

CEOS NEWSLETTER

Committee on Earth Observation Satellites
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Outcome from 2015 CEOS activities.

Current Status
2015 was a remarkable year for CEOS and for space-based Earth observations – marked by important international events such as the World Conference on Disaster Risk Reduction (WCDRR) in Japan, the Sustainable Development Goals summit in NY, the GEO Ministerial meeting in Mexico, and finally the Paris Climate Conference (COP21).

In the midst of these events, the 29th CEOS Plenary meeting was held in Kyoto, the thousand-year capital of Japan, welcoming more than 100 participants from 35 agencies. 2015 was the year where our collective conscious embraced both global and regional issues facing human society. It was a great pleasure to Chair CEOS in this exciting period.

WCDRR indicated that a global perspective is key for disaster risk reduction, whilst COP21 showed us the necessity of international cooperation and solidarity to cope with global climate change. In each case, satellite Earth observation was recognized as an important tool. In this light, the GEO ministerial endorsed the next 10 years strategic plan.

In order to meet this challenge, CEOS, the space arm of GEO, has not only worked hard by ourselves in the past one year but also enhanced the linkage with outer organizations such as the UNISDR,

I truly appreciate all the efforts of the active members including SIT chair, Working Group Chairs, and Virtual Constellation leaders.

Outcome of the 29th CEOS Plenary.

We welcomed four new members from four different continents. The Australian Bureau of Meteorology, the Gabonese Agency for Space Studies and observations, the

Malaysian National Space Agency and the Mexican Space Agency. Now we have 31 Members and 28 Associates in the CEOS community. CEOS recognises the increasing number of EO satellite operation agencies as well as users. We shall continue our efforts to encourage new agencies to join the CEOS community.

As one of the Chair initiatives, we published the CEOS Report on Data Applications. This is a collection of successful instances from recent applications of satellite Earth observations. We can learn best practices from these examples. Also, we published Earth Observation Handbooks for climate and for disasters. These three informative books can serve as great guides for our new journey.

Discussion on how CEOS will participate and contribute to the new GEO 10-year strategy was one of the main parts of the 29th Plenary. We confirmed continuation of provision of space-based EO data and services for GEO while stepping up to participate in GEO governance. Continuing contributions to several GEO activities such as GFOI, GEOGLAM, Blue Planet, Carbon and Water strategies were also confirmed.

We also continue to ensure climate observations, especially to contribute to data collection for Essential Climate variables (ECVs) identified by the Global Climate Observing System (GCOS) in response to the needs of the UNFCCC - as well as supporting the COP21 meeting.

Those discussions are summarized as the Kyoto Statement available on the CEOS website, and delivered to GEO by the new

Shizuo Yamamoto,
2015 CEOS Chair



CEOS Chair (CSIRO) in order to convey our message to stakeholders.

Accomplishments of CEOS's Virtual Constellations and Working Groups were reported and we confirmed concrete progress of each area.

CEOS members expressed warm special thanks to Pascale Ulte-Guerand (CNES) for her great contribution in the past 2 years as SIT Chair. The SIT Chair was handed over to Stephen Briggs (ESA). Also Chairs of four working Groups (WGISS, WGDisasters, WGCopD and WGClimate) were handed over to new personnel. CEOS Members expressed sincere thanks for all their contributions.

I would conclude my message with wishing a successful year of 2016 as a new stage for CEOS under the direction of CSIRO, the new CEOS Chair.

JAXA will also be willing to continue cooperation with, and contribution to such effort.



COP-21/SBSTA-43 Outcomes

The historic agreement on climate change in Paris, December 2015, aims to hold the increase in global average temperatures to well below 2°C. The European Space Agency was there, also representing CEOS, to inform, discuss and educate the communities gathered in Paris about the role of Earth observations in climate change.

ESA had a stand in the area reserved for accredited

delegations, observers and media. A number of side events were run, many of which involved the satellite community: REDD+ and forest monitoring; measuring changes in the polar regions; Earth observations for better climate resilience; and climate services using satellite data. The stand was also a hub for media interviews with journalists from across the globe, wanting to know how satellites can benefit their country specifically, and how the data is used by the climate

Pascal Lecomte, ESA

community.

In parallel, the Grand Palais in Paris hosted a range of events for the public. A team from the ESA Climate Office were part of the 'Climate Desk', which joined businesses, artists, and scientists to showcase how we

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GEO XII Plenary/Ministerial Summit

Alex Held, CEOS Chair Representative (and Stephen Briggs, SIT Chair)

The 12th Plenary session of the intergovernmental Group on Earth Observations (GEO), and the associated Mexico City Ministerial Summit, were held in Mexico City between the 9th and 13th of November 2015. The main objective of these meetings was to lay a strong foundation for the second decade of GEO, ensuring it is even more successful than the first decade of operation. The level of attendance, with over 400 delegates, speaks to the level of support there is for GEO.

It was my pleasure to lead a strong CEOS delegation to these important meetings, with the Executive Officer Team of Jonathon Ross (GA) and Marie-Josée Bourassa (CSA-ASC) joining me, along with Chu Ishida (JAXA), Brent Smith (NOAA), Brian Killough (NASA), Eric Wood (USGS) and Arnold Dekker (CSIRO).

It was our pleasure to speak with the GEO community about our record of contribution to GEO across so many domains: from our role as the largest provider of data to the GEOSS Common Infrastructure, to our foundational cross-cutting coordination work as the 'space arm' of

GEO, to our pivotal role in the success of initiatives like GEOI and GEOGLAM and our extensive contribution across other areas of GEO activity. I would like to thank the entire CEOS community for providing us with so many fantastic achievements to talk about!

The key highlight of these meetings was approval of the GEO Strategic Plan 2016-2025 - a product of a year's extensive work by the GEO community with extensive input from CEOS.

This plan provides a strong foundation for the next decade of GEO and will enable us to strengthen the already deep CEOS-GEO relationship further. It was our pleasure to reassure the GEO community not only of CEOS's commitment to the next decade of GEO and to the Strategic Plan, but also our desire to work with GEO on the big strategic issues that we will need to address to ensure the success of the new strategy. These big issues include engagement with the United Nations, engagement with the private sector, and ensuring Earth observations contribute to the big international agendas around sustainable

development, disaster risk reduction and climate change. Working on these issues together will require strong CEOS-GEO coordination.

One of the key topics discussed was the future governance of GEO. Our goal for a long time has been to ensure that Participating Organizations like CEOS, which make such significant contributions to GEO activity, are able to make a strong contribution to GEO governance. I am pleased to advise you that the revised Rules of Procedure adopted at the meeting will enable us to play this greater role. As a result, there is now the opportunity for us to play our part in stewarding design and implementation of the GEO Work Programme through the new GEO Programme Board, and also to contribute to the GEO Executive Committee as an Observer.

One final highlight from the meeting was the CEOS Exhibition Booth. I would like to express my personal thanks to those, particularly Brian and Eric, who organised the booth and manned it so professionally. The booth really highlighted the great work of CEOS, and drew in people for discussions that will lead to future collaboration. It was particularly exciting to have a visit to the booth from the United States Secretary of the Interior, Sally Jewell, and other senior US officials. They were very interested in the work CEOS is doing to ensure satellite Earth observations contribute to solutions from local to regional to global scales.

The future for GEO and the future CEOS-GEO relationship look bright and I look forward to working with you all to make it as successful as possible.



GEO Commits to unleash the power of open data to address global challenges

The GEO-XII Plenary session and fourth Ministerial Summit in Mexico City concluded with commitments to share data on Earth observations at a time of exponential data growth, human development and climate change.

The meeting was hosted by the Instituto Nacional de Estadística y Geografía (INEGI). More than 400 delegates from 41 GEO governments and 39 partner organizations attended, including Ministers of Environment, Science and Natural Resources.

U.S. Interior Secretary Sally Jewell attended, commenting, "We can and should share Earth observation data to help address climate challenges because science and open data are critical to understanding land, water, wildlife & climate change. They must be at the heart of every policy decision - no country can solve it alone."

Dr. Alex Held, 2015 CEOS Chair Representative made a statement saying "The coordination role that CEOS plays benefits GEO in many ways: it makes satellite observation of the Earth more cost effective for individual governments; enables more comprehensive observation of the Earth system; enables more data to be made available

for more users, a significant portion of it at no cost; and ensures important data gaps are closed."

Major achievements include the adoption of a ten year Strategic Plan (2016 - 2025) and a Ministerial Declaration that focuses on harnessing critical environmental observations to enable leaders to make better-informed decisions for the benefit of humanity at a time of rapid global change.

Against the backdrop of the recent adoption of the UN Global Goals for Sustainable Development and an anticipated global agreement on climate change, GEO launched several bold, new initiatives, including a global Marine Biodiversity Observation Network (MBON), regional programmes to share EO data in the Americas (AmeriGEOSS) and Europe (GNON) and a renewal of GEONETCast, an initiative of China, Europe and the United States to provide critical Earth observation data to developing countries.

Osamu Ochiai, GEO Secretariat

GEO welcomes new Members Ecuador, Kenya, Somalia, Viet Nam, Zimbabwe, Uruguay and UAE, bringing the number to 102 nations; five new Participating Organizations: the Commission on the Protection of the Black Sea Against Pollution (BSC), International Research Center on El Niño (CIFFEN), Future Earth, Research Data Alliance (RDA) and The World Bank (BRD/IDA); and four new Observers: European Severe Storms Laboratory (ESSL), Inter-Islamic Network on Space Sciences and Technologies (ISNET), the Organisation for Economic Co-operation and Development (OECD) and the UN Initiative on Global Geospatial Information Management (UN-GGIM).



Outgoing SIT Chair Report

The SIT chair's focus over the past two years has been consolidation: allowing the CEOS community to gradually assimilate the deep-laid foundations that were reset during NASA's tenure as SIT Chair and specifically during the CEOS self study. This SIT Chair team has had the honour of taking the new-look CEOS through its "commissioning phase" and, in a number of important areas, the processes and principles laid down have now been proven. This is true of our relationships with external stakeholders, the way in which different parts of CEOS interact and, most importantly perhaps, our overall progress in the development of an efficient space segment fit for purpose in observing the earth and serving society across so many important domains.

2015 has been an exceptional year in terms of CEOS's relations with external stakeholders. The decadal UN conference on Disaster Risk Reduction (WCDRR), a GEO ministerial and the major UNFCCC COP 21 meeting

all require significant CEOS engagement to highlight space's added value. This has been achieved in each of these milestone events building on the hard work of the CEOS Working Groups, particularly the Working Group on Disasters and Joint CEOS-CGMS Working Group on Climate, and the broad CEOS leadership group.

Some of the most striking examples of CEOS delivering today are to be found in the various ad-hoc activities where specific structures have been established out of necessity. The Global Forest Observing Initiative is one such case, where CEOS is going the last mile to deliver space data directly to the users. Our action in this domain, as in that of agriculture, carbon or water, demonstrates agencies's willingness to go further than in the past, and is being driven by a new recognition that our collective responsibility goes beyond launching and operating space hardware through to the use of the data. Earth observation is in a critical phase where several factors, new space infrastructure, an emerging

**Pascale
Ultré-Guérard,**
CNES



data economy and new generation ground infrastructures including exploitation platforms may combine to bring about a potentially rapid increase in its use over the next few years. The way in which space agencies meet increasing interest from the private sector will be a key element in this.

CNES, as SIT Chair, is proud to have had some role in nurturing, coaxing and guiding the energy of the CEOS community to deliver over these past two years and you can rest assured that will continue to be an active and enthusiastic contributor to CEOS. Finally, all our very best wishes go to ESA who can continue to count on our support throughout the 2016-2017 period.

New SIT Chair Message

Space agencies, individually and in combination through CEOS, have made an increasingly significant, and increasingly recognised, contribution to major international political initiatives and processes of late, for example through UNFCCC COP21, through development of the UN Sustainable Development Goals (SDGs) and through our work in Disaster Risk reduction in WCDRR. In addition, CEOS agencies have continued to pursue other important initiatives, for example in Carbon and Water, through GEO in GFOI and GEOGLAM, via our long-term partnership with GCOS and many others. We also have significant work programmes in the Working Groups and Virtual Constellations. All these have highlighted the enormous benefit to be gained in society from better use of EO data, but they come at the cost of significant effort from CEOS agencies.

The potential for space agencies to contribute will only increase, and we should welcome this. The outcomes of COP21 will require, in due course, greater efforts in support of climate in many areas. The review of GEO activities and processes will lead

to a greater commitment on the part of agencies in the next decade. The advent of the SDGs gives the opportunity, if managed correctly, for space agencies to provide fundamental information for improved global sustainability in future.

These are all exciting prospects for CEOS agencies. There is no limit to the benefits we could potentially deliver in their progress. But there is a limit, set by the level of support to our programmes.

Over the next two years ESA would propose that we further address the balance between opportunity to make the greatest contribution, and the resources at our disposal. This means we need to ensure the most effective means of establishing partnerships with key agencies - in the UN, in International Finance Institutions, through international conventions and agreements and in other major user areas. We also need to understand how and to what extent partnership is optimised through GEO. The GEO Strategic Plan 2016-2025 recommends to "systematically observation requirements, jointly with user communities, to determine and prioritize gaps

Stephen Briggs,
ESA



in the availability of observations". Similarly to what was done with the "GCOS Satellite Supplement", CEOS should be closely involved during the generation of those requirements in order to ensure that the resources at our disposal are used to best advantage.

We will therefore have to consider how best to support our international commitments and to optimize and coordinate the several thematic observational strategies implemented by CEOS in support of a diversity of sectors, consistent with the capacity available within CEOS and agencies.

SIT-31 will be a good occasion for us to further progress on those topics and to enable us to set priorities for our support to global initiatives and programmes clearly deserving of it

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understand and are responding to climate change. As part of this, Pascal Lecomte, head of the ESA Climate Office, was interviewed for Solutions COP21 TV with French astronaut Jean-Francois Clervoy. The two discussed the different perspectives from space and what they tell us about the world, both through a human viewpoint and in terms of the information gathered. Wearing his CEOS hat, Pascal also explained the role of CEOS to bring space agencies together and its work on climate change through WGClimat.

Pascal also presented some of the work of the Climate Office throughout the weekend. Short animations of key environmental changes measured by satellites, were

explained to the general public at the Grand Palais.

To help engage a wider audience than those present at COP21, CEOS organised a series of tweet chats that took place on the social networking site, Twitter. Two chats were organised during COP21 for the 3rd and 10th of December, where CEOS posed a series of questions to its Twitter followers about coordinating climate information from space. Using the hashtag #cop21ceos, Twitter users were able to join in or just follow the discussion points put forward by CEOS; CNES, NASA, ESA and EUMETSAT joined in to offer contributions from their work. These tweet chats managed to engage a wide variety of people and groups, from individual remote sensing scientists to groups such as the National

Centre for Earth Observation in the UK.

In the final Paris agreement, there is a statement calling for "strengthening scientific knowledge on climate, including research, [and] systematic observation of the climate system". It is clear from the discussions and the work presented, in and around COP21, that the satellite community can do much more to support managing climate change. We hope that the presence of the space agencies at COP21 helped to disseminate this message to even more of the climate change community.

Pictures can be downloaded from the ESA Climate Twitter account: <https://twitter.com/esaclimate/media>

CEOS Chair New Initiatives

I'm pleased to report an update on the two new CEOS Ad-hoc Teams which are carrying forward the two studies proposed by CSIRO and accepted by Principals at the 29th CEOS Plenary.

Future Data Access & Analysis Architectures Study Team

New generation Earth observation satellites will create such significant volumes of data with comprehensive global coverage that, for many applications, a lack of data will no longer be a limiting factor.

Extensive research and development has resulted in new applications for long time series Earth observation data, offering significant potential to deliver great impact on important environmental, economic and social challenges, at the regional and global scales necessary to tackle issues such as long-term climate monitoring, land-use change and water resources mapping, food security, and the monitoring of key indicators for sustainable development across the world.

However, to make the most of this enormous potential, the growing gap between data access & processing and application, especially in developing countries, needs to be bridged.

Attempts by individual users to address this problem have so far not resulted in an optimal solution, and miss the opportunities offered through collaborative environments where both data providers and users can work together across domains and

geographic boundaries.

We believe that the data management and analysis challenges arising from the explosion in free and open data volumes can be overcome by new, high-performance Information and Communications Technologies (ICT) infrastructure and architectures aimed at improving data management for providers and removing obstacles to data uptake by users.

The *Future Data Access & Analysis Architectures Study* will assess the current status of data supply, access, processing and delivery, and provide guidance on the potential that new high-performance or cloud-computing technologies can provide.

Membership in the study team has now been confirmed, and the initiative will be co-lead by CSIRO (Robert Woodcock) and USGS (Tom Cecere) and supported by 11 other CEOS Agencies: CNES, CSA, DLR, EC, ESA, EUMETSAT, GA, JAXA, NASA, NSMC-CMA and UKSA.

Non-meteorological Applications for Next Generation Geostationary Satellites Study Team

The deployment over the next few years of a constellation of advanced meteorological geostationary (GEO) satellites with improved spectral, spatial and temporal resolution sensors, opens up a world of new possibilities for continuous monitoring of the high-temporal dynamics of the land, oceans and atmosphere. Data from GEO satellites can be applied

Alex Held, CEOS Chair Representative

to a broad range of societal challenges, particularly in combination with moderate resolution Low Earth Orbit (LEO) observing satellites.

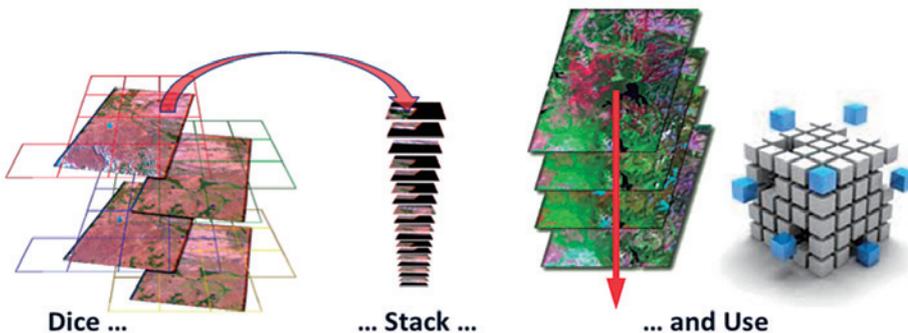
While the primary mission of these new GEO satellites is to support operational meteorological services, they offer opportunities for non-meteorological applications that can enhance and complement the LEO-based applications that have been the workhorse for monitoring the broader Earth system.

The development of meteorological applications using these advanced GEO satellites is well addressed by the meteorological community. However, the development of a set of additional non-meteorological applications from these advanced missions is a new area of EO application development that shows much promise.

The Non-meteorological Applications for Next Generation Geostationary Satellites Study Team is undertaking a systematic survey of potential applications, benefits and capacity. CSIRO is delighted to report that nominations for co-leadership were enthusiastically submitted by many agencies already active in this area. CSIRO (Thomas Schroeder), EUMETSAT (Kenneth Holmlund), NOAA (Satya Kalluri) and the Australian Bureau of Meteorology (Ian Grant) will lead a team of 13 additional CEOS agencies: CNES, CSA, DLR, EC, ESA, GA, JAXA, JMA, KARI, NASA, NSMC-CMA, UKSA and USGS. The Study will result in a report that provides comprehensive and pragmatic guidance to CEOS on the new opportunities arising from next generation geostationary satellites and GEO-LEO synergies.

The ad-hoc teams will be working over the coming months to agree the detail of their reports and will next meet at CEOS SIT-31. I look forward to observing each team's journey over the coming year and reading the post-2016 action plans that will be submitted for consideration by CEOS at its 30th Plenary meeting in Brisbane later this year.

If you are interested in contributing to these initiatives, please contact the CSIRO CEOS Chair Team at: chair-team@lists.ceos.org



The Australian Geoscience Data Cube: a tool that simplifies user access to analysis-ready Earth observation data through application of new ICT infrastructure and architectures

LSI-VC

The new Terms of Reference and Implementation Plan for the Land Surface Imaging Virtual Constellation (LSI-VC) were endorsed by CEOS at its 2015 Plenary meeting in Kyoto, Japan. The LSI-VC exists to maximize the value derived from CEOS agency land surface imaging assets and activities by providing an overarching coordination role.

Three co-chairs have been identified: Adam

Adam Lewis, GA, Bianca Hoersch, ESA, and Jennifer Lacey, USGS

Lewis (GA), Bianca Hoersch (ESA) and Jennifer Lacey (USGS). The initial membership of the renewed LSI-VC will be CNES, CSA, CSIRO, EC, ESA, GA, ISRO, JAXA, NASA, NOAA and USGS, with other CEOS agencies encouraged to engage.

Over the coming years, LSI-VC will be working to: promote the sustained and systematic

collection of satellite-derived land surface imaging observations; collate and harmonize validated requirements identified by CEOS Working Groups and ad hoc teams (Carbon, SDCG/GFOI, GEOGLAM, WSIST) as well as downstream user communities, to increase the

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Working Group on Disasters (WGDisasters)

The WGDisasters entered into a two-year era of chairmanship by the Italian and Canadian space agencies.

The three Disaster Risk Management pilots on floods, seismic hazards, and volcanoes are progressing well. CEOS Agencies, through the WGDisasters, continue regular provision of satellite data. Endorsed at the 29th CEOS Plenary in Kyoto, Japan, the new CEOS Landslide Pilot aims to demonstrate the effective exploitation of satellite Earth Observation data across the full cycle of landslide disaster risk management, with a distinct multi-hazard focus on cascading impacts and risk. Through this pilot, we seek to improve coordination and sharing of satellite acquisitions, data products and methodologies in support of landslide management and connect these activities to end-user groups for adoption.

CEOS Agencies have responded positively to the continuation of the Hawaii and Iceland GEO permanent geohazard supersites, following the endorsement of their two-year extension.

Stéphane Chalifoux, CSA, WGDisasters Chair

Reduction 2015–2030.

It is with great pleasure that I welcome the National Remote Sensing Centre from India and the *Agence Gabonaise d'Études et d'Observations Spatiales* from Gabon for their new membership in the WGDisasters.

The CEOS ROOT held a one-day working session in Washington, hosted by the World Bank / Global Facility for Disaster Reduction and Recovery. This meeting aimed at further refining the type of products the Observatory will produce, and establishing institutional cooperation on long-term recovery in anticipation of the first Recovery Observatory triggering. The group agreed to share information on major disasters that result in Post-Disaster Needs Assessments, and to collaborate on one or two specific long-term monitoring products that would showcase how satellite data support the recovery process.

GEO-XII Plenary endorsed the transitional GEO Work Programme 2016, which includes the GEO-DARMA initiative (Data Access for Risk Management). For the Concept phase, this WGDisasters initiative seeks independent identification of disaster risk management priorities at the regional level by authoritative Regional Institutions, in line with the priorities of the *Sendai Framework for Disaster Risk*



CEOS Recovery Observatory Oversight Team (ROOT) holds a working meeting at the World Bank in Washington, USA (December 10, 2015)

Working Group on Climate (WGClimate)

Working closely with the WGClimate Vice-Chair Jörg Schulz (EUMETSAT), a comprehensive 4-year work plan spanning both our 2-year chairmanships has been defined. Our common responsibilities and vision for the working group is captured by our shared activities, including :

ECV Inventory & Climate Architecture.

The ECV Inventory is intrinsic to the core responsibilities of WGClimate and forms a pivotal asset in the implementation of the Climate Monitoring Architecture. The objective is to lead to completion a whole ECV Inventory development cycle over two years, Cycle #2 (ending November 2017), and Cycle #3 (ending November 2019).

Each cycle comprises a series of crucial tasks to ECV Inventory development including, amongst many, quality control of the ECV Inventory, identification of shortfalls between the ECV Inventory and requirements expressed by the UNFCCC and GCOS, and the planning of actions to fill those identified gaps.

This activity will also involve the development and the maintenance of a WGClimate web site to provide a single authoritative location housing the assets for which WGClimate is responsible, including the Climate Monitoring Architecture definition and the ECV Inventory, and used as the working area for WGClimate members both from CGMS and CEOS. Development of the WGClimate web site will include additional resources for CDR users (e.g. finding CDRs by using ECV Inventory, etc...).

COP-21, GCOS and UNFCCC / SBSTA

As defined in its Terms of Reference, WGClimate ensures the planning and development of a response to climate information needs, reporting to UNFCCC/SBSTA and GCOS. Following a successful COP-21, a major task will be to support the upcoming SBSTA sessions, and to answer the GCOS definition of new requirements planned for the end of 2016.

Supporting CEOS Strategy for Carbon Observations

observations through the promotion of common standards, making land surface image products more easily discovered and ready for analysis (Analysis-Ready Data).

The first face-to-face meeting of the LSI-VC (LSI-VC-1) will be held from the 22nd to the 24th of February at ESA ESRIN, co-located with a meeting of the Space Data Coordination Group (SDCG) for

Pascal Lecomte,

ESA, WGClimate Chair



The CEOS Carbon Strategy Implementation Study Team (CSIST) was created at SIT-29 (April, 2014) and tasked with developing a set of implementation options for the 42 actions defined in the CEOS Strategy for Carbon Observations from Space. The 28th CEOS Plenary (Tromsø, October 2014) agreed to instruct CEOS entities to include the relevant CSIST-identified actions in their programmes of work.

Supporting GEO

The GEO 2016 Work Plan and GEO 2016-2015 Strategic Work Plan indicate no explicit invitations nor requests to CEOS/WGClimate. Nevertheless, numerous activities in these work plans refer explicitly to climate, and consequently we prepare for good dialogue and engagement.

the Global Forest Observations Initiative (GFOI). This presents an ideal opportunity for coordination, given common themes being explored by each group – including next generation data distribution architectures and Analysis Ready Data.

For more information on LSI-VC, and details of the LSI-VC-1 meeting, please see: <http://ceos.org/ourwork/virtual-constellations/lsi/>

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resilience of land surface imaging programs and to identify current and potential data gaps (both in terms of geographic and temporal coverage, and monitoring requirements); coordinate the production and distribution of fundamental, non-domain specific measurements derived from land surface imaging observations; and facilitate the maximum utilization of land surface imaging

Working Group on Information System and Services (WGISS)

The 40th WGISS meeting was hosted by UK Space Agency (UKSA), in Harwell, England, from 28 September to 2 October, 2015. There were 57 participants, (including 28 remotely), from 20 agencies / institutions. During this meeting, in addition to discussions on current projects and interest groups a workshop on EO Ground Segment and Data Access Evolution was held.



WGISS created a Future Architecture of Data Interest Group with the object of studying future data access systems, including the GA Datacube and Analysis-ready Data (ARD). This subgroup will also participate in the 2016 CEOS Chair initiative study of 'Future Data Access and Analysis Architectures'.

The Recovery Observatory Infrastructure is now ready for a triggering by CEOS Disasters WG. It is being used operationally by the KallHaiti project in CNES.

Both the CEOS WGISS Integrated Catalog (CWIC) and ESA's FedEO have implemented the CEOS OpenSearch interface and are jointly providing access to over 2300 collections and 76+ millions granules of EO mission data standard interfaces.

A video was produced demonstrating the search and access of satellite data across multiple CEOS agencies by making use of a set of commonly defined WGISS interoperability standards (CEOS OpenSearch). The video is accessible at <http://wgiss.ceos.org>

Andrew E. Mitchell,
NASA



WGISS has implemented the new Data Purge Alert procedure with the aim of preventing, or at least minimizing, the loss of EO space data.

WGISS reviewed and issued five new Best Practice documents:

- Data Preservation guidelines
- Preservation Workflow
- Generic EO Dataset consolidation Process
- Persistent Identifiers Best Practices
- Preserved Data Set Content (PDSC)

The 41st WGISS meeting will be hosted by GEOSCIENCE Australia and CSIRO in Canberra Australia from March 14th – March 18th, 2016. This meeting will be held jointly (in parts) with the CEOS WGCV-40 Plenary.

Working Group on Capacity Building and Data Democracy (WGCapD)

The CEOS WGCapD is happy to welcome its new Vice-Chair, Dr Senthil Kumar who is the Director of India Institute of Remote Sensing (IISR) of the India Space Research Organisation (ISRO). He brings immense expertise and experience in Earth Observation applications and capacity building.

Following the Plenary in Kyoto, WGCapD has made strides in the final preparation strategy document with its three year work plan. Under the following four refined strategic objectives, various projects and activities have been selected. The strategic objectives are i) Continue to increase access to data, products, and tools and ability to use them ii) Improve communications and coordination between member agencies,

CEOS WGs/VCs and related international organisations' capacity building and education activities iii) Build awareness of new CEOS missions and datasets, and how to use the latter within the context of existing datasets or in support of CEOS/ GEO projects, and iv) increase the ability of the WGs/VCs to provide their own capacity building. Within the confines of both human and financial resources, the following projects have been added to the ongoing activities. In support of the working group's objective to build awareness of new CEOS missions and datasets, and how to use them, both face to face and webinars on SAR training are planned. More than five space agencies have shown their interests and support of the training workshops. Furthermore a new capacity building pilot activity on Geospatial technologies and their application in

Jane Olwoch,
SANSA,
WGCapD Co-Chair



G-Governance is also planned. This activity also has potential to support many GEO related actions including resources management, urban master planning, and traffic and pollution flow control. The other new activities include providing capacity building support to CSIRO and the CEOS Chair initiatives and CEOS's contribution to Sustainable Development Goal programme. The team and I looking are forwards to the 5th Annual meeting that will be hosted by the CEOS SEO in Hampton, Virginia, USA from Wednesday, March 30, 2016 to Friday, April 1, 2016.

Working Group on Calibration and Validation (WGCV)

Working Group on Calibration and Validation (WGCV) activities in this report period was driven by subgroup meetings and background activities. It is worth to note that vital workshops from different groups do prepare the input and the base for the coming WGCV plenary meeting which will be held partly with WGISS in Canberra in March 2016. In particular, one very well-noticed highlight was the CEOS SAR workshop on calibration that included aside calibration science with regard SAR sensors a huge amount of calibration and characterization presentations of instrument providers. Due to its actuality one focus day was with very impressive results from Sentinel-1A.

During the recent plenary in May 2015 many actions had

been settled which built now the base for the organization of the activities for which WGCV had been asked. A team consolidates its assessment results with the challenging Carbon action items in order to properly translate them into work plan activities. The implementation plans for two task teams are now ready for presentation for approval during the coming WGCV plenary.

In the background several subgroup activities were supported by setting up project related to Fiducial Reference Measurements which means in short that in-situ based Cal/ Val instruments are properly referenced to the same standard providing consistent results during measurement campaigns.

In addition to the very successful and highly recognized

Albrecht von Bargaen,
DLR, WGCV Chair



CEOS SAR workshop hosted by ESA the subgroup for Atmospheric Composition workshop was hosted in a joint meeting with GSICS at NOAA. CNES and ONERA were also very supportive in hosting the IVOS subgroup workshop together with dedicated topical workshops. The Land Product Validation subgroup is progressing well having the monthly teleconferences but planning also their coming meeting in May 2016.

WGCV is looking forward to a fruitful plenary welcoming new additional participants.

Global Forest Observation Initiative (GFOI)

The Global Forest Observations Initiative (GFOI) hosts its annual Plenary at ESA ESRIN in late February 2016. All of the components (Space Data, R&D, Capacity Building, Methods and Guidance) will come together with user countries in an Open Forum to compare progress and to promote GFOI outcomes in support of National Forest Monitoring Systems. By this time, we also hope to have finalized the move of the GFOI Office to FAO – as the logical home for the coordination hub for the Initiative.

GFOI takes on renewed significance with forests being enshrined in the global climate agreement reached in Paris. The agreement includes language that operationalises forest protection and seeks international finance to make it happen. And there will be technical and scientific rules to support national forest protection plans. The emphasis of GFOI on consistent and comparable monitoring systems using wall-to-wall satellite data mean that the initiative is well placed to support countries seeking to engage in this process.

GFOI represents the first and most advanced of the new breed of acquisition strategies that CEOS space agencies are collaborating on, and which have significant potential for our Earth observing satellite programmes to reach further and deeper into society to deliver precious information in support of a well-managed future. Significant challenges lie ahead, but there are also significant opportunities – including with the first steps of the Paris climate agreement – and CEOS is in a good position to continue to promote the central role of space data.

GFOI continues to progress and matures with a changing leadership. After leading the CEOS effort for seven years, Stephen Briggs will give way to Masanobu Shimada of JAXA as the GFOI CEOS representative after the February meeting and Doug Muchoney of USGS will take over the Chair of the GFOI Leads Team. Following the retirement of Ken McDicken, the new FAO Lead, Anssi Pekkarinen, has already shown great enthusiasm for the challenge and will be an asset to the Leads team. Together

Stephen Briggs,

ESA,

CEOS Lead for GFOI



with Anthony Bennie of Australia and Henrik Fliflet of Norway, this is a strong team to take GFOI forward.



GEOGLAM

Agricultural markets have become increasingly volatile, threatening food security and human livelihoods. Access to timely, accurate, and transparent information about crop condition and production will help stabilize markets and provide early warnings of crop failure, thereby promoting food security. In 2011, the Group of Twenty (G20) Agricultural Ministers developed the G20 Action Plan on Food Price Volatility and Agriculture that included the launching of the Agricultural Market Information System (AMIS; www.amis-outlook.org), and the Group on Earth Observations' (GEO) Global Agricultural Monitoring initiative (GEOGLAM), the latter utilizing Earth observations for improved information about crop condition and production.

Crucial to GEOGLAM's success is the acquisition and timely dissemination of the appropriate satellite data for agricultural monitoring. To this end, the CEOS Ad Hoc Working Group for GEOGLAM was established in 2012

Bradley D. Doorn, *NASA and Selma Cherchali,* *CNES*

to characterize Earth observation requirements for global agricultural monitoring, implement an acquisition strategy for monitoring, and address issues related to EO data access and utilization around the world. The Ad Hoc WG presented their first acquisition strategy for endorsement at CEOS Plenary in 2013, and has received endorsement every year since.

Under NASA (Bradley Doorn) and CNES (Selma Cherchali) leadership, the Ad Hoc WG has made considerable progress in addressing EO requirements for agricultural monitoring in the research and development context. For example, data from CSA, JAXA, DLR, NASA, ESA, and others have been acquired for GEOGLAM's operational R&D activity JECAM (Joint Experiment on Crop Assessment and Monitoring (www.jecam.org)), as well as for the rice-focused sub-initiative, Asia-RiCE (www.asia-rice.org). Challenges for 2016 and beyond

include scaling up fine-to-moderate spatial resolution EO acquisitions to national coverage, for which implementation will begin in Southeast Asia, through Asia-RiCE.

Crucial to EO data utilization and to GEOGLAM's success, particularly in computation and internet-limited locations, is the dissemination of large EO-based datasets. To this end, CEOS has been working through its Systems Engineering Office (SEO) to prototype data services systems, with this activity expected to grow and evolve through 2016 and beyond. The systems developed through this R&D activity will find a long-term home in agricultural ministries and with other end-users. This is something GEOGLAM is working diligently to ensure through the GEO Secretariat and with guidance from the GEO Advisory Committee, of which CEOS is a member., which convened for the first time in November 2015.

WSIST

CEOS Strategy For Water Observations From Space In 2014, the GEO Integrated Global Water Cycle Observation Community of Practice (IGWCO CoP) produced the GEOSS Water Strategy to guide international activities related to the acquisition, archiving, processing, dissemination, and use of water observations and data products – and GEO invited contributions to its implementation plan. At the 28th CEOS Plenary, Tromsø (October 2014), CEOS established the Water Strategy Implementation Study Team (WSIST) comprising interested experts and members from CEOS Agencies to prepare its response to the GEOSS Water Strategy.

The GEOSS Water Strategy contains 58 recommendations, 22 of which have been identified as relevant for CEOS attention. The WSIST compiled these

CEOS potential contributions and prepared the CEOS Water Strategy* to respond to the GEOSS Water Strategy recommendations. In May 2015, the IGWCO CoP annual meeting, in College Park, Maryland, USA, provided the opportunity to clarify requirements and the background of those recommendations.

The major CEOS potential contributions were presented at the 29th CEOS Plenary, Kyoto in November 2015. A feasibility study on a water virtual constellation (modeled after the A-Train constellation) is one such contribution. The Plenary endorsed the CEOS Water Strategy and a one-year extension of the WSIST to implement the proposed CEOS Water Constellation Feasibility Study – and other potential actions in cooperation with WGs and VCs, with a report required at the CEOS SIT-31 meeting in April and at the CEOS Plenary in November.

Chu Ishida, *JAXA*

The Feasibility Study is being implemented based upon six priority parameters: precipitation, soil moisture, evapotranspiration, groundwater, river discharge and water storage. It is expected that the Feasibility Study will establish a full understanding of requirements and capabilities of existing/future observations systems, postulate benefits from different levels of coordination (orbits, co-flights, new capabilities, GEO-LEO synergies, etc.), and to review cost implications of different scenarios. The final report will be made at the 30th CEOS Plenary.

*http://ceos.org/document_management/Meetings/Plenary/29/Documents-For-Decision/27_CEOS-Response-to-the-22-GEOSS-WS-Recommendations-v1-0.pdf

Chair Message, 46th CEOS Newsletter



Dr. David Williams,
CSIRO,
2016 CEOS Chair

As CEOS Chair it is my great pleasure to welcome the CEOS community to 2016. I'm honoured to serve as CEOS Chair and look forward to working with you all to further the CEOS mission, in the context of the new opportunities that arose during the course of 2015.

The 2015 CEOS Plenary saw the establishment of two new ad-hoc teams to pursue the 2016 CEOS Chair's priority initiatives on Non-meteorological Applications for Next Generation Geostationary Satellites and Future Data Access and Analysis Architectures. Many CEOS Agencies have enthusiastically volunteered to join and lead the studies, and good progress is being made. CSIRO greatly appreciates the support the studies have received.

Of course, CEOS continues its important work

in SIT and the Working Groups as well as other key issues including disasters, water and carbon; and is evaluating potential contributions to the UN's Sustainable Development Goals.

On the wider front, the CEOS involvement in GEO was strengthened by decisions at the GEO-XII Plenary. The plenary adopted the GEO Strategic Plan for 2016-2025, a transitional work programme for 2016 and a number of organisational changes that will see CEOS have an increased opportunity to influence the GEO work. I thank all those people involved in preparing inputs from CEOS to the GEO Strategic Plan.

While the specific impacts of the global climate agreement reached at COP-21 will not be fully realised for many years, the COP21 outcomes will undoubtedly provide direction for the work

of CEOS and its agencies. CEOS, through the Working Group on Climate, remains committed to serving the observational needs of the global climate community, and looks forward to being a vital component in the future of addressing climate change.

2016 presents a fantastic opportunity to capitalise on the strong groundwork laid in 2015 and I look forward to seeing great progress on all of these key tasks.

Wishing you all the very best for a happy and productive 2016.

Meeting Calendar

As of Marh 2016

Activities	2016											
	March	April	May	June	July	August	September	October	November	December		
CEOS Plenary and CEOS SIT (Strategic Implementation Team)		▲18-20 SIT-30 Frascati, Italy						▲13-15 SIT Technical WS Oxford, UK		▲10/31-11/2 CEOS 31st Plenary Brisbane, Australia		
CEOS VCs and CEOS TFs (Virtual Constellations and Task Forces)				▲6-10 GHRSSST XII & SST-VC College Park, USA						▲10/31-11/4 OSIST Mtg & OST-VC La Rochelle, France		
CEOS WGs	▲7-9 CEOS-CGMS WClimate-6 Paris, France	▲8-10 WGDisasters-5 Bonn, Germany						▲6-8 WGDisasters-6 Vancouver, USA	△ WGISS-42 Japan			
		▲14-18 WGISS-41 Canberra, Australia						△ WGCV-41 Japan				
		▲14-18 WGCV-40 Canberra, Australia										
		▲3/30-4/1 WGCapD Annual Mtg Virginia, USA										
GEO related Activities (Group on Earth Observations)	▲8-9 GEO ExCom Geneva, Switzerland		▲2-4 GEO Work Programme Symposium Geneva, Switzerland								▲8-10 GEO XIII Plenary & ExCom St. Petersburg, Russia	
			▲5-6 2nd GEO Programme Board Geneva, Switzerland									
Others	▲1-2 Asian Water Cycle Symposium Tokyo, Japan			▲5-10 CGMS-44 Biot, France		▲7/30-8/7 41st COSPAR Istanbul, Turkey		▲26-30 IAC 2016 Guadalajara, Mexico				
	▲2-4 GCOS Conference, Global Calimate Observation: The Road to The Future Amsterdam, The Netherlands											

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

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