

CEOS NEWSLETTER

The Committee on Earth Observation Satellites

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30th CEOS Plenary Outcomes

Capping a busy and productive Chair year, the Commonwealth Scientific and Industrial Research Organisation (CSIRO) hosted the 30th CEOS Plenary from October 31st to November 2nd 2016 in Brisbane – the sunny capital of Queensland, Australia.

During the Plenary we welcomed our newest CEOS Member – The Korean Meteorological Administration (KMA). We all look forward to collaborating closely in the future.

The occasion of the Plenary marked the conclusion of the two CEOS Chair initiatives and their *ad-hoc* teams for 2016 on Future Data Architectures and Analytics (FDA-AHT) and Broader Applications for Next-Generation Geostationary Satellites (NMA-AHT). CEOS endorsed the recommendations and opportunities presented by these initiatives respectively. Both CGMS and CEOS were tasked with assessing the opportunities presented by the NMA-AHT, and will report back at CEOS-31.

While the initial phase of the FDA-AHT came to a close, USGS agreed to take forward the Future Data Architectures (FDA) topic as a CEOS Chair priority theme for 2017, with an emphasis on framing strategic discussions on the way forward for CEOS at the 31st CEOS Plenary. The 31st CEOS Plenary in 2017 will include discussions on how CEOS should take the various activities forward within the CEOS structure to best ensure that CEOS agency data is used more effectively, on a larger scale, and in new and exciting ways to unlock the true potential of EO for society.

One of the FDA-AHT recommendations accepted by CEOS was the proposal for FDA pilot projects to be progressed, which will help CEOS develop an understanding of the costs and benefits of FDA (including Data Cubes, Thematic Exploitation Platforms, etc.) and ARD production for both CEOS Agencies and users. ARD (Analysis-Ready Data) is the concept of satellite data that have been processed to a minimum set of requirements and organised into a form that allows immediate analysis with a minimum of additional user effort. At the Brisbane Plenary, CEOS endorsed its own definition for land imaging purposes (CEOS Analysis-Ready Data for Land, CARD4L) and this will underpin many CEOS activities including Data Cubes and other future data distribution architectures.

Another activity that came to a close at the 30th CEOS Plenary was the Water Strategy Implementation Study Team (WSIST) Water Constellation Feasibility Study Report. CEOS Principals acknowledged the completion of the study and agreed to reconsider the CEOS approach to water observation requirements at CEOS SIT-32, in the context of developments within GEO (AquaWatch, GEOGLOWS, etc.). I would like to take this opportunity to personally thank Chu Ishida of JAXA for his tireless effort leading the WSIST.

Consistent with the commitments laid out in the Kyoto Statement, adopted at the 2015 CEOS Plenary, the Brisbane Plenary also agreed to establish an *ad-hoc* team to coordinate and drive CEOS engagement on UN Sustainable Development Goals (SDGs) as well as a new approach to

Alex Held, CSIRO, CEOS Chair Team

progress the *CEOS Strategy for Carbon Observations from Space*. As a Co-Lead of the new SDG ad-hoc team, I look forward to representing CEOS on this important global effort.

Over the 4 months since the Plenary, we have seen the new USGS CEOS Chair team do an exceptional job, including around ensuring continuity of these priority themes. I am looking forward to seeing where we have progressed by the time of the 31st CEOS Plenary and the commencement of the European Commission's 2018 CEOS Chair term.

I hope you enjoyed your time in Australia. I look forward to seeing many of you very soon at CEOS SIT-32.



COP-22/SBSTA-45 Outcomes

Overall 22 500 participants came together in Marrakech during the two weeks of COP-22 (7-18 November 2016). The negotiations focused on matters related to the entry into force (4 November 2016) and the implementation of the Paris Agreement, which the UK signed during COP-22 as the 111th country.



Opening of the COP-22 in Marrakech by Ségolène Royal Chair of COP-21 and Abdellatif Loudiyi Chair of COP-22.

During the Opening Ceremony of the COP on 7 November and the Subsidiary Body for Scientific and Technological Advice (SBSTA) later on the same day, CEOS was represented by the WGClimate Chair as part of the ESA delegation which has an Inter Governmental Organisation (IGO) observer position.

The Space Agency Statement, as finalised during the CEOS Plenary in Brisbane was presented as agreed by the Delegation of the United States of America as well as the GCOS Implementation Plan.

This was followed on the following day by a Earthinfo Day organised by SBSTA. WGClimate presented on behalf of both CEOS and CGMS a poster titled Space Agencies and Climate Change - 2016 Global Climate Observing System Implementation Plan. The format put in place for the

Earthinfo Day proved to be very useful to facilitate discussion between the parties and the Climate Scientific community.

The SBSTA acknowledge the contribution of the Space Agencies, recalled its conclusions from SBSTA 41,33 and encouraged CEOS to submit its comprehensive space agency response to the GCOS IP 2016 at SBSTA 47 (November 2017). It was also agreed to present a progress report on the Space Agency response to the GCOS IP 2016 at SBSTA 46 in Bonn (May 2017).

On 11 November, a Head of Space Agencies side event was co-organised by the Kingdom of Morocco and France. After an opening by the COP21 and COP22 Chairs and by Moroccan Minister of Defence, the WGClimate Chair made an introductory presentation titled "The role of satellites in the battle against climate change".

Recapping the 13th GEO Plenary

It was my pleasure to attend the 13th GEO Plenary meeting in St. Petersburg, Russia, as head of the CEOS delegation. The 400 attendees participated in a new meeting format that featured three interactive panels rather than speakers reading prepared statements. Here is a quick update.

A “GEOSS Development Panel” discussed how the GEO community can improve development of a Global Earth Observation System of Systems. It discussed how to improve coordination of terrestrial in-situ observations; how an “essential values” approach like that used in climate could benefit the GEO community; how lowering technical barriers for using Earth observations can help non-traditional users exploit the data; and how to engage our peers to better emphasize the economic benefits of Earth observations.

A “User Driven Initiatives Panel” focused on how GEO participants can better connect their activities to the priorities and needs of end users. They discussed the challenges in understanding what users want, as well as how GEO and users can engage to co-create products and services that are more likely to fit specific purposes while fostering user ownership.

A “Commercial Sector Panel” discussed how a “win-win” engagement with the commercial sector was possible



and critical for GEO's success in its second decade. Panel members encouraged direct engagement with the commercial sector for follow-on activities meant to discern which specific engagement models may work best for GEO.

Engagement Strategy

Plenary participants endorsed a strategy that describes the role actors in the GEO community can play in connecting GEO and its stakeholders. Three Engagement Priorities were adopted as part of this strategy: the Sustainable Development Goals; the Sendai Framework for Disaster Risk Reduction; and Climate Change, specifically Greenhouse Gas monitoring.

While the GEO community will engage in other agendas and with other stakeholders, those priorities signal to the GEO Secretariat, GEO Executive Committee, and GEO Programme Board that these areas deserve specific, dedicated attention and focus. Connecting this GEO Engagement Strategy with our priorities as stated in the Kyoto Statement reflects a keen insight and commitment CEOS agencies have in building the space arm of GEOSS.

Three-Year GEO Work Programme

The endorsement of the first three-year GEO Work Programme was a huge achievement for the Programme Board, including CEOS representatives Stephen Briggs, Jonathon Ross, and Ivan Petiteville. Appropriately acknowledged by the GEO Plenary, the delivery of a comprehensive document just one year from inception is a significant accomplishment.

While CEOS remains committed to its existing contributions, Plenary attendees also earned that it is engaged with Future Data Architectures, has plans to promote a global

Dr. Frank Kelly,

CEOS Chair



Stephen Briggs,

SIT Chair



open source community of contributors to the CEOS Data Cube, and is working to make satellite data easier to use.

Other Highlights

- CEOS has been accepted to serve on the Programme Board in its next phase, and also been elected as a representative of the Participating Organisations on the GEO Excom for three years. This continues our previous Programme Board and elected Excom membership for the initial one-year period in 2016.
- The initial “bottom up” mapping undertaken by the GEO Programme Board showed almost all of GEO's work programme contributes to the Sustainable Development Goals (SDG)—a welcome confirmation about the relevance of GEO activities.
- The Programme Board will now continue a more strategic “top down” activity to identify where there may be gaps in existing contributions, and where targeted contributions could increase the role Earth observations play in this area.

Group on Earth Observations – Implementing GEOSS

The Royal Government of Cambodia joined GEO on 23 January as its 104th Member. It will be represented by the Ministry of Planning of Cambodia. Cambodia joins the latest new Members announced at the end of 2016, Uruguay, United Arab Emirates and Mongolia. Among the new Participating Organizations approved in 2016 are the European Association of Remote Sensing Companies (EARSC); the Humanitarian OpenStreetMap Team (HOT); the Integrated Carbon Observation System (ICOS); the Sahara and Sahel Observatory (OSS); and the World Health Organization (WHO).

GEO-XIII PLENARY

The Thirteenth GEO Plenary (GEO-XIII) was held in Saint Petersburg, Russia, hosted by the Russian Federation, led by ROSHYDROMET AND ROSCOSMOS. A total of 20 Side Events were held 7-8 November, an Exhibition was held from 8-10 November, the fourth Programme Board was held 7 November, the 38th Executive Committee on 8 November and the Thirteenth GEO Plenary from 9-10 November.

The redesigned GEOSS Portal was unveiled during the Plenary meeting and features a new interface with

Kathleen Anderson and Osamu Ochiai, *GEO Secretariat*

enhanced searchability functions. Participants also addressed how best to advance GEO Initiatives linked to the Sustainable Development Goals (SDGs) and for the first time, to engage with the commercial sector through a Plenary panel session. The Plenary opened with a message from the International Space Station in which cosmonauts observed the work of GEO makes Earth observations more widely available and meaningful, for the benefit of humanity.

GEO WORK PROGRAMME 2017-2019

The third Programme Board meeting was held from 7-8 September, 2016. Outcomes included continued analysis of Foundational Task prioritization; finalization of the Initiative and Flagship review process for inclusion in the 2017-2019 Work Programme with the following four Flagships being recommended to GEO-XIII Plenary: GEOBON, GEOGLAM, GFOI and GOS4M. The fourth Programme Board meeting was held immediately prior to the GEO-XIII Plenary meeting and summarized lessons learned as the interim members stepped down and new formation took shape.

The fifth Programme Board meeting was held from 1-2 February, 2017. The meeting was presided by co-

chairs Ivan DeLoatch (United States), Tim Haigh (European Environment Agency) and Albert Fisher (IOC). Three PO observer seats to the Executive Committee were announced as CEOS, GOOS and IEEE. Sub-groups were established, to carry out the intersessional work of the Programme Board as follows: Sub-group 1 Deliver SDG process outline; Subgroup 2 Shape 2017 WPS process, taking into account the contextual priorities of Climate Change/GHG Monitoring and Disaster Risk Reduction. Sub-group 3 Performance indicators and Monitoring and Evaluation. The Programme Board is preparing for the run up to the GEO Work Plan Symposium, to be held in Tshwane, South Africa, on 13 May, immediately after the 37th International Symposium on Remote Sensing of the Environment (ISRSE-37).

E04SDGs

The GEO Initiative on Earth observations for the 2030 Agenda, E04SDG, has engaged with national governments and UN processes developing and implementing the SDGs to deploy Earth Observations data to achieve sustainable communities in UN member countries. In addition, the

(to be continued on page 3)

Future Data Access and Analysis Architecture

In 2016, CSIRO proposed and led a CEOS study through the Ad Hoc Team on Future Data Access and Analysis Architectures (FDA). While providing an excellent interim report on contextual developments in this area—a report whose recommendations were endorsed by the CEOS Plenary in October 2016 at Brisbane, Australia—the team postponed a full and final CEOS response, given the strategic significance of the topic and pervasive impact on CEOS activities.

That final CEOS response, as well as any adjustments to existing or new tasks within its many subsidiary groups, was left to a second year of analysis led by the 2017 CEOS Chair, USGS. This ensures that this CEOS contribution to GEO remains technically and inter-institutionally coordinated by CEOS, while responsive to the stakeholder needs of the wider GEO community.

As a key initiative of 2017 CEOS Chair USGS, the FDA Continuation effort in 2017 will likely include:

- Finalization the CEOS Analysis Ready Data (ARD) definition initiated by SEO and now led by LSI-VC.
- Actions to support the development, production of, and access to compatible ARD from multiple CEOS

agencies.

- Informal coordination and consultation with the big data players to maximize their uptake of CEOS agency ARD in their systems.
- Advancing the draft CEOS Data Cube 3-Year Work Plan and establishing the institutional arrangements and leadership for its implementation.
- Further developing existing CDC and ARD prototypes for GFOI/GEOGLAM to explore potential for CEOS agency purposes.
- Consideration of actions to address issues raised by the GFOI Global Data Flows study in 2016 and the feedback that came with it.
- Establishing an understanding of how these technologies are best deployed in support of CEOS and agency objectives.

The outcomes sought from 2017 FDA work include the delivery of a final report well in advance of the U.S. Plenary in November 2017; strategic assessment of the trends identified by the FDA Interim Report and recommendations as to where CEOS should focus for maximum effect; an evaluation of the impact of these recommendations on the CEOS Work Plan and associated structures, with clear

Steve Labahn,

USGS



recommendations for any changes to either; and progress on several of the existing pilot activities.

The Chairs—Steve Labahn of USGS and Nick Hanowski of ESA, as well as outgoing Chair Alex Held of CSIRO—want to have the strategic assessment and recommended CEOS focus topics in an advanced state by SIT-32 in late April 2017 so that a side meeting to review might be arranged with all stakeholders around SIT-32.

In parallel with the conclusion of the analysis and recommendations, the FDA Study Team will support progress of the pilot studies that were agreed on to explore and develop some of the provisional priorities identified by the Interim Report, including trial production of CEOS Analysis Ready Data (CARD4L) to demonstrate the pros and cons for CEOS agencies and their users, and EO application to the CEOS Data Cube to support the ARD demonstration.

Moderate Resolution Sensor Interoperability

The USGS CEOS Chair has introduced a new initiative in 2017 on Moderate Resolution Sensor Interoperability (MRI) to complement and build on the work of the CSIRO-initiated Future Data Architectures (FDA) study, as well as the LSI-VC CEOS Analysis Ready Data for Land (CARD4L) efforts.

The FDA work and CARD4L definitions need to be fully coordinated with the interoperability initiative. Those activities provide input to the MRI framework as results are implemented. In 2017, two important activities are foreseen for the MRI effort:

- A framework of moderate resolution interoperability will provide a structure for coordinating the investigations. This framework needs to be generally applicable to address components such as radiometry, geolocation, per-pixel metadata, and image metadata needed to support science data analysis, and the search for and discovery of science data.
- Case studies should be defined to move each of the components of the interoperability framework forward with an initial emphasis on Landsat and Sentinel-2. Case studies undertaken by space agencies to meet specific agency needs will be crucial to the success

of the initiative.

The USGS Chair Team is reaching out to the CEOS community for assistance in developing products that are interoperable across sensors and through time. By understanding and describing the challenges of interoperability, the goal is to support CEOS agency development of products, and to guide GEO and other users in the use of the products.

The MRI framework will build upon the proposed CARD4L specification framework and enhance it as it evolves. Along with the major components of that framework mentioned earlier, data formats, browse, data access, metrics, and reporting are all secondary components needing coordination to support interoperability activities.

Case studies will document, publish, and communicate clearly to the community the objectives and intended uses of the interoperable products. Case study documentation will be aligned with the MRI framework, coordinated through LSI-VC, and led by the CEOS Working Group on Calibration and Validation (WGCV). An initial case study will involve documenting and advancing current Landsat-Sentinel-2

Eugene Fosnight,

USGS



interoperability. FDA pilots also will be used as potential additional data sets for conducting interoperability studies.

The current scope of the MRI initiative is restricted to moderate resolution optical and SAR sensors designed for global Earth monitoring of the land and associated water features. However, due to MRI's planned generally applicable structure, CEOS agencies should feel free to explore other sensor interoperability combinations once the framework has been developed.

This MRI initiative is a broad-reaching topic that will require contributions from many experts. The USGS invites all CEOS agencies to recommend qualified representatives willing to actively contribute. Contributions and feedback from thematic areas are critical to setting the priorities needed to establish user costs and benefits of the many aspects of interoperability.

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Secretariat and global initiative have engaged with global stakeholders through a series of data collaboratives. The Secretariat, as an Anchor Partner to the Global Partnership on Sustainable Development Data (GPSDD) is contributing to a "Data 4 SDGs Toolbox" designed to provide methods for supporting the SDGs and sustainability policy.

GEO has been able to engage in the InterAgency Expert Working Group (IAEG) Geographical Geospatial Information

Management (GGIM) to integrate Earth observation data from GEO into the UN process to develop and support the SDGs. A workshop, held in December, 2016 in Mexico City set the stage for National Statistical Organization adoption of Earth observation data into environmental statistic and SDG data processes.

In January, the United Nations Statistical Division along with Statistics South Africa convened the first ever UN World Data Forum. This gathering was designed to

bring statistical and other communities and technical disciplines together to improve global statistical practice including support for the 2030 Agenda for Sustainable Development. GEO participated in numerous sessions and plenary presentations. Geospatial information along with Earth observations data became an informal theme for many of the sessions. Many of the delegates from statistical organizations and other stakeholders remarked on the priority geospatial data had become through the entire program.

SIT Chair Report

The 13th GEO Plenary has successfully closed 2016, a year of transition for GEO, opening a new era for a GEO that is more user-driven and coherent content, more responsive to policy needs, driven more top-down and less bottom-up. CEOS has played a key role in the reorientation of the GEO strategy through its participation in various GEO bodies, in particular the GEO Programme Board and the GEO Executive Committee (ExCom) as Observer, in which CEOS will continue to sit until end 2019. Excom also decided to nominate a lead Chair - as “*primus inter pares*” - rotating annually, and this role will be taken up by the EC for 2017. ESA will support EC, also the incoming CEOS Chair, in this important task.

The decisions of GEO Plenary of St Petersburg were consistent with the priorities and approach set by the CEOS Plenary that immediately preceded it, and I believe we can continue to expect a strong resonance between CEOS and GEO. CEOS has also been a major player in the definition of the GEO Engagement Strategy endorsed at the GEO-XIII

Plenary, and articulated around the three following priorities:

1. 2030 Agenda for Sustainable Development;
2. Climate Change – Greenhouse Gas Monitoring;
3. Disaster Risk Reduction;

The creation of a new Ad Hoc team in charge of the Sustainable Development Goals and the one-year extension of the Future Data Architecture Ad Hoc team will reinforce CEOS' capabilities to address those GEO Engagement priorities, proposing effective mechanisms to foster the exploitation of the increasing archives of EO satellite data, developing new information products that serve the real needs of the citizens.

The 32nd CEOS SIT meeting (25-27 April 2017, ESA Headquarters, Paris, France) will address the above priorities as well as other topics that include the successful advancement of ongoing CEOS commitments, the full exploitation of Copernicus Sentinel data, further development of climate observations, the optimisation of strategic partnerships, and the support to the 2017 CEOS



Stephen Briggs,
SIT Chair

Chair initiatives. Another major item for the SIT-32 meeting will be the endorsement of the CEOS Work Plan 2017-2019.

In the coming weeks, the SIT Chair team will participate in the following events in order to prepare SIT-32:

- The 5th GEO Programme Board meeting will take place the same week as the CEOS-GEO Coordination meeting, beginning of February.
- The first round of the 2017 teleconferences between the SIT Chair team and all the CEOS Working Groups and Virtual Constellations will take place in February 2017.
- The first GEO Excom meeting of 2017 will take place in Geneva on March 9-10th.

I am looking forward to welcoming you all in Paris for a fruitful SIT-32 meeting.

Working Group on Disasters (WGDisasters)

Supporting Emergency Relief in Sri Lanka

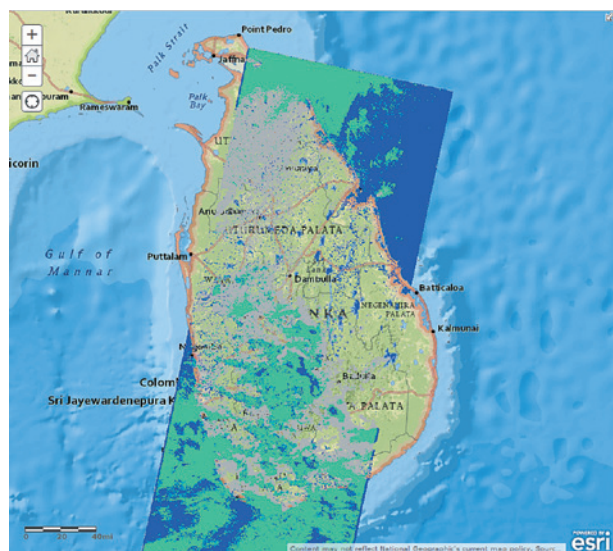
The Disaster Risk Management (DRM) pilot initiatives on floods, seismic hazards and volcanoes continue to make significant progress. In addition to ongoing support of real-time events, the pilot teams are summarizing what has been learned and preparing recommendations for after these pilots formally conclude their work at the end of 2017. The overarching goal is to identify the most promising operational solutions to reduce risks in each sector. Meanwhile, the Landslide Pilot, initiated in 2016 with a focus on detecting, mapping and monitoring landslides in different physiographic and climatic regions, is kicking off shortly with data

acquisition.

Through the Data Coordination Team, CEOS Agencies have continued providing Earth observation data to support the pilot teams' activities as well as the GEO Geohazards Supersites and Natural Laboratories Initiative. Also, the Greek supersite covering the Gulf of Corinth and Ionian Islands was approved by CEOS at the 30th CEOS Plenary in Brisbane, Australia.

The CEOS Recovery Observatory was triggered on December 22, 2016 to cover the area devastated by Hurricane Matthew in southwestern Haiti. The Recovery Observatory works with reconstruction professionals to develop the use of Earth observation data in the reconstruction phase that takes place following a major disaster, over a period of three to four-years.

This figure highlights the flood pilot team support of relief efforts following Cyclone Ruanu in May 2016. The cyclone dumped upwards of 150-300 mm of rain in less than 3 days over much of Sri Lanka. The rain fell on ground that was already saturated from heavy rain the previous week. The severe flooding and landslides that followed affected over 300,000 people, left over 100 people dead, and caused the equivalent of billions of US dollars



**Stéphane
Chalifoux,**
CSA, WGDIsasters Chair

in damage. High-resolution optical imagery from the National Aeronautics and Space Administration (NASA) Terra and Aqua satellites were used to create maps of the extent of the flood at resolutions of several hundred meters, offering an overview of affected areas. Finer-scale flood maps using NASA Earth Observation-1 (EO-1) and Landsat-8 data were used to provide details of damage. The figure shows a flood extent map from Landsat-8 data. Open water (including oceans) is blue, clouds with open water believed to be underneath are green, and areas completely obscured by clouds are grey.

Link to published article: <http://ceos.org/home-2/ceos-flood-pilot-supports-emergency-relief-in-sri-lanka/>

The 7th CEOS WGDisasters meeting, hosted by the Italian Space Agency (ASI), will be held in Rome, Italy, from March 14 to 16, 2017. A GEO-DARMA (Data Access for Risk Management) Kick-off Workshop will be held the morning of March 14 in conjunction with the WGDisasters meeting. This workshop aims to review possible paths forward for the project and to develop partnerships for implementation. A second "Concept Workshop" will be held during the May 2017 Global Platform Meeting in Cancun, Mexico. The content for the first GEO-DARMA projects will be finalized at that time.

The Joint CEOS/CGMS Working Group on Climate (WGClimate)

The work of the WGClimate is focusing on two main topics, the Space Agency Response to the GCOS IP and the Implementation of the Climate Architecture via the population of the ECV inventory followed by the Gap Analysis and the Action Plan.

The 7th WGClimate meeting has been held in São José dos Campos hosted by INPE on February 8th and 9th, 2017. This was preceded by a special meeting on the Space Agency Response to the GCOS IP (Implementation Plan) writing team on February 7th, 2017.

The Space Agency Response to the GCOS IP:

The Writing team set up has been completed and a schedule was agreed. This includes the following main milestones:

- A progress report to be presented at SBSTA-46 (Bonn – Germany) in May 2017,
- A second Face to Face meeting of the Writing Team in September (Frascati – Italy)
- A final draft response sent to SBSTA-47 beginning of October 2017
- A statement at SBSTA-47 and COP-23 (Bonn – Germany) in November 2017

The document structure was agreed, aiming at a lighter document compared to the past but

still addressing all GCOS actions and also providing feedback to the requirements process within GCOS.

At a later stage (2018) an annex which would include more technical elements might be added to complement the main report.

The Implementation of the Climate Architecture:

The WGClimate underscored the very impressive progress on the ECV inventory population and the highly valued work of the EUMETSAT support team. The call to support the population of the Cycle 2 ECV Inventory has been issued on June 2nd 2016 with 160 people contacted of which 150 registered as responders. 90 of the responders have been active and 761 entries (518 existing data records + 243 planned data records) have been recorded, covering ~80% of the listed physical quantities (spanning across 28 of the 29 ECVs in GCOS-154). [71% Atmosphere, 17% Land, 12% Ocean].

The call is now closed for new entries to give room for the verification process which is still ongoing (10% finalised, ~50% being iterated with Responders, 17% under review and re-review). The group aims at finishing the verification process by the end of March 2017.

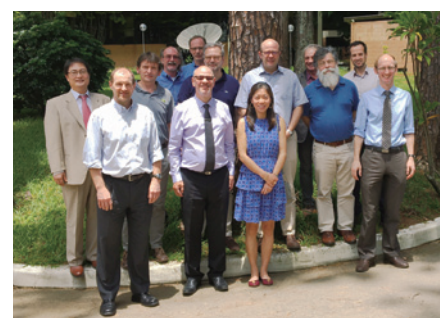
WGClimate also placed the emphasis on the

Pascal Lecomte,
ESA, WGClimate Chair



ambitious and critical schedule for the gap analysis. This includes the need for a Gap Analysis Coordinator which will in place in March, the extension of the domain specific analysis teams, and implement the appropriate tools to achieve maximum automation in the Gap Analysis process.

WCapD has expressed interest on the use of the ECV Inventory for training purposes. This is in accordance with interest of the WMO/CGMS VLab on the ECV Inventory manifested in a CGMS action.



WGClimate 7 group picture.

Working Group on Information System and Services (WGISS)

The 42nd WGISS plenary was hosted by the European Space Agency (ESA) at the European Space Research Institute (ESRIN) in Frascati, Italy on September 19-22, 2016. Highlights of this meeting included a Cloud Computing workshop hosted by the WGISS Technology Exploration Interest Group, which serves as a forum for exchange of technical information and lessons learned about current and trending data systems technologies. A key finding at the workshop was that due to the increase in EO measurements, there is a strong need to move users closer to the data and not move large volumes of data. The findings from this workshop and future cloud discussions are being compiled into a lessons learned document and will be an input into the CEOS study of 'Future Data Architectures'.

WGISS recently formed a System Level Team to provide technical support for CEOS partners that offer access to data via WGISS integrated systems and services. Currently the systems represented by the WGISS Connected Data Assets include the International Directory Network (IDN), FedEO (Federated Earth Observation Gateway), and CWIC (CEOS WGISS Integrated Catalog). The WGISS Connected Data Assets are also integrated within the GEOSS (Global Observation System of Systems) Common Infrastructure (GC) where they provide access to many CEOS agencies' data assets.

Over 5000 data collections (representing over 280+ million inventory records) are accessible using WGISS supported standards. These standards (OGC CSW 2.0.2 and CEOS OpenSearch Best Practices) continue to be adopted by additional CEOS agencies who make their data discoverable via the WGISS Connected Data Assets.

WGISS will be supporting the discoverability and accessibility of Essential Climate Variable (ECV) Products and space-borne Climate Data Records (CDRs) relevant to CEOS Strategy for Carbon Observations activities via WGISS supported standards. In addition, WGISS is implementing a Carbon Portal to facilitate the discoverability and accessibility of carbon related ECV products and space-borne CDRs for scientists and general users.

As WGISS continues to enable the sharing of agency developments and lessons learned relating to data preservation and curation, the Data Stewardship Interest Group (DSIG) within WGISS is developing a reference model that provides guidelines and recommendations for the preservation and improvement of data including a roadmap for scientific data stewardship improvement.

Andrew E. Mitchell,
NASA, WGISS Chair



The 43rd WGISS plenary will be hosted by NASA on April 3-6, 2017 in Annapolis, Maryland in the USA. During this meeting, WGISS will convene a Technology Exploration workshop on Future Data Architectures and Cloud Computing with presentations on current prototypes underdevelopment by CEOS agencies. There will also be a Global Earth Observations System of Systems (GEOSS)-WGISS Interoperability workshop which will foster an open exchange of ideas resulting in an increase of interoperability for discoverability, accessibility, and usability among the GEOSS and WGISS data systems.



Working Group on Capacity Building and Data Democracy (WGCapD)

The second half of 2016 and beginning of the New Year have been very busy for WGCapD, finalizing activities that had been planned, continuing the planned ones and evaluating the groups' next steps. Three SAR training workshops have been conducted between October 2016 and February 2017 and were aimed at bridging the gap in SAR processing, especially in the region where they were held. The first workshop was held in Lusaka, Zambia in October 2016 and was attended by 12 participants (Figure 1). The second one was a joint collaboration between the WGCapD and Japan International Cooperation Agency (JICA) and was held in Pretoria, South Africa in January 2017. It was attended by 13 participants from the Southern African Development Community (SADC) region. Finally, the third workshop was held in February 2017 in Libreville, Gabon and was hosted by the Gabonese Agency for Space Studies and Observation (AGEOS). It was attended by 23 participants from West African and North African countries (Figure 2). Our special thanks to ESA-Copernicus, UNOOSA and JICA, for having gently sponsored them. In addition to the SAR training workshop, there was another regional training on SRTM-2 Digital Elevation Model (DEM) which was held from 19 – 22 September 2016 at the International Centre for Integrated Mountain Development (ICIMOD) in Kathmandu. The

workshop was attended by 22 participants (Figure 3).

We are getting ready for our 6th Annual Meeting to be hosted by DLR in Oberpfaffenhofen, Germany, from March 27 to 29. The agenda foresees discussions on planning new activities, while keeping up the current ones and strengthening collaborations with other CEOS Working Groups and Virtual Constellations with their capacity building activities and guidance on best practices. Successful partnerships, such as the one we had in 2015 with the Canadian Space Agency (CSA) for co-organizing the online session of Civil Security & EO Workshop, encouraged us to get involved with the One Earth – One Health Workshop: Contributions of Earth Observations (EO) to Public Health Practices (Montreal, June 2017). Session 1 of this workshop will be made freely available to virtual attendees via GoToMeeting, allowing the participation of stakeholders from all around the globe. We also plan to strengthen our collaboration with GEO by AmeriGEOSS, AfriGEOSS and AO GEOSS Initiatives, contributing to training topics and exploring new ones. We will sure have an eventful year ahead of us!

Phila Sibandze,

SANSA,
WGCapD Chair



Figure 1: Zambia SAR Training Workshop



Figure 2: Gabon SAR Training Workshop



Figure 3: Nepal SRTM-2 Workshop.

Working Group on Calibration and Validation (WGCV)

The 41st Working Group on Calibration and Validation (WGCV) plenary meeting was hosted by JAXA at Tokyo's Denki University from September 5th to 7th, 2016. Twenty institutions were represented by 32 attendees for the last WGCV plenary chaired by Dr. Albrecht von Bargen (DLR). Participation in WGCV expanded under von Bargen's encouragement during his chairmanship as initiated a new work plan structure. WGCV expresses its great appreciation for his efforts. Dr. Kurtis Thome (NASA) has assumed the role of chair and is joined by Dr. Cindy Ong (CSIRO) who was approved by the CEOS plenary as the incoming vice-chair.

In addition to the Agency and Sub-Group reports, the plenary included special sessions dedicated to addressing Carbon Action Items, fostering interactions with WMO/GSICS, and identifying how best to support CEOS Chair initiatives such as non-meteorological applications for geostationary sensors and interoperability. Discussions with WMO/GSICS members clarified the goals and work plans for each entity and defined how best to

ensure future interactions at the WGCV GSICS-EP levels as well as with the sub-groups. A half-day of the plenary was dedicated to a joint session with the CEOS SAR Workshop that was organized by the WGCV SAR Sub-Group. There were more than 90 attendees of the workshop including 60 contributed talks and posters. The abstract book for the workshop can be found at <http://sarvcv.ceos.org/workshop2016>.

The RadCalNet web site was opened to beta users in October. The site provides top-of-atmosphere reflectance that can be used to assess the

Kurtis Thome,

NASA, WGCV Chair



radiometric calibration of on-orbit imagers. There are currently three test sites currently supplying data (one each in Europe, US, and China). A fourth site in Africa is anticipated to be available by summer 2017. There are currently 15 approved users who will provide feedback to WGCV at the IVOS Sub-Group meeting in March 2017. That feedback will be used to update the web site in anticipation of opening the site for general use by Fall 2017.



Attendees of the joint CEOS SAR Workshop and WGCV Plenary #41 hosted by JAXA at Tokyo's Denki University.

Global Forest Observation Initiative (GFOI)

Masanobu Shimada, JAXA, CEOS Lead for GFOI

With the GFOI Review process successfully completed and supporting continued investment from the major donors in the governments of Australia and Norway, the GFOI Leads are now focused on the definition of what we are calling Phase 2. With the assistance of Jim Baker contracted through the GFOI Office in FAO, Rome we are undertaking design of the future initiative in consultation with the Components.

For CEOS agencies and the Space Data Component, the main impact will be the intention to broaden the component to ensure inclusion of broader data types (other than Space Data) and to encourage participation of other GFOI stakeholders in the existing activities in support of increased integration of the data and its application in user countries.

The GFOI Plenary in Vietnam in April (Ho Chi

Minh City, 10-12 April) will emphasise country engagement and also provides an opportunity for the different Components and their stakeholders to come together to affirm their common sense of purpose for GFOI objectives. CEOS Space Data Coordination Group (SDCG) for GFOI will meet at that time (9th & 10th April) and all CEOS agencies with a history of participation are encouraged to ensure they are represented and their voice is heard in defining GFOI's next steps.

SDCG has asked GFOI to consider greater emphasis on deforestation early warning capabilities since this is a unique capability of satellites and we will pursue this at the GFOI Plenary.

The Methods & Guidance Documentation (MGD) is a key connection for the engagement of countries in support of GFOI. This is now in full

release of v2.0 in English and with French and Spanish language versions in finalisation. Together with GFOI, UN-REDD, FAO, Australian Government and SilvaCarbon, Melbourne University delivered a 2 week short course based on the MGD on MRV for REDD+ in late 2016. 27 participants from PNG, Solomon Islands, Vanuatu, and Fiji participated in this first pilot of the course. It applied a university-grade syllabus, including assessment for a Master's level subject complete with credit points for students – with a view to helping to develop in-country capacity for the application of the GFOI MGD.

As CEOS Lead for GFOI I remain at your service in support of any issues relating to the initiative. Since CEOS Plenary, I am pleased to note Stephen Ward is serving as my alternate when I am unavailable to attend meetings. And we thank CSIRO and NASA for supporting the operation of SDCG SEC during 2017.

GEOGLAM

GEOGLAM Coordination Supports Policy Action and Decision Making
GEOGLAM was mandated in 2011 by the G20 to leverage Earth observations (EO) to provide transparent, timely, and accurate information on global crop conditions and outlooks for production to inform decisions and policy related to food security and sustainable agriculture (Figure 1). Because of GEOGLAM's considerable efforts

and successes so far, including through its Crop Monitor initiatives (www.cropmonitor.org), the G20 Agricultural Ministers restated their commitment to the implementation of GEOGLAM again 2017 (Figure 2).

Alyssa Whitcraft, GEOGLAM Secretariat

on training workshops and "best practices" for capacity development, as well as with the Land Surface Imaging Virtual Constellation (LSI-VC) on EO requirements characterization, analyses of gaps in potential and actual coverage, and on analysis-ready data and interoperability. GEOGLAM is actively engaging with the CEOS Systems Engineering Office to test the Data Cube in many regions around the world.

Rangeland and Pasture Productivity (RAPP): This initiative's community of practice will be hosted by ESA ESRI during May 2017, where the group will focus on using radar satellites for rangeland biomass monitoring.

Regional Networks Update: Following the successful example of Asia-RiCE under JAXA's leadership, GEOGLAM has launched two additional regional networks: GEOGLAM Latinoamérica (led by Instituto Nacional de Tecnología Agropecuaria-Argentina) and AfriGAM (African Global Agricultural Monitoring, led by the Agricultural Research Council of South Africa). GEOGLAM Latinoamérica held its first workshop in Bogota, Colombia in June 2016 and will convene a second thematic session and training workshop at the Brazilian Remote Sensing Symposium in Santos, Brazil, May 2017. Meanwhile, the AfriGAM network – a joint contribution to GEOGLAM and AfriGEOSS – was launched at the International Symposium on Remote Sensing of Environment in Kampala, Uganda in October 2016 during a full-day session highlighting the status and priorities for sub-national to regional scale monitoring on the African continent. Further outreach for AfriGAM will be accomplished at the upcoming International Society for Photogrammetry and Remote Sensing conference in South Africa, May 2017.

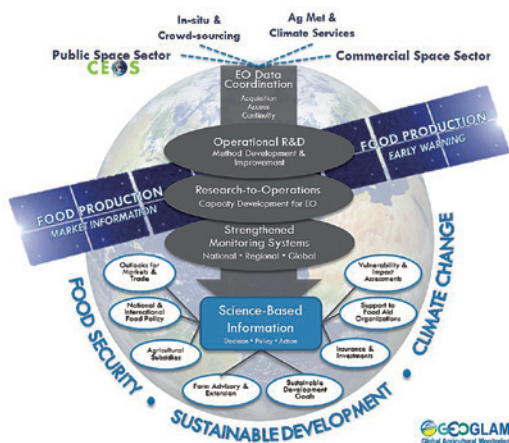


Figure 1: The workflow diagram of GEOGLAM's activities and goals



G20 Agriculture Ministers' Action Plan 2017

*Towards food and water security:
Fostering sustainability, advancing innovation*

January 22nd 2017 in Berlin

13. We will all strive to ensure that AMIS is strengthened as a mechanism that informs decisions and promotes the coordination of actions to overcome critical food market situations in accordance with the Terms of Reference concluded in September 2011. In this context, we undertake to continue support for GEOGLAM's activities on enhancing global agricultural monitoring using earth observations as a mechanism for the provision of timely and reliable information.

Figure 2: Excerpt from the G20 Agriculture Ministers' Action Plan 2017

Recent Dispatches:

- GEOGLAM's operational R&D network, JECAM, convened its annual meeting in Kiev, Ukraine in October 2016. Commitments were made to ramping up cross-site SAR intercomparison research, as well as to developing a compendium of best practices for agricultural monitoring, which directly informs GEOGLAM's data requirements. JECAM and Asia-RiCE will also look to further collaborate on R&D underpinning rice monitoring in 2018.
- GEOGLAM held its 4th annual session at the Fall Meeting of the American Geophysical Union, with speakers and presenters from around the world.

Activities with CEOS: The CEOS Ad Hoc Working Group for GEOGLAM has expanded and flourished, with GEOGLAM now collaborating with both the Working Group on Capacity Development (WGCapD)

New CEOS Chair Favors Continuity, Coherence in 2017

Dear CEOS Colleagues and Friends,

USGS is honored to be the 2017 CEOS Chair Agency, providing leadership on numerous initiatives in support of CEOS objectives. We look forward to furthering the good work of CEOS, including important endeavors that were started in 2016.

To ensure the continuity and coherence of CEOS activities, USGS aims first to make sure that priorities and themes identified under the 2016 CEOS (CSIRO) and SIT Chair (ESA) are supported and further developed through 2017. That includes:

- A study of future data access and analysis architectures.
- A study of non-meteorological applications for next generation geostationary satellites.
- Consideration of future partnerships and priorities for CEOS, most notably with GEO, the UN system, development banks, and the big data players.
- Expediting existing CEOS thematic acquisition strategies in relation to forests, agriculture, disasters, climate, carbon, and water.

Given the relevance of several core programs of

USGS, the agency specifically plans as CEOS Chair in 2017 to prioritize a number of topics currently under study within the CEOS Future Data Architectures *ad hoc* team—Future Data Architectures Continuation, and Moderate Resolution Sensor Interoperability.

These fundamental and enabling technologies have significant promise in supporting the broader uptake and application of CEOS agency Earth observation (EO) satellite data. The USGS has already committed to an information strategy within the agency for the Landsat series that will feature both Analysis Ready Data (ARD) and Data Cubes as core elements. The USGS will seek to leverage internal activities and capacities in this direction for the benefit of equivalent CEOS initiatives.

In this information-rich society, EO satellite data must compete with easily accessible and easily ingested sources of data and information. Sophisticated EO data visualization and analysis systems provided by big data industry players are raising expectations of users as to how easy it could be to access and apply EO satellite data.

It should not require an advanced degree for users to be able to integrate CEOS agency data into their

Dr. Frank Kelly,

USGS,
2017 CEOS Chair



applications and systems. Removing the complexity and difficulty of handling large and technical data sets, often with unique quirks and characteristics, is essential for government-sponsored EO satellite programs to maximize their impact in society.

The Moderate Resolution Sensor Interoperability initiative will work to make optimal use of the increasing number of data streams available in the moderate resolution class, with a focus for 2017 on Landsat/Sentinel-2. As Sentinel-2's product generation pipeline develops and is implemented, a need for higher level coordination exists, in particular to ensure agency commitments to support the generation of interoperable products on an operational basis.

Again, as we build on the efforts of CSIRO and ESA in these and other areas in 2016, we remain convinced that continuity and coherence are key to our work in 2017 and beyond. The continued engagement of all CEOS agencies is paramount. We look forward to leading that effort.

Meeting Calendar

As of March 2017

Activities	March	April	May	June	July	August	September	October	November	December
CEOS Plenary and CEOS SIT (Strategic Implementation Team)		▲25-27 SIT 32 Paris, France					▲11-14 SIT Technical Workshop Frascati, Italy	▲18-20 CEOS 31st Plenary Rapid City, USA		
CEOS VCs and CEOS TFs (Virtual Constellations and Task Forces)	▲20-21 LSI-VC-3 Frascati, Italy			▲5-9 GHRSS XII (inc. SST VC meeting) Qingdao, China						
CEOS WGs	▲13-17 WGDisasters-7 Rome, Italy	▲3-7 WGISS-43 Annapolis, USA	△WGCV-42 USA							
		▲27-29 WGCapD-6 Oberpfaffenhofen, Germany								
GEO related Activities (Group on Earth Observations)	▲9-10 GEO ExCom Geneva, Switzerland	▲11-12 GFOI Plenary Ho Chi Minh, Vietnam	▲8-12 GEO Work Programme Symposium & GEO Programme Board Pretoria, South Africa						▲23-27 GEO XIV Plenary Washington DC, USA	
Others			▲8-12 ISRSE-37 Pretoria, SA	▲6-8 3rd Blue Planet Symposium Seattle, USA	▲6-8 IWGGMs Helsinki, Finland	▲23-28 IGARSS 2017 Forth Worth, USA	▲25-29 IAC 2017 Adelaide, Australia		▲6-17 UNFCCC/COP 23 Bonn, Germany	▲14-18 APRSAP-24 Bangalore, India

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

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