CEOS NEWSLETTER
The Committee on Earth Observation Satellites
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CEOS Priority on Greenhouse Gases Monitoring

***Mark Dowell**, European Comission, 2018 CEOS Chair Team*

The Paris Agreement signed in 2015 entered into force less than one year later. The Agreement includes both mitigation and adaptation actions. The 195 participating countries have agreed to reduce global emissions of greenhouse gases and, amongst other actions, to implement a transparency framework for monitoring the impact of the Nationally Determined Contributions (NDCs) and the global stock take. The changes in the global stock take should be evaluated every 5 years starting from year 2023. Governments also agreed to track their progress towards the long-term goal, using a robust transparent and accountable system. The Paris Agreement designs a transparency system that is to be implemented bottom-up by individual countries through national reports. The latter would also be the primary input to the global stock takes. A global greenhouse gas monitoring capacity using an ensemble of independent, observation-based atmospheric data is needed to complement this bottom-up transparency framework and contribute to increase the reliability and accuracy of the national reports.

The Paris agreement acknowledges explicitly the need to ensure environmental integrity and implicitly asks to complement the bottom-up information with atmospheric measurements for verification. Complementary to the bottom-up emission inventories, reported to the United Nations Framework Convention on Climate Change (UNFCCC), Greenhouse Gases (GHG) emissions can be estimated top-down using atmospheric measurements and inverse modelling. Although not yet mandatory within the official UNFCCC reporting process, the Inter-governmental Panel on Climate Change (IPCC) Guidelines (2006) recommend nevertheless to implement verification procedures using such top-down estimates in order to improve the accuracy and reliability of national inventory systems and to contribute to the verification procedures. Furthermore in the refinement of the Guidelines the satellite contribution will be further reinforced.

It is agreed that a broad and holistic system approach is required to address the requirements which are represented by the climate policy, of which the satellite component, whilst important, cannot effectively be developed in isolation. This system in fact, includes the satellite observing capability but also, in situ observations, the required modelling (inversion and transport) component and data integration elements, prior information and ancillary data.

Taking advantage of the remarkable achievements resulting from a number of satellites in recent years (i.e. SCIAMACHY, GOSAT, OCO-2, TanSat) in elucidating the synoptic distribution of greenhouse gas distribution over the last decade, CEOS and their member agencies are coordinating a joint reaction to the Paris Agreement (COP-21). Space Agencies recognise that high-quality and resolution greenhouse gas observations, relevant to the needs of the Paris Agreement, will be essential to track progress towards the achievement of Nationally Determined Contributions (NDCs) and for stocktaking, and recognise the added value of these observations, when combined with ground based measurements and models (inversion and transport) through a fully integrated system in supporting the proposed Transparency Framework. It should also be noted that the Conclusions of the Subsidiary Body for Scientific and Technical Advice at COP-23 (SBSTA-47) for the first time acknowledge the value of atmospheric measurements of greenhouse gases, from both in situ and satellite, and encouraged Parties to the Convention to continue to support these efforts.

Specifically, CEOS will undertake, over the next few years, dedicated preparatory work in a coordinated international context, to provide cumulative added value to the specific programmatic activities of their member agencies. Concerted efforts have already begun in the context of 2018 during the European Commission's Chairmanship of CEOS and include:

- The finalisation of the definition of an architecture of space component elements to address the requirements of a GHG monitoring system, taking advantage of the existing competence of the CEOS Atmospheric Composition Virtual Constellation. This will provide a holistic perspective both from the point of view of existing and planned space segment assets as well and that for an optimum global constellation and a dedicated way forward for its implementation.
- The documentation of best practices on the relationships between individual Space Agencies and their counterparts working on the modelling aspects, the inventories and in situ data provision, to better refine the required interfaces for the overall system implementation. This was addressed in a dedicted workshop in June 2018, from which a common understanding on the system emerged and concrete recommendation on activities at the interfaces with other system components (in situ, inverse modelling and inventories)
- The further consolidation of partnerships and collaborations between the relevant international entities including: the relationship between CEOS and CGMS on the space component aspects, the partnership with the WMO and GEO on the broader framework, and with specific attention on their possible role in coordinating the in situ

(to be continued on page 2)

Workshop on EC CEOS Priority on GHG Monitoring, June 2018, Ispra, Italy

Satellites Contribution to Paris Agreement – Worldwide Engagement for Greenhouse Gases Emission Monitoring from Space –

Kazuo Tachi,
JAXA Principal for CEOS

"The Paris Agreement's aim is to strengthen the global response to the threat of climate change by keeping a global temperature rise this century well below 2 degrees Celsius above pre-industrial levels and to pursue efforts to limit the temperature increase even further to 1.5 degrees Celsius. Under this agreement, the rules are being discussed to ensure transparency of activities." (ref. UNFCCC website)

Nations are required to report their inventories of greenhouse gases. Intergovernmental Panel on Climate Change (IPCC) developed a guidance to assist countries in compiling complete, national inventories of greenhouse gases. The guideline is now being refined and to be adopted in IPCC plenary in 2019.

JAXA, in collaboration with the Ministry of the Environment – Japan (MOE) and the National Institute for Environmental Studies (NIES), launched Greenhouse gases Observing SATellite "IBUKI" (GOSAT) in 2009, which is the world's first satellite dedicated to measuring greenhouse gases. GOSAT enables to monitor atmospheric carbon dioxide and methane all over the world.

After the launch of GOSAT, NASA, China and ESA have also launched GHG monitoring satellites, and the world's capability of GHG monitoring from space has been significantly increased, and this capability will be further increased for coming years. On October 29, 2018, Japan will launch GOSAT-2, which is capable of observing methane (CH4) and carbon dioxide (CO2) as well as carbon monoxide (CO) levels with greater accuracy across a broader range of locations, including industrial and densely populated areas. Space agencies of other countries, such as USA, France, Germany, China and European Commission are planning to launch more GHG monitoring satellites.

Satellite observation made significant and remarkable scientific and technical advances on monitoring global GHG for this decade. The next challenge would be on how the satellite observation achievements could be included in decision making process particularly on how to support accuracy of national GHG report by using satellite GHG data and information. To realize the challenge, CEOS has made comprehensive efforts throughout engaging technical, scientific and political stakeholders towards the inclusion of space-based GHG monitoring in the IPCC refined Guidelines.

For beyond the refinement of the Guidelines, the Paris Agreement stipulates to establish transparency of the framework: periodical global stock take of the implementation to assess the collective progress towards achieving the long-term goals of the Agreement.

JAXA believes that the CEOS endeavor continues its contribution to assure transparency of the framework by provision of reliable and consistent data set of satellite GHG observation.

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data networks, and finally the relationships with GCOS itself, UNFCCC and IPCC TFI process in better defining the role for space-based observation in the inventory guideline process.

These efforts will continue to be implemented in the context of the comprehensive CEOS Strategy for Carbon Observations from Space, which is pursuing additional complimentary, relevant, activities to better constrain the natural carbon fluxes and stocks.

There is an imperative to take decisions both at the level of individual agencies, programmatically, as well as in the context of establishing an efficient international coordination mechanism if we are to provide the most effective input in the climate policy context at the international level. A prototype system should be in place by the first Global Stocktake in 2023 and a full operational implementation by the second Global Stocktake in 2028. We have a decade to put this in place, which provides clear boundary conditions for the definition of a roadmap.

In summary the needs are clear, the architecture implementation-though challenging – is within the means of agencies and their coordination mechanisms, we have a clear understanding of how we fit into the wider system and with which external stakeholders we need to engage. We also have an understanding of short/mid-term priorities that should be addressed to advance implementation; most importantly we have the necessary competences within CEOS (and CGMS), and their technical working groups and entities as well as their respective agencies, to address these priorities. So with the appropriate initiative and direction we can - and should - strive to build the necessary constellation and associated system interfaces over the next decade.

Where are we going, after 60 years of Earth observation?

Gilberto Câmara,
Director of GEO Secretariat

As the GEO Secretariat Director for the period July 2018 to June 2021, and having been CEOS Chair in 2010, it is my great privilege to address the CEOS community in the year where we commemorate 60 years of results from Earth observation satellites. In 1958, the Explorer-1 and Explorer-3 satellites provided data that led to the discovery of the van Allen radiation belt over our planet. Sixty years on, the space agencies that make up CEOS can be proud of their contribution to a better understanding of how the Earth system operates.

Satellites have proven to be essential for providing input data for numerical weather prediction, measuring Earth's radiation budget and ozone depletion, estimating groundwater from gravity data and ice sheet flows, following ocean dynamics, and evaluating terrestrial and marine productivity. For these reasons, the global community has recognized the need for continuous monitoring of the Earth system. Given the significant costs of maintaining operational services on a global basis, CEOS has been most successful with engaging space agencies in co-operative missions. The concept of "virtual constellations" has provided a global basis for mission partnerships. Missions such as JASON, ICESAT/CRYOSAT, GPM, GRACE, and the combined efforts for carbon measurements from space (GOSAT, OCO-2, TanSAT), show that international cooperation is now a preferred mode of practice between the CEOS agencies.

The Earth observations programmes supported by the CEOS agencies also have a societal dimension: images of our planet are now accessible globally and have contributed to shape a new perception of the Earth. From ancient civilizations until recently, humanity had a cornucopian sense of the planet. We viewed the planet as an "endless frontier", capable of providing whatever we needed to support economic growth. The current generation, born after the 1950s, is the first one in our history to be confronted with the realities of a planet with limited resources, and yet to hold a global aspiration for a better quality of life for all. We can now navigate our planet in space and time. Anyone who has seen images showing how Amazonia has been deforested or how the Aral Sea almost disappeared is inspired to protect our planet. Personally, I am deeply moved to see how climate change has transformed places where I spent my childhood.

In this global-local nexus, Earth observations are expected to play an essential role by providing systematic and objective data for the Sustainable Development Goals (SDGs). CEOS and GEO are already engaged in finding out how can Earth observations contribute to the SDGs. CEOS has recently produced an important document, led by ESA and CSIRO. However, major challenges remain, one of which for the CEOS agencies is providing the kind of data that best supports countries to produce SDGs indicators and take actions to support pathways for green societies and green economies.

Sustainable development is a long-term process. To support the production of SDG indicators, we need multi-satellite, long-term analysis-ready data sets. Long-term data sets are essential for projecting future trends since they allow societies to know what their current situation is and what has happened in previous decades. Big multi-sensor analysis-ready data sets are a major requirement for using Earth observations to support the SDGs.

To produce Earth observation data for the SDGs, the CEOS agencies need to move beyond the concept of "virtual constellations" to encompass data put together from different Earth observing platforms. However, merging data sets from multiple satellites from different agencies is a major undertaking. In the current state of affairs, one likely possibility is that many data providers will try to build these repositories independently, resulting in duplication and fragmentation. While some countries may benefit from having competing providers for the same data, other regions may not have adequate data provision, although the original data is free and open. The solution promoted by the GEO Secretariat is to encourage and support public data aggregators.

In the years to come, the GEO Secretariat plans to engage with the CEOS agencies and other data providers to maximize global data aggregators. These services would expand and enhance the combined efforts of our space agencies that support open data policies. These data aggregators would be services that provide cloud access to big satellite image time series data, which is analysis-ready. Building such public aggregators is insignificant in comparison with the cost of building and operating the satellites. The benefits far outweigh the costs.

Global progress towards realizing social goals in recent decades is unprecedented in human history. The World Bank estimates that 1.1 billion people escaped extreme poverty since 1990. The just and valid expectation of the Global South for better living standards means we face a "perfect storm". Can we provide food, water, and energy for 9,4 billion people, avoid dangerous climate change, and protect our planet's biodiversity? Never in human history have we faced a situation where daily personal actions such as buying a car or switching on the heating entail global consequences. Sustainable development practices are the only way we can preserve the Earth for future generations. By combining the efforts of CEOS and GEO, and ensuring our societies obtain full and open access to all the Earth observation data they need, we will solidly contribute to the well-being of current and future generations. Those yet to be born will be most grateful to us.

Views from the European Commission reflecting on the full, free and open data policy in place for Copernicus

Philippe Brunet,
Director, Directorate-General for Enterprise and Industry, European Commission

Copernicus is a public service. Its core objective is to provide geo-information services to policy and decision-makers in the key domains of environment, civil protection and civil security. The six Copernicus Services [1] respond to this objective. It is the data required by the Copernicus Services that define the need for observations, whether from space or from other observation platforms. The family of Sentinel satellites, seven of which are flying already, and observation instruments responds to most of Copernicus' needs for observations from space. Both the underlying space observation data from the Sentinels and the Copernicus Services are available on a full, free and open basis, with some necessary caveats for the security domain.

Where the observation needs are not fully met by the Sentinels alone the Commission purchases complementary data. While the derived service-information remains available under the full, free and open data policy, the purchased data itself, which represents a very small fraction compared to the Sentinel data, will be subject to licensing conditions agreed upon on a case-by-case basis with data providers.

Copernicus thus still buys Earth Observation data to complement the Sentinels and this data is in general not available on a free, full and open basis. For the future, the Commission is taking stock of the experience of the current phase and is exploring ways to evolve its approach to sourcing Earth Observation data that complements the data harvested by the Sentinels.

In June this year, the Commission published a proposal for the continuation of Copernicus after 2020 that is currently being negotiation by the European Parliament and the Council of the European Union as co-legislators. The Space Strategy for Europe [2] adopted in 2016 already outlines some of the main priorities: to address the challenges of climate change and sustainable development, to monitor anthropogenic CO2 and other greenhouse gas emissions, land use and forestry, or changes in the Arctic. Furthermore, enhancing the security dimension of Copernicus is currently also high on the agenda.

Stability and consolidation of the achieved remains the main priority for the Commission. Consequently, the Sentinels constellation will remain at the core of the Copernicus system in the future. Its evolution must keep up and where possible anticipate the evolving needs of users. Hence the Commission is exploring how best to leverage the paradigm shifts in Earth Observation, for instance in the growing offer of high quality satellite data, be it optical/ multispectral or radar. Tapping into this supply may provide efficient opportunities to continue delivering world-leading services to the Copernicus user community. While providing value for money to the programme and excellence to the Copernicus users, it allows reinforcing a robust and sustainable industrial EO capacity and stimulating further private investments.

In future, the Commission expects to continue sourcing Earth Observation data in complement to the Sentinels. Alternative approaches to simply buying the data are under consideration (based on innovative partnership models or service-buy schemes). In exploring opportunities with potential partners, the Commission will seek to maintain the principle of a full, free and open access policy for the Copernicus Services as well as for the Sentinels and Sentinel-like data streams, allowing as is the case now for the necessary caveats in the security domain. By doing so, the Commission expects to advance the second objective of Copernicus, which is to foster growth and competitiveness in the space industry, while fully responding to the needs of the Copernicus users.

(notes)

[1] Copernicus services cover land, marine, atmosphere, climate, emergency and security

[2] COM(2016)705 of 26 October 2016

Open Data Cube Initiative

Brian Killough,
CEOS Systems Engineering Office

The Committee on Earth Observation Satellites (CEOS) is a founding partner in the Open Data Cube (ODC) initiative which seeks to provide a free and open data architecture solution that has value to its global users and increases the impact of Earth Observation (EO) satellite data. The ODC is based on the implementation approach used by the Australian Geoscience Data Cube (AGDC) but is modified to allow globalization for a diverse set of users, datasets and deployment options. Though the ODC is a specific approach to data management, it is not the only approach for managing data in "cube" formats. For example, Google Earth Engine uses a similar data management approach and has transformed the EO satellite data user community. More recently, the European Commission (EC) has launched an initiative to develop Copernicus Data and Information Access Services (DIAS) which uses data exploitation methods similar to those in the ODC.

All of these approaches to "cubes" benefit from addressing user needs identified by CEOS, including free and open satellite data, open source software tools and algorithms, pre-processed Analysis Ready Data (ARD), a broader ARD Strategy that promotes interoperability of diverse datasets, and flexible deployment (e.g. cloud or local compute and storage). In response to these user needs, CEOS Agencies are pursing solutions seeking to remove the burden of data preparation, yield rapid results, and foster an active and engaged global community of contributors.

Starting in 2017, several CEOS Agencies (Geoscience Australia, CSIRO, USGS), NASA's CEOS Systems Engineering Office (SEO) and the United Kingdom Catapult Programme formed the ODC "Partners Forum" to steward the ODC community and contribute to the ODC architecture. They seek to encourage others to join the initiative with an ultimate goal to meet the targeted needs of global users, similar to the objectives of the AGDC, GEE and DIAS, but differing in implementation.

As of August 2018, just 18 months after the start of the ODC initiative, there are 9 country-wide operational Data Cubes (Australia, Colombia, Switzerland, Taiwan, Ghana, Kenya, Senegal, Sierra Leone, Tanzania), 6 in active development (Georgia, Moldova, Uganda, United Kingdom, Vietnam, China) and 35 other countries with expressed interest. Most recently, the Global Partnership for Sustainable Development Data (GPSDD) and Amazon collaborated with the CEOS SEO on the launch of the Africa Regional Data Cube (ARDC) to support 5 countries (Ghana, Kenya, Senegal, Sierra Leone, Tanzania). Since the ARDC launch and initial face-to-face training, there have been a number of online training sessions focused on national issues such as, illegal mining, land change, water extent, agriculture and rapid urbanization.

The ODC solution intends to support a number of objectives, which include building the capacity of global users to apply EO satellite data and to support global priority agendas, such as those found in the United Nations Sustainable Development Goals (UN-SDG) and the Paris and Sendai Agreements. With the support of external stakeholders (e.g. GEO, GPSDD) the ODC expects to continue its growth and impact. One recent example of this growth is the early planning of Digital Earth Africa, which will use the ARDC as a prototype toward a fully operational system to serve all of Africa. With a goal to implement more operational data cubes around the world, the ODC will make a significant global impact and ensure EO information is being used to its full potential.

Photo from the Africa Regional Data Cube (ARDC) Workshop on May 9-11, 2018 in Nairobi, Kenya

33rd Meeting of the CEOS Strategic Implementation Team: Outcomes and Aspirations

Dr. Stephen Volz,
2018-2019
CEOS SIT Chair

Members of the CEOS Community converged in the foothills of the Colorado Rockies in April to participate in the 33rd meeting of the CEOS Strategic Implementation Team (SIT-33). Over 75 participants from 20+ CEOS Agencies were treated to the fickle Colorado weather with falling snow one day, followed by blue skies and warm sunshine the next. The weather perfectly complemented the varied discussions that we had at SIT-33, ranging from the endorsement of the Working Group on Disasters Volcano and Seismic Hazard Demonstrators to discussions about Agency future mission plans.

At SIT-33, we challenged the attendees to consider how CEOS can serve space agency needs and through the efforts of its working groups and activities can capitalize on the significant opportunities to apply information from satellite Earth observations in the service of society. Specifically, what value can CEOS bring to its Members and Associates AND what how can CEOS Agencies contribute to and through CEOS to address needs and requests from external partners and the world community.

SIT-33 was my first opportunity to introduce the SIT Chair priorities for 2018-2019 and to determine how the actions, discussions, and conclusions at SIT-33 could address these priorities. The four priorities are:

1. Ensure the efficient execution of existing SIT responsibilities as described in the SIT Terms of Reference, addressing Working Group and Virtual Constellation continuity, sustainability, and outputs, including:
   - Undertaking gap analyses for each VC, to support ongoing and likely upcoming strategic Agency observatory decisions, and
   - Seeking observations from VCs and WGs on what is working well within their groups, and consider modifications to existing practices to apply best practices across the VCs and WGs.
2. Enhance the utility of new observations from next generation of geostationary satellites coming on line globally, and exploring development of LEO/GEO combination products and data processing capabilities.
3. Improve and clarify CEOS relationships with CGMS, GEO, and to a lesser degree WMO, by identifying coordinated activities and, where appropriate, holistic interaction among CEOS, CGMS, GEO, and WMO, emphasizing the unique values of each in the collaborations.
   - Identify and focus on areas of appropriate and productive collaboration.
   - Take stock of trends and future directions so that CEOS can best serve the needs of its Agencies and support future role of CEOS, CGMS, GEO, and WMO engagement with private and commercial sectors.
4. Support initiatives undertaken by CEOS Chairs in 2018 and 2019.

On the first day of the meeting, we focused on the transfer of information, communicating Agency near-term and long-term future plans, emerging activities, and building a common understanding of implementation activities across CEOS through the seven Virtual Constellations and five Working Groups. Our strategic direction for the Virtual Constellations and Working Groups was to establish a clearer overall CEOS observing system assessment and desired observing strategies which might serve as an input to CEOS Agency mission planning processes currently, or soon to be underway, for the next generation Earth observing systems.

We also looked at the advancement of our emerging and ongoing activities, specifically in those areas where CEOS is committed to support other global initiatives and activities such as water, climate, and carbon. We discussed future mission plans in the context of viewing 5 to 15 years down the road and identified potential areas where CEOS can contribute to agency decisions.

All the Virtual Constellations and Working Groups leaders were instrumental in the successful execution of SIT-33. Leading up to SIT-33, all VCs and WGs responded to lengthy questionnaires focused on identifying tangible and sustainable outcomes from, and sustainable commitment to, our VCs and WGs. The answers to the questionnaires, and extensive dialog between the VCs/WGs and the SIT Chair team framed the discussions on the first day.

The second day focused on broader strategic discussions, identifying linkages across CEOS work, mapping the work of CEOS to other partners, such as the Group on Earth Observations (GEO), and concluding CEOS business. The session on *ad hoc* teams was an opportunity for SIT to reflect and report on the *ad hoc* team trajectory and lifecycle in relation to the thematic initiatives each support. We sought to present a clear understanding on the possible evolution of those teams past their current *ad hoc* status, including considering long-term sustained operations and what those sustained trajectories might mean for

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CARD4L Will Offer New Opportunities for Land Monitoring Applications

LSI-VC team

For many land monitoring applications using remote sensing, a lack of data is no longer the issue it once was. The European Commission's (EC) Copernicus program and the U.S. Geological Survey's (USGS) Landsat missions have adopted systematic acquisition strategies, and distribute vast amounts of satellite data under open licenses. Similarly, storage and computing capability have evolved to make it cost effective and practical to process and analyze these data at various scales. Data architecture solutions, such as the Open Data Cube (ODC) and the Copernicus Data and Information Access Services (DIAS), are providing frameworks that make scientific analysis simpler and straightforward.

However, enabling non-expert users without computation resources to pre-process and store low-level data products to exploit these capabilities has proven more challenging.

The Committee on Earth Observation Satellites (CEOS) is addressing this challenge through 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.

Traditionally land-based remote sensing has evolved around individual sensors producing unique data streams with applications built around a single data stream only. In contrast, CARD4L identifies "Product Families" which are comparable and measurement types. The Product Families provide details of what is required in order to deliver such measurements in an analysis ready form. Currently there are three Product Families Specifications (PFS): Surface Reflectance, Surface Temperature and Radar Backscatter. Additional radar PFS such as; Polarimetric Covariance, Polarimetric Decomposition, INSAR LOS, INSAR Coherence and Geocoded SLC are being assessed and developed by CEOS experts.

CARD4L will be an important enabler of the Open Data Cube (ODC) initiative. Through CARD4L, users will be able to easily locate products that are suitable for ingestion into Data Cubes, and will have confidence that these different CARD4L products limit as far as possible barriers to interoperability.

Many satellite data users lack the expertise, infrastructure, and internet bandwidth to efficiently and effectively access, pre-process, and utilize the growing volume of space-based data for local, regional, and national decision-making. Even sophisticated users of Earth Observation (EO) data typically invest a large proportion of their effort into data preparation—a major obstacle to mainstreaming the use of EO data, and a threat to the success of major global and regional initiatives supported by CEOS. As data volumes grow, this barrier is becoming more significant for users.

Countries and international organizations have expressed a desire for support from CEOS to facilitate access to and processing of satellite data into CARD4L products, which are expected to greatly reduce the burden on global satellite data users and boost data use. The provision of this data is possible through many options, including systematic processing and distribution, processing on hosted platforms, and processing via toolkits provided to users.

CARD4L products are also intended to be flexible, accessible, and suitable for a wide range of users and a wide variety of applications, including time-series analysis and multi-sensor interoperability. They are also intended to support rapid ingestion and exploitation via high-performance computing, cloud computing, and other data architectures.

However, CARD4L products are not suitable for all purposes, and are made available in addition to and not as a replacement for other satellite products. Expert users, for example, can be expected to continue to utilize lower level data that enables processing for specific applications.

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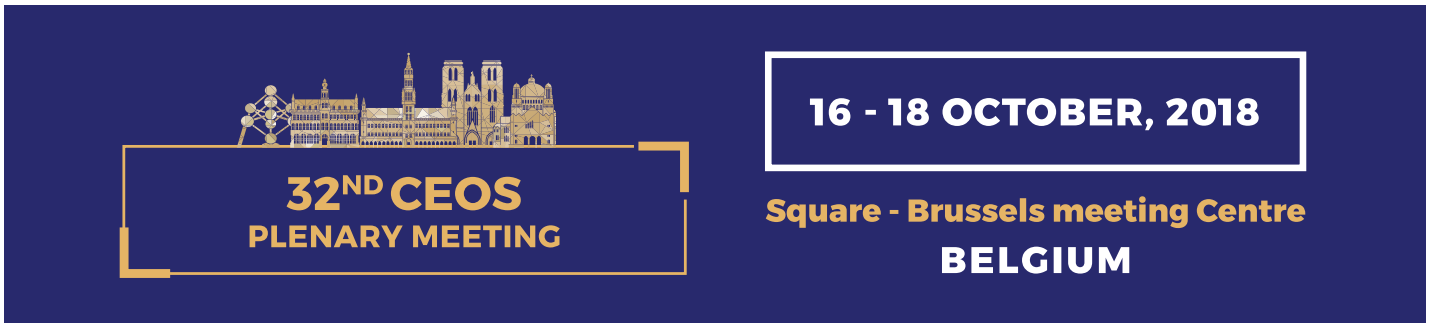
CEOS and CEOS Agency participation.

The Partnership session focused on further development of the CEOS relationship with the Coordination Group on Meteorological Satellites (CGMS), in part based on the success of the joint CEOS-CGMS Working Group on Climate. In this session, we discussed opportunities for enhancing the utility of new observations from the next generation of geostationary satellites and explored the development of GEO/LEO combination products and data processing capabilities. CGMS had already identified three Pilot Projects during their 2017 Plenary on aerosol/dust observations; fire observations; and flood observations and we discussed how CEOS could contribute to those observations to fulfill goals of both CGMS and CEOS.

Data, especially future data architecture, analysis ready data, and open DataCubes figured prominently in our discussions as well, as those are one of the CEOS Chair Priorities for 2018 and will continue to figure prominently as we move to the September SIT Technical Workshop and October CEOS Plenary.

We will continue to address many of the topics from SIT-33 in the upcoming SIT Workshops in September and into 2019. I believe SIT-33 was a success because of the continued contributions and personal dedication of the representatives of Agencies who commit to CEOS, and especially because of the active engagement by the membership in the SIT meeting itself. We have some ambitious objectives for the next 16 months and I look 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.



GEO Week 2018 and the GEO-XV Plenary.in Kyoto, Japan

This gathering of GEO's 105 Member governments and 126 Participating Organizations will explore efforts and opportunities for the use of Earth observations for the benefit of humankind, focusing on GEO's three priority areas: the Sendai Framework for Disaster Risk Reduction, the Paris Climate Agreement, and the UN Sustainable Development Goals.

Meeting Calendar

As of August 2018

Activities	2018 August	September	October	November	December	2019 January	February	March	April	May
CEOS Plenary and CEOS SIT (Strategic Implementation Team)		▲10–14 **SIT Technical Workshop** Darmstadt, Germany	▲16–18 **CEOS 32st Plenary** Brussels, Belgium	▲13–15 **Freshwater from Space WS** Delft, Netherlands					△1–5 **SIT-34**	
CEOS VCs and CEOS TFs (Virtual Constellations and Task Forces)		▲3–7 **LSI-VC/GEOGLAM/SDCG for GFOI Meetings** Ispra, Italy								
CEOS WGs		▲28–31 **WGCV-44** Darmstadt, Germany ▲5–7 **WGDisasters-10** Naples, Italy	▲22–25 **WGISS-46** Oberpfaffenhofen, Germany					▲4–8 **WGCapD-8** Dehradun, India		
GEO related Activities (Group on Earth Observations)				▲31–1 **GEO-XV Plenary** Kyoto, Japan						
Others			▲1–5 **IAC 2018** Bremen, Germany	△ **APRSAF-25** Singapore	▲3–14 **UNFCCC/COP 24** Katowice, Poland					▲13–19 **ESA Living Planet Symposium** Milan, Italy

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

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