new activities and undertaking them as community resources permit. The next annual meeting is being planned for June 2020 in Europe, continuing the now-annual rotation among North America, East Asia, and Europe.

Tokyo, Japan, 10-12 June 2019

(continued from page 4)

that CEOS and CGMS agencies made in systematic observations of the climate system from space.

Considering the specific importance of greenhouse gas monitoring as stated in the Conference of the Parties (COP)-21 Paris Agreement, JWGC has established at its 10th meeting in Marrakech, Morocco in March 2019 a task team led by Mark Dowell (European Commission) and Albrecht von Bargen. The task team started to coordinate CEOS and CGMS entities involved in the development of the constellation architecture for monitoring atmospheric carbon dioxide (CO_2) and methane (CH_4) concentrations. JWGC will coordinate the integration of satellite data into an operational atmospheric CO_2 and CH_4 monitoring system with relevant stakeholders such as the WMO Integrated Global Greenhouse Gas Information System and relevant modelling centres. In addition, JWGC will build and maintain the necessary partnerships with the relevant users, both within the inventory and policy communities, to address the needs and the overall system implementation goals.

JWGC has started to engage with other CEOS working groups and Virtual Constellations, e.g. on climate data record registration in CEOS International Directory Network with the Working Group on Information System and Services, and on validation needs for climate data records with the Working Group on Calibration and Validation. In addition, work is underway with several Virtual Constellations (Atmospheric Composition, Precipitation, Sea Surface Temperature, and Surface Vector Wind) as there help is essential for addressing coordinated actions resulting from the analysis of the inventory of data records for GCOS ECVs.

The 11th meeting of the JWGC will be held just before the 2019 CEOS Technical Workshop from 4-6 September in Anchorage, Alaska, USA. This meeting will have joint parts with the LSI-VC and the SDCG Ad hoc group.

Joint Working Group members at the 10th meeting in Marrakech, Morocco, 19-22 March 2019.

Advancement of Space-based Greenhouse Gases Observation towards supporting national inventory reporting

Kazuo Tachi,
JAXA Principal for CEOS

"The 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories" was adopted during the 49th Session of the IPCC in May 2019. This refinement was prepared by the Task Force on National Greenhouse Gas Inventories (TFI) and 190 experts in accordance with the decision taken at the 44th Session of IPCC in October 2016. Following the decision, the Guidelines were refined to maintain the scientific validity of the 2006 IPCC Guidelines and taking into account scientific and other technical advances that have matured sufficiently since 2006.

Space agencies, through CEOS, have taken the initiative to provide detailed input to the update of IPCC guidelines on the methodology used by governments to report their greenhouse gas emissions and removals. The refinement includes information on the potential contributions of space-based observations for comparison with greenhouse gas emission estimates, drawing attention to data from ENVISAT/SCHIAMACY, GOSAT and OCO-2. We welcomed the adoption of these guidelines by the IPCC.

Since 2016, JAXA has devoted to lead on this relatively short-term but intensive campaign in order for the guidelines authors and relevant policy makers to recognize its significance. JAXA also supported Ministry of Environment in Japan (MOE) and National Institute of Environmental Study (NIES) to release "Guidebook on the use of satellite GHG observation data to evaluate and improve GHG emission inventories" in March 2018. In addition, JAXA, jointly with various international partners including GEO and GCOS, organized three side events concerning to the Greenhouse Gases Monitoring systems at the UNFCCC COP-23.

The refinement guidelines recognize that supporting GHG inventories by satellites with inverse models still have technical challenges and in the experimental stage. It is also noted that capabilities and a number of observations are expected to be enhanced by missions such as Sentinel-5/TROPOMI, GOSAT-2, GeoCarb and TanSat. It expects such an enhancement will improve the quality of GHG emission estimates.

In order to meet the above expectations and tackle the climate change, JAXA together with CEOS agencies will contribute to the Paris Agreement by monitoring the emissions and the removals of GHG with our state-of-art technologies.

Report of CEOS SDG AHT

***Flora Kerblat, Alex Held and Marc Paganini**, CEOS SDG-AHT*

The CEOS Ad-Hoc Team on Sustainable Development Goals (SDG AHT) continues to coordinate CEOS efforts in support of the UN Agenda 2030 and promote the use of EO data for tracking progress against national SDG targets.

At SIT-34 in Miami, the SDG AHT led by Marc Paganini (ESA) and Alex Held (CSIRO), organised a side-meeting and provided an update to the Principals on current activities against the CEOS Work Plan 2019-2021. The team presented a new Engagement Plan with a few options for the evolution of the CEOS collaborative activities on SDGs.

Given the diversity and complexity of the SDG process, the team recognised and stressed the need to focus and speed up efforts on tangible outcomes and to streamline the CEOS engagement on SDGs in 5 cardinal activity lines (Satellite data requirements, EO enabling infrastructures, Awareness and Capacity Building, EO Good Practices and Standardization).

Figure 1 Presentation on SDG at SIT-34

The team agreed to initially focus the analysis on showcasing the contribution of EO to 3 indicators that are underpinned by mature EO methodologies in domains such as water (indicator 6.6.1), urbanisation (SDG 11.3.1) and land degradation (15.3.1). The SDG team invites your agency to inform us where it can actively support these efforts, so we can better plan our work.

Not only our team is moving towards this direction - the Systems Engineering Office (SEO) also presented their work on the implementation of SDG-related algorithms on the Open Data Cube. More planning of training and capacity building activities with CEOS WGCapD was also further explored.

During the 2019 Living Planet Symposium, the SDG AHT (led by ESA) organized a panel session on SDG indicators with senior representatives from Space Agencies (NASA, ESA, EC, JAXA), UN Agencies (UN Environment, UN Habitat, UNCCD), National Statistical Offices (Mexico and Sweden) and EO Data Enablers (GEO and GPSDD) to discuss the opportunities and challenges lying ahead for successfully integrating EO technology within the national monitoring and reporting systems on SDG indicators, leaving no country behind. The panel aimed at raising awareness amongst the EO community on the importance to join efforts to offer robust and cost-effective solutions for countries to better achieve their SDG targets.

Our SDG team is working closely with the GEO 'EO4SDG' initiative. This cooperation, stronger today, allows us to work on joint activities such as designing CEOS-GEO strategy documents on SDGs, defining Satellite data requirements for the SDG indicators, preparing training webinars, and organising dedicated (side)-events at major EO and/or SDG forums such as the World Data Forum in Dubai. Our CEOS SDG team deeply contributed to the new GEO EO4SDG plan for the next GEO Work Programme. Our SDG teams also submitted a joint proposal for a High-level side-event on SDGs at the next GEO Ministerial and Plenary to be held in Canberra (4-9 November 2019).

All these activities keep our SDG team busy, but while we try to make EO data more accessible and useful for the process, we need to keep ensuring that our efforts are fully aligned with CEOS objectives and Agencies' missions, as well as GEO priorities.

Figure 2 Participants at the LPS 19 panel on SDG indicators

CEOS Analysis Ready Data

Adam Lewis, Matt Steventon and Andreia Siqueira,

with acknowledgements to the LSI-VC team members for their comments and input.

CEOS, through the LSI-VC, continues to progress the CEOS Analysis Ready Data for Land (CARD4L) initiative. CARD4L will enable users to access satellite data products that are ready to use for a variety of land applications. Moreover, CARD4L aims to enable non-expert users access to products that have been processed enough to be suitable for immediate analysis for a range of applications, while ensuring they are not too specific to only be used for particular topics or areas.

CARD4L reached another important milestone early in 2019 when the LSI-VC endorsed the first Product Family Specifications (PFS) for surface reflectance, land surface temperature, and normalised radar backscatter intensity at its 7th meeting in Hanoi, Viet nam (pictured here). Teams working on these specifications were drawn from across and beyond CEOS.

The endorsement of these specifications clears the way for agencies to begin producing CARD4L data. Data providers will self-assess their datasets to ascertain their degree of compliance with the CARD4L specifications, and make adjustments as needed. A peer- review from the CEOS Working Group on Calibration and Validation will follow to ensure consistency and the robustness of datasets.

Additional PFS are also being developed, with several more radar specifications expected to be endorsed over the coming year.

CARD4L data must be accurately geo-located, have been appropriately corrected for atmospheric and other effects; are measurements of a physical property of the land surface; and include metadata for the dataset level and for pixels (for instance in the form of flags or masks).

CEOS Analysis Ready Data Strategy

Noting the importance of this work, CEOS has agreed the need for a top-down, coordinated strategy on analysis ready data (ARD). A CEOS strategy for ARD will be key in supporting CEOS missions into the future, as the private sector continues to play an increasing role in the provision of Earth observation data and analytics. The CEOS ARD Strategy will develop broad consensus on the evolution of this work within CEOS, on the prioritisation of future products and Product Family Specifications in other thematic areas (such as oceans, inland surface waters and atmosphere) and on engagement with data suppliers, Big Data hosts and aggregators, and data users for maximum impact and benefit.

The CEOS ARD Strategy will be presented at the 2019 CEOS Plenary by the incoming SIT Chair Team (CSIRO/GA) and its implementation will be a key priority for their term (2020-2021).

Outreach

CEOS work on Analysis Ready Data has not gone unnoticed, with significant sessions in international conferences in the USA, Asia and Europe and keen interest from the private sector including at the 2019 ESA Living Planet Symposium in Milano. A second private-sector workshop on Analysis Ready Data is expected in the USA in August 2019, and the forthcoming conference of the European Association of Remote Sensing Companies is considering a presentation from LSI-VC on CARD4L.

For more information on CEOS Analysis Ready Data, please visit the website: http://ceos.org/ard

Overview of the COVERAGE (CEOS Ocean Variables Enabling Research and Applications for GEO) Initiative

Eric Lindstrom,
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NASA Jet Propulsion Laboratory

Jorge Vazquez-Cuervo,
NASA Jet Propulsion Laboratory

COVERAGE is a three-year collaborative project endorsed by the CEOS community in 2017 that seeks to provide improved access to inter-agency satellite ocean data across the CEOS Ocean Virtual Constellations (VCs) in support of applications for societal benefit.

The initiative places emphasis on the availability of a set of consistently gridded, analysis ready satellite data products spanning the key ocean parameters (sea surface temperature; ocean surface vector wind; ocean color radiometry and ocean surface topography) plus select in-situ datasets accessible via a thematic data portal providing a suite of value-added data services. COVERAGE's underlying Cloud-enabled technology platform will be assembled from a largely existing open source software stack that will be further exercised, refined, and illustrated in the context of a target demonstration application relevant to partnering GEO initiatives, MBON and Blue Planet.

The COVERAGE initiative is advancing a four-phase (A-D) development concept. Now complete, Phase-A involved laying the essential foundations of the project: 1) Organizational aspects, including assembly of the project team and the establishment of an external advisory board with strong ocean community, CEOS agency, and VC representation. 2) Technical aspects, including system design, functional requirements, and specification of constituent data. 3) Definition of a compelling application around which a COVERAGE demonstration would be built. This objective involved identifying the thematic focus based on community consultation, securing specific supporting datasets, and the development of partnerships within the target applications community. 4) Ongoing outreach and engagement of the lead agency, NASA, VCs and other stakeholders, including periodic reporting to CEOS and annual work-plan contributions. Phase-A culminated in a successful COVERAGE side meeting workshop activity and presentations at the September 2018 CEOS SIT Technical Workshop.

Phase B is now underway and aims to deliver, within a year, a working prototype of the COVERAGE system comprised of a coherent set of identified inter-agency datasets for demonstration and community comment. The objective is to illustrate this baseline system in the context of a target demonstration application relating to high seas fisheries and environmental dynamics. Phase-B will also focus on the implementation of a pilot distributed system architecture with nodes hosted by NASA and EUMETSAT. This will both serve as an initial proof-of-concept and provide the basis for refinement and evaluation of a more feature complete system subsequently. It will further build the stakeholder interest and advocacy required for potential operationalization of COVERAGE in the future.

CEOS Systems Engineering Office Report

Brian Killough,
NASA, CEOS Systems Engineering Office

The CEOS Systems Engineering Office (SEO) continues to provide technical support and systems engineering solutions to the CEOS organization. Some of our recent work includes progressing the creation and access of analysis ready data products for global users, progressing the Open Data Cube initiative in support of Africa and the United Nations Sustainable Development Goals (SDG), and adding new features to the CEOS Visualization Environment (COVE) tool (http://ceos-cove.org).

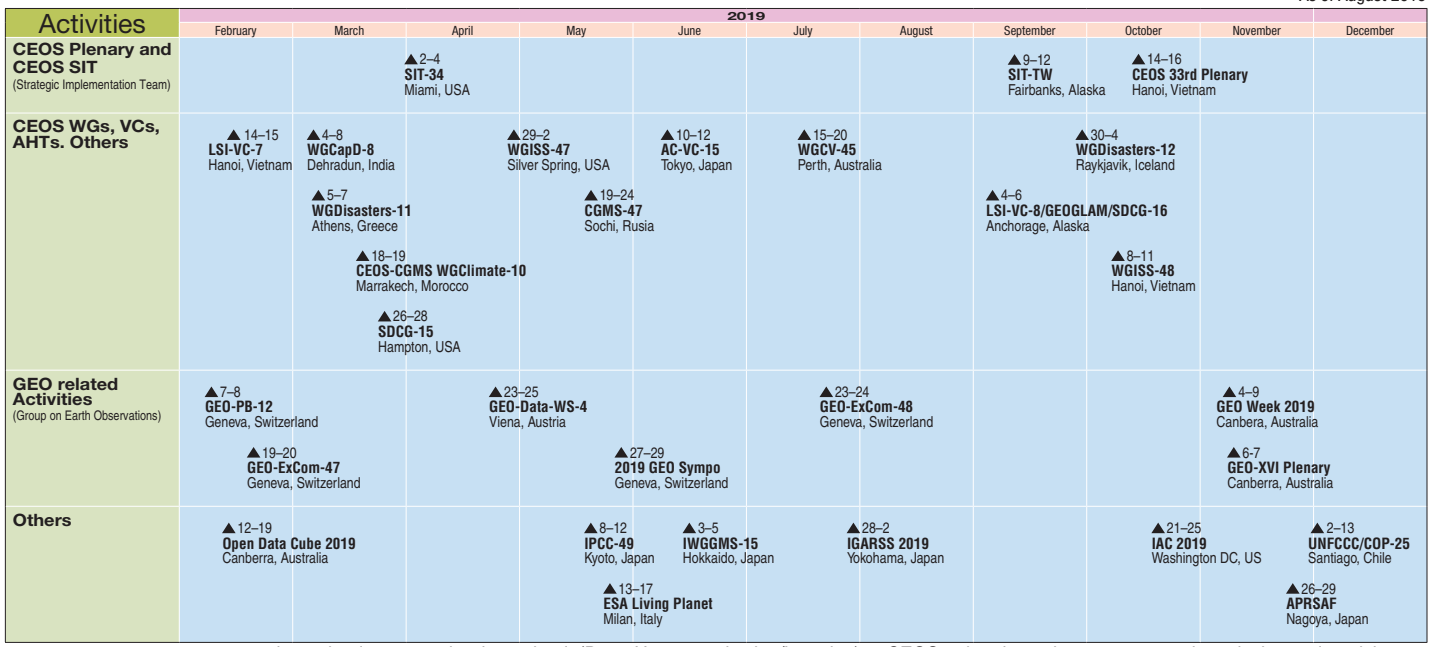
The CEOS Analysis Ready Data for Land (CARD4L) initiative (http://ceos.org/ard) has received significant global support and is making satellite data easier to use and access. CARD4L are satellite data that have been processed to a minimum set of requirements and organized into a form that allows immediate analysis. The SEO has has worked closely with the CEOS Land Surface Imaging (LSI) Virtual Constellation team and the European Space Agency (ESA) to develop approaches for the production of Sentinel ARD and making that data accessible in cloud computing frameworks. Preprocessing the entire global archive into CARD4L compliant products and making it easily accessible to all users is a challenge, though technical solutions are increasingly evolving.

Once CARD4L data are routinely available in the cloud, it will greatly improve the efficiency and impact of projects such as the Open Data Cube (ODC) (http://opendatacube.org). For example, the recent announcement of the GEO-Amazon Cloud Credit Programme includes 5 projects using the ODC and CEOS Agency satellite data. In addition, the Africa Regional Data Cube (ARDC) project support five countries and has recently demonstrated the value of Sentinel-1 and ALOS-PALSAR ARD products to support illegal mining and deforestation studies. In the past, global users have primarily used Landsat data due to its ease of use and long time series, but now, users are gaining an understanding of the power of radar data in ARD format to eliminate the interference from atmospheric clouds and provide a consistent view of the surface. Finally, there is the potential to support the United Nations 2030 Agenda for Sustainable Development and the SDGs. To date, the SEO has developed and is testing several ODC algorithms that support SDGs including 6.6.1 (water extent), 11.3.1 (urbanization), 15.1.1 (deforestation), and 15.3.1 (land degradation).

The COVE tool was one of the first systems engineering tools developed by the SEO. Its user base has significantly expanded over the years (4000+ annual users) and the request for enhancements has increased. In the coming months, COVE will add a number of new features including enhanced coverage analysis for Landsat and Sentinel missions, a custom mission feature for designing new missions and calculating revisit rate, and cloud coverage probability based on Landsat archive data. Once complete, COVE will be a powerful, free and open systems engineering tool that integrates data from many CEOS Agency missions (over 130) and provides unique systems engineering products.

Meeting Calendar

As of August 2019



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

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