

MINUTES and ACTIONS
2019 CEOS Strategic Implementation Team Technical Workshop (SIT TW 2019)
FINAL V1.0
11-12 September 2019, Fairbanks, AK, USA

1. Welcome and Opening Remarks

Steve Volz (SIT Chair, NOAA) welcomed participants to the 2019 Technical Workshop of the CEOS Strategic Implementation Team (SIT) and to Fairbanks, on behalf of NOAA.

Participants introduced themselves, their affiliations and CEOS roles in a *tour de table*.

Paula Bontempi (NASA) acknowledged and thanked NOAA for their efforts as SIT Chair over the past two years. Paula then announced that NASA would be offering its self-nomination for the role of 2021 CEOS Chair. She noted that a formal letter of self-nomination would be forthcoming shortly.

Larry Hinzman (Vice Chancellor for Research, University of Alaska, Fairbanks [UAF]), John Pace (Director, Geographic Information Network of Alaska), and Larry Ledlow (Fairbanks Command Data and Acquisition Station [FCDAS] Manager, NOAA) added their welcomes. Larry Ledlow expressed thanks to all for coming to Alaska and provided a personal view of impacts of climate change in the arctic environment.

CEOS SIT Chair Introduction [PPT]

Presenter: Steve Volz (SIT Chair, NOAA)

Steve reported that the SIT Chair Team spent significant time over the past few months with our tag-ups to see how CEOS is engaging internally and externally with the broader international and scientific communities. He stated that some of what we will be discussed during the TW would be a little bureaucratic but the discussions are essential for CEOS to continue to operate successfully in the global community.

Main points:

- **Workshop Topics and Objectives:** working team discussions from the Virtual Constellation (VC)/Working Group (WG)/*Ad Hoc* Team (AHT) Working Day and SIT Chair Tag-ups; discuss the two Study Team outcomes and way forward; proposed language changes to two CEOS governing documents; the way forward for CEOS coordination on greenhouse gases (GHGs), joint CEOS-CGMS activities, the Essential Climate Variable (ECV) Inventory; the way forward on data-related activities; the CEOS approach to key partnerships, including CGMS, WMO, and GEO.
- **SIT Chair Priority Review:** execution of existing SIT responsibilities in the Terms of Reference (TOR); Low Earth Orbit (LEO)/Geostationary Orbit (GEO) combination products and data processing; CEOS relationships with CGMS, GEO, and WMO; support to CEOS Chair initiatives.
- **SIT Actions:** review of the open actions with particular focus on those actions to be addressed at SIT TW such as: the identified need for CEOS entities to update their respective information on the CEOS website (34-01); CEOS governance (SIT-34-11 through SIT-34-17); SEO will be seeking inputs on the CEOS Booth for GEO Week (SIT-34-02).
- **Continuity of SIT Chair Themes for 2018-2019:** *Concept Paper for Restructuring CEOS Virtual Constellations and Creation of New Working Group* (March 2019): the paper, which was first discussed by CEOS at SIT-34 and resulted in the creation of two Study Teams. The conclusions and recommendations of the Study Teams will be presented and discussed at the TW.



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Review of CEOS Chair Priorities [Presentation]

Presenter: Lam Dao Nguyen (CEOS Chair Team, VNSC)

Main points:

- CEOS Chair initiative priorities are Carbon Observations (including forested regions), and agriculture (rice); the focus includes the whole Mekong basin region.
- **Plenary objectives forest:** Forest map of Mekong area countries, and monthly and yearly forest mapping.
- **Plenary objectives agriculture (rice):** crop maps, phenology; production, and GEOGLAM products.

Main discussion points:

- Paula Bontempi (NASA) commended the effort and hoped CEOS could build on it in the future.
- Steve Volz (SIT Chair, NOAA) asked if VNSC has all they need to support their Plenary objectives. Lam Dao confirmed this was the case and that they had received data from USGS, JAXA, as well as CESBIO/CNES.

VC/WG/AHT Working Day Outcomes [PPT]

Presenter: Steve Volz (SIT Chair, NOAA)

Main points:

- **Main topics:** Study Team Outcomes; VC Leadership and AHT Life Cycles; and crosscutting discussion around data, climate, and oceans and coastal.
- **WGST:** Two Options developed: #1: Create a new Working Group; #2: Use existing CEOS leadership and technical group channels; initial preference for #2.
- **OVCNST:** does not recommend merging the Oceans VCs (OVCs); better integrate OVCs with CEOS leadership and entities; suggested a new CEOS entity to prepare OVC tasks; end-user relevance important and challenging.
- SIT Chair agreed to address minor language updates to the CEOS **Virtual Constellations Process Paper** in this cycle.
- **Data Exploitation and Architecture:** interplay between WGCV and WGISS on calibration may be a fruitful work area for future; outreach to Agencies for compliance with guidelines is slow, suggest we work through VCs in addition; conversely, if end-user motivated data formats or approaches are developed within VCs, they should coordinate with WGISS.
- **CEOS ARD Strategy:** good initial progress for the land imaging elements of ARD (CARD4L), and 3 land pilots are identified in the Strategy from CSIRO/GA; more general ARD applicability for CEOS needs to be demonstrated with non-land imaging examples; Need to come to Plenary with specific resource requests.
- **GHG and Carbon Outcomes:** no current need for update to the Carbon Strategy; on the GHG Roadmap, CEOS group roles have been identified in support, but we need to work more with CGMS support transition from science to operations; resources will be needed to realize the roadmap.

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- Suggestion to form a **Study Team to initiate the discussion on Coastal observations**; include multi-sensor observations through value chain to extract information for users; user engagement would be key; ARD could play a role.

Main discussion points:

- Jonathon Ross (SIT Vice Chair Team, GA) noted that progress on some priorities will be limited by the lack of a CEOS Executive Officer (CEO) following Plenary.
- Paula Bontempi (NASA) suggested using the term leadership ‘succession’ rather than ‘rotation’ in reference to VC Leadership, since ‘rotation’ implies change among the existing group and ‘succession’ leaves open the possibility for new contributors. She also noted that it would be helpful to hear more information on the Oceans and Coastal topic to better understand what is being proposed. Kerry Sawyer (SIT Chair Team, NOAA) confirmed that ‘rotation’ is only noted in the formal action from SIT-34 and does not appear in any proposed changes to CEOS governing documents.
- Mark Dowell (COM) clarified that the GHG White Paper is one of many actions in the CEOS Carbon Strategy. The ‘Roadmap’ being referenced is an internal implementation of the GHG White Paper and outlines the traceability to the CEOS Work Plan.
- Mark clarified that the communications with the Conventions on systematic observations is strong. In parallel with this is the land (REDD+) support, and discussions are ongoing to better integrate these dialogues.
- Paul Counet (EUMETSAT) reflected on the role of the VCs, noting that their purpose was in part to facilitate dialogue with CEOS and CEOS Agency leadership on a thematic basis, but there have been issues with lack of responsiveness and resources. The message to Principals is to determine how to address the shortfalls and continue support. EUMETSAT will review their appointed representatives to the VCs to ensure they are optimal.
- Ivan Petiteville (ESA) noted a disparity between how WGs and VCs are allowed to report to SEC, Plenary, etc. We need to improve communication but how to do it without having three-hour monthly SEC telecons. It was proposed that a reporting rotation to SEC for VCs be instituted whereby two VCs would report each SEC, with each VC essentially reporting every third SEC.

Work Planning [\[PPT\]](#)

Presenter: Steven Hosford (CEO, ESA/CNES)

Main points:

- **Work Plan Status:** report on progress made against the deliverables via the *new/updated* CEOS Deliverables tracker (<http://deliverables.ceos.org>) by 30th September. A CEOS Work Plan Progress report will be prepared by the CEO for presentation to CEOS Plenary.
- **2020-2022 Work Plan:** the annual review of the CEOS Work Plan (2020-2022 this year) should be developed from mid-November to mid-February. As this job is undertaken by the CEO and a successor has not yet been identified, there is now uncertainty around the timely completion of this critical task for CEOS.
- **CEOS-GEO Work Programme Cross Analysis:** looked for CEOS Work plan deliverables that cite GEO Work Programme elements; characterization of the ‘level’ of the GEO activities’ links using the way that the GEO activity refers to CEOS inputs as a proxy. The ‘likely clarity of requirements’ have also

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been characterized (for discussion) in a much more *ad hoc* manner; 16 GEO Work Programme elements were identified, 11 have explicit links to CEOS, and of these 8 are reciprocated in 8 CEOS WP deliverables; there are 5 additional domains where CEOS cites contributions to GEO in the CEOS Work Plan, but these GEO activities do not cite CEOS in the GEO Work Programme.

Main discussion points:

- Ivan Petiteville (ESA) suggested a more holistic approach to the analysis of external stakeholder requests, as some are not aware of CEOS and satellite EO capabilities.
- Jörg Schulz (WGClimate, EUMETSAT) noted there is no clear relation between the Space Climate Observatory (SCO) and CEOS or EUMETSAT after the initial information provided.
- Lawrence Friedl (NASA) noted the challenge of CEOS expecting GEO to deliver requirements - which may not be realistic. He noted CEOS should not be passive, waiting for requirements; CEOS should be proactive.
- Doug Cripe (GEOSEC) noted that the GEO Secretariat does not fully grasp both the CEOS capability and user requirements, and both CEOS and GEO should use bilateral discussions to improve this understanding. Perhaps by inviting leadership from selected initiatives that could benefit most by engaging with CEOS to the annual CEOS-GEO bilateral meetings. Jonathon Ross (SIT Vice Chair Team, GA) noted this was a good recommendation and would explore further for the next GEO-CEOS Bilateral (to be scheduled for February 2020).

SIT-TW-2019-01	CEO	Distribute the updated information on the new online CEOS Deliverables Tracker to CEOS Agencies and request inputs.	ASAP (Inputs due before end September)
	<i>Rationale: Reinforce the credibility of CEOS as an organization through a “define-monitor-report approach” to work planning.</i>		

2. External User Environment

Global Climate Observing System (GCOS) [PPT]

Presenter: Carolin Richter (GCOS Secretariat) via GTM

Main points:

- GCOS will be **focusing on panel work plans until 2023** in improving monitoring of the Earth cycles and interface issues, such as air-sea fluxes and land-ocean fluxes. GCOS expert panels will agree on consistent approaches including review of ECV requirements, monitoring how well ECVs are being observed and reviewing implementation plan actions.
- To date, **there are no agreed global indicators of changes to the biosphere**. GCOS has started discussing how to improve relations with the biodiversity community and how to support the development of accurate ECVs by these communities, and help to identify and reduce the uncertainties.
- **GCOS timetable headlines:** review of the status of climate observing systems (2021) and update (Oct 2022) of the GCOS implementation plan (with threshold and goal values as a new feature); update requirements by 2022 (UNFCCC Global Stocktake). See PPT for graphic.

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Main discussion points:

- Mark Dowell (COM) recommended that CEOS stay closely engaged with GCOS on the timing and interaction of inputs and responses to the new documents so that CEOS status reporting could be integrated with the GCOS Statement.
- Jörg Schulz (WGClimate, EUMETSAT) noted that WGClimate proposes to write to GCOS to propose a robust process for interaction with space agencies, including on long-term requirements for change in atmosphere amongst others.
- Osamu Ochiai (JAXA) highlighted JAXA contributions to the IPCC and GHG guidelines, which provide detailed inputs on methodology used for governments to report on GHG uptake.

Global Ocean Observing System (GOOS) [PPT]

Presenter: Albert Fischer (GOOS Secretariat) via GTM

Main points:

- **Essential Ocean Variables (EOVs):** awareness and explicit crossover with related ECVs (most EOVs are actually ECVs with different reporting requirements); linkages with CEOS VCs and other EOVs that use satellite observations have been identified.
- GOOS has a **2030 strategy** for a truly global ocean observing system that delivers the information needed for sustainable development, safety, wellbeing and prosperity. This needs growing integrated observing capacity, proliferation of output systems, and improved connection from observations to users.
- Regarding **CEOS collaboration:** the link between VCs and Science Teams has been valuable in the experience of GOOS; VCs have been important in getting concerns about continuity of missions expressed; but responding to requirements needs thinking beyond variables, to applications; GOOS is interested in partnering down the value chain for better delivery.

Main discussion points:

- Raj Kumar (Incoming CEOS Chair, ISRO) asked if GOOS has identified priorities for the EOVs/parameters and continuity of missions as this would be helpful to CEOS Agencies. Albert responded that it would be hard to prioritize EOVs/ECVs because it depends on the applications but perhaps an analysis of how *in situ* observations can best support and combine with satellite data for applications in the four EOVs that are covered by the VCs would be a good starting point.
- Ivan Petiteville (ESA) asked about partnerships down the value chain and how this relates to GEO. Albert noted that GOOS is a GEO Participating Organization, though it is not the only coordination channel. GOOS has started with analysis, models, and partnerships with ‘super users’ that are well connected to downstream users though remain scientific and technical.
- Steve Volz (SIT Chair, NOAA) asked if there is no prioritization, is there an assessment of the criticality of satellite observations to EOVs? Some GOOS projects have attempted this, but more work needs to be done in this area.

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Group on Earth Observations (GEO) [PPT]

Presenter: Doug Cripe (GEO Secretariat)

Main points:

- GEO is looking to CEOS to promote uptake of EO by providing evidence of the unique and complementary value of satellite data to successful delivery of GEO Flagships and Initiatives but how this will be mapped out is still unknown.
- **GEO Foundational Tasks** (engagement; data, info and knowledge resources; GEOSS infrastructure; WP support; SEC operations) underpin all GEO activities; detailed review of Tasks in the [PPT](#).
- Doug Cripe is the GEOSEC point of contact for CEOS.
- 15.3.1 is the **Land Degradation Neutrality** indicator in the SDGs. A number of CEOS Agency datasets and missions are expected to support reporting.
- **More ARD desired:** CARD4L is a good start (e.g. for UN-CCD as custodian for SDG 15.3.1, LDN); others: CARD4O (Blue Planet); CARD4W (snow/water extent, quality); CARD4H, CARD4SDGs, CARD4PA, CARD4SEN, etc...; Land cover classification is one application where ARD could help.

Main discussion points:

- Jörg Schulz (WGClimate, EUMETSAT) asked about the GEO-CARBON initiative, and Doug noted this awaits the outcome of the WMO governance reorganization. WMO hopes to increase support of UNFCCC climate information needs.
- Marc Paganini (SDG AHT, ESA) noted the need for finer resolution of AQ observations, as well as above and below ground carbon stocks.
- Brian Killough (SEO, NASA) noted ARD tends to be L2 data, not L3/L4, but further discussion on GEO's perceived ARD needs would be welcomed.

WMO Realignment [PPT]

Presenter: Werner Balogh (WMO Space Programme)

Main points:

- **WMO Governance Reform:** WMO 2020-2030 Strategic Plan has identified five long-term goals, of which the first four are relevant to CEOS (refer to PPT, link above).
- **Vision for WIGOS 2040:** four groups of space missions, with CEOS most linked to Group 3 (operational pathfinders, tech/science demonstrators).
- OSCAR updates are critical for WMO observing system gap analysis and WMO would welcome inputs from CEOS space agencies in support.
- Propose to have a bilateral meeting with WMO like CEOS has with GEO, or perhaps we could plan for a trilateral with CEOS-GEO-WMO because there are very strong synergies and connections with all three entities.

Main discussion points:

- Ivan Petiteville (ESA) noted that the annual MIM updates are a significant effort for both the team and agency contacts. It is not feasible to gather the level of detail required for OSCAR using the current

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MIM process, and Ivan suggested that this should be a shared effort. The MIM can provide the programmatic information, and the OSCAR team can work on collecting the technical details. Last year, CEOS provided MIM data to OSCAR but CEOS did not receive any feedback on if the data were actually used and integrated because differences were still evident.

- Paula Bontempi (NASA) suggested WMO send a letter ahead of CEOS Plenary so CEOS Agency Principals can understand what WMO is asking for concerning OSCAR. The letter should address the “why” to help understand the context and provide a point of contact if there are questions.

SIT-TW-2019-02	Werner Balogh	Work with SIT Chair to draft a letter from WMO to CEOS leadership explaining the outlook for OSCAR and how space agencies might assist with inputs. The letter should provide the appropriate WMO point of contact with whom CEOS Agencies can follow up.	30 September 2019
<i>Rationale: Inform CEOS Agencies of what OSCAR requires so Principals can consider before and discuss at Plenary. Include in the letter a brief description of what the WMO will do with the information and how CEOS will also benefit from the effort.</i>			

Perspective on Arctic Initiatives [PPT]

Presenter: Hajo Eicken (UAF)

Main points:

- **SAON Roadmap for Arctic Observing:** SAON (Sustaining Arctic Observing Networks) has emerged as the de facto governance body under Interagency Standing Committee (IASC) and Arctic Council to provide an inclusive environment within which to establish such a framework; their vision is for a connected, collaborative, and comprehensive long-term pan-Arctic Observing System that serves societal needs; a Roadmap has been developed for this purpose.
- **Essential Arctic Variables** have been proposed to help conceptualize the challenge, and link arctic variable to global observations.
- Want to aspire to GEOGLAM for arctic food security program.
- **Arctic Observing Summit** planned for 30 Mar – 2 Apr 2020.

Main discussion points:

- Mauro Facchini (COM) noted increased engagement (e.g., the Arctic Circle Assembly), and the identification of expanded roles for space-based observations. Three of the six Copernicus expansion missions being considered have links to the Arctic. Hajo noted there will be a full session on observations at the next Arctic Circle Assembly.

Discussion Time [PPT]

Main discussion points:

- There are many types of ‘essential variables’ included in the GEO Work Programme, and more beyond those mentioned there. The approach has proven powerful in terms of focusing resources, and for advocacy. It would be appropriate for GEO to consider how to formulate input when new initiatives are proposed; one of the prerequisites should be an estimate of observational requirements for user community needs as this will help CEOS respond much more effectively to requests. Doug Cripe (GEOSEC) suggested this may be a responsibility that the GEO Programme Board should consider.

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- Mark Dowell (COM) noted the risk of dilution with so many ‘essential’ variables, in particular in terms of the rigor that went into the GCOS ECVs. Jörg Schultz (WGClimate Chair, EUMETSAT) noted that the requirements work behind the ECVs is what makes them of value. Repeated use of the Essential Variables concept may reduce their value.
- Steve Volz (SIT Chair, NOAA) noted that we cannot define ‘essential variable’, but suggested that CEOS could communicate how it interprets and assesses these variables. WGISS has a glossary of terms, and Mirko will look at how they define these variables.
- Paula Bontempi (NASA) noted that few of these variables can be measured directly from space, and a number that are derived from observations fed into models.
- Paul DiGiacomo (NOAA) noted efforts from IGOS-P to handle this question in the past, and this could inform the future approach.

3. Study Team Outcomes

Working Group Study Team (WGST) Update [PPT] [WGST Response v8]

Presenters: Brian Killough (SEO, NASA) and Mark Dowell (COM)

Main points:

- The **WGST goal** has been to assess interest and feasibility to create a new Working Group to address external requests to CEOS. The concept suggested by SIT Chair at SIT-34 was that a new WG would provide a “filtering” function by working closely with user communities to understand requirements and assessing how CEOS can provide the needed data and support.
- The WGST identified **three basic categories of external requests**: GEO WP; Global Policy Frameworks – climate (UNFCCC/SBSTA/GCOS) and disasters (Sendai Framework UNDRR); Global Development Groups – finance (World Bank, ADB) and capacity building (GPSDD). Many potential requests are related to water observations.
- Two options were considered: **Option #1 - create a new Working Group; Option #2 - use existing CEOS leadership and groups but streamline the process.**
- The WGST concluded that **existing CEOS leadership and technical groups can adequately respond to future external requests** and that CEOS should formalize and codify the process to streamline and improve the CEOS response to such external requests. There is no agency champion for a new WG.
- The Study Team proposes to: continue the WGST until the CEOS Plenary to discuss SIT-TW outcomes and integrate feedback; terminate the WGST at CEOS Plenary and convene a new and smaller group to develop a “*CEOS External Request Process Paper*” - for the 2020 SIT-35 Meeting.
- It is clear that CEOS can improve how it addresses requests for CEOS Agency data; we cannot continue to deal with requests in an *ad hoc* way.

Mark Dowell noted that any process paper could be used in future in the event that a new group was again considered necessary.

Main discussion points:

- Mitch Goldberg (NOAA) suggested that CEOS should take a systems engineering approach and conduct an inventory assessment of projects that are already taking place at CEOS Agencies so that

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when a request comes in to CEOS, we can easily identify which Agency may already have data available.

- Trevor Dhu (GA) was supportive of this process and credited NOAA with identifying this need but iterated the success of this approach is dependent on a CEO; any filtering process will rely on a CEO to identify where the agency connections are in any request. Trevor hoped that this process could provide an opportunity for users to have a light process whereby they could approach CEOS and make a pitch on their requirements.
- Mauro Facchini (COM) stressed the need to constrain the scope (*e.g.*, by user type) and to be able to convert needs into capabilities, to translate needs into requirements, as well as being sensitive to commercial capabilities (sometimes users may be able to get the data they want commercially instead of for free). Mark Dowell (COM) is willing to continue to support the work of the WGST.
- Steve Volz (SIT Chair, NOAA) suggested two parts for the next steps: one, the External Request Process Paper, which can frame how people engage with CEOS and the second part as a “market analysis” and task assessment that will assess potential user community needs and external demand for CEOS observations. Steve volunteered NOAA to participate in supporting the demand side of the market analysis (not the implementation side).
- Ivan Petiteville (ESA) stated it is important in the process to make sure the group that will be in charge of evaluating the requests is fully aware or has very good knowledge of what is being done in CEOS Agencies. Ivan volunteered to participate in the market analysis study.
- Steve confirmed that the proposed way forward is what will be taken to Plenary.
- Jono Ross (SIT Vice Chair Team, GA) suggested that *Task Team* may be an appropriate title for what goes forward to conduct the market analysis.

SIT-TW-2019-03	WGST	Integrate feedback from SIT TW and finalize the Study Team report for SIT Chair presentation to the 33 rd CEOS Plenary.	30 September 2019
	<i>Rationale: Provide Plenary with the findings and recommendations to consider at Plenary.</i>		
SIT-TW-2019-04	SEO	Develop a “CEOS External Request Process Paper.”	SIT-35
	<i>Rationale: The External Request Process Paper is expected to streamline and guide the processing of requests from external partners.</i>		
SIT-TW-2019-05	SIT Chair Team	Propose the creation of a Task Team to conduct an assessment of the potential user community needs and external demand for CEOS observations (a “market analysis”).	For 33rd CEOS Plenary
	<i>Rationale: The market analysis will help CEOS assess the potential associated workload.</i>		

Ocean Virtual Constellation Merger Study Team (OVCMST) Update [PPT] [OVCMST Assessment v1.1 8.27.19]

Presenter: Ken Casey (SST-VC Co-Lead, NOAA)

Main points:

- OVCMST was created in the weeks after SIT-34 to **assess the feasibility of merging the current four ocean Virtual Constellations (OVCs) into one Ocean Virtual Constellation**, including identification of any challenges and opportunities potentially arising from a merger, and report to SIT TW 2019.

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- Discussions highlighted two overall perceptions: (primary) need to **increase the sense of engagement** through dialogue with CEOS leadership (including Principals); and, (secondary) **lack of opportunities for consistent reporting** to CEOS leadership.
- **Pros identified:** merging could reduce workforce required (i.e. currently need 4x Oceans VC staff); could reduce administrative burden for CEOS by reducing the number of Co-Leads; and, could provide a mechanism for harmonization of multivariate observations into consolidated products.
- **Cons identified:** single agency rep is not likely to have all the expertise needed; could result in a loss of focus; risk loss of connection to user communities (e.g. IOCCG, OSTST, IOVWST, and GHRSSST); and, risk weakening the diverse ocean community voices in CEOS.
- **Proposed way forward:** no merger; implement a more rigorous tasking and feedback process between CEOS Agency Principals and individual VCs; identify a CEOS mechanism (could be another Working Group – if endorsed, or modifications to the existing structures) to work with VCs to develop integrated requirements for cross-domain products.
- It was noted the OVC MST reached a pretty firm consensus through its discussions.

Main discussion points:

- Mauro Facchini (COM) stressed the importance of a reinforced collaboration amongst Ocean VCs, and noted the range of topics addressed (e.g., coastal areas, climate change). This could be achieved through several methods include an Oceans coordinator, or a rotating coordination lead to ensure common approach and eliminate silos. Ivan Petiteville (ESA) cautioned that identifying a “coordinator” passes the burden of trying to get the VCs to engage and does not really address the underlying problem of getting the VCs to actively participate in CEOS.
- Jenn Lacey (USGS) noted parallels in the land community and benefits of the joint meetings across related CEOS groups (LSI/SDCG/GEOGLAM). Maybe it would be beneficial to plan joint oceans meetings. Ken agreed this might be helpful and would work best if we had an external pull.
- Steve Volz (SIT Chair, NOAA) noted that the one-way connection for the VCs to SIT Chair is not sufficient, and success will depend on inputs and proactivity from the VCs. External science teams tend to drive the agenda, and Steve would encourage an active outreach from VCs to the crosscutting WGs in arranging opportunities to interact. The responsibility lies with the CEOS Agency Principals of the Co-Leads to ensure the Co-Leads will be at SIT meetings twice a year. We need to create opportunity for VCs to contribute.
- Kerry Sawyer (SIT Chair Team, NOAA) expressed how important it is for the VCs to contribute and engage and they will only do that with the support of their Agencies. If people volunteer to Co-Lead the VCs, they need to be supported by their agencies to participate in SIT meetings, not just phone in to virtually present their VC report but be present for the entire meeting so that they can determine how to engage with other CEOS activities; the VCs need to be proactive to ensure success.
- Steve suggested some increased reporting from the VCs to CEOS SEC could help the information flow. Perhaps this means reporting at every third SEC meeting for each VC.
- Paula Bontempi (NASA) noted the inputs from VCs are often coordinated across the relevant external community; however, there is a challenge in identifying ‘actionable’ items for SIT and/or Plenary to discuss.

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- Alex Held (CSIRO) supported COM’s suggestion that the VCs have a rotating representative on the CEOS SEC. Steve highlighted this is actually the job of the SIT Chair.
- Jorge Vazquez (COVERAGE, NASA) noted that the expertise within VCs is valuable, and with the advent of new measurement approaches (e.g., SWOT), this expertise will become more valuable.
- Steve stressed the role of Principals in ensuring VC participation, e.g., by supporting VC Co-Lead staff to attend the SIT meetings. He also suggested that all groups look at their plans for the next two years and identify at least one opportunity where they are meeting with another CEOS group.
- Mark Dowell (COM) noted the success of WGClimate’s request for cross-representation from specific groups (e.g., with WGCV, AC-VC).
- Paula suggested that it may be timely to renew the purpose and mandate for VCs to ensure appeal to the CEOS Agencies and to support provision of leadership.
- David Crisp (AC-VC, NASA) noted that AC-VC covers many disciplines. These are covered by task team leads.

SIT-TW-2019-06	OVC MST	Integrate feedback from the SIT TW and finalize the Study Team Report for SIT Chair presentation to the 33 rd CEOS Plenary.	30 September 2019
	<i>Rationale: Provide Plenary with the findings and recommendations to consider at Plenary.</i>		
SIT-TW-2019-07	SIT Chair Team	Develop a set of recommendations and observations regarding communication and engagement by Virtual Constellations with CEOS leadership and other elements. To be presented at the Plenary.	For 33rd CEOS Plenary
	<i>Rationale: Insufficient two-way interactions between some VCs and other elements of CEOS was identified as a recurring theme at the SIT TW.</i>		

4. Reports from Working Groups

Working Group Climate (WGClimate) [PPT]

Presenter: Jörg Schulz (WGClimate Chair, EUMETSAT)

Main points:

- **Case Studies for the Climate Architecture:** based on 13 earlier case studies published in 2015, WGClimate is developing a new much bigger set of case studies promoting the use of CDRs in applications supporting policy and decision-making. WMO has agreed to lead a report with a target publication date in the second half of 2020.
- **ECV inventory** is at: <http://climatemonitoring.info/ecvinventory> and now has almost 1400 records. The WG will present the gap analysis report and updated coordinated action plan at 2019 CEOS Plenary but ask CEOS/CGMS Plenaries for virtual endorsement in Q4/2019 after extensive review of documents by agencies. ECV inventory v3.0 will be announced soon.
- Estimated support to the ECV Inventory work is ~ 6.5 person years per annum. **Agencies are asked to continue/enhance their support to the ECV Inventory** related work and to award full appreciation to engaged contributors within their agencies.
- **COP-25** will take place from 2-13 December 2019 and SBSTA-51 will take place 2-9 December 2019, in Santiago, Chile.

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- **COP-25/SBSTA-51 Space Agency Statement:** to be delivered to UNFCCC Secretariat one week ahead of SBSTA-51; to be presented for endorsement at 2019 CEOS Plenary and delivered by WGClimate Chair (India, as CEOS Chair Agency country, will not be attending COP-25). COP will include an Earth Information Day.
- **Joint meeting with LSI-VC** discussed implementation of Coordinated Actions on Climate; **it is proposed to add a standing action for all VCs to support the annual gap analysis process of WGClimate.**
- WGClimate will be looking to identify a new Vice Chair, who will take on duties at the 34th Plenary in 2020. Per the agreed upon CEOS and CGMS rotation cycle, the next WGClimate Vice Chair should be from a CGMS Agency.

CEOS Carbon Strategy Update [PPT]

Presenter: Mark Dowell (COM)

Main points:

- Considerable progress on many of the 42 initial actions identified in 2014 Carbon Strategy: mid and coarse resolution optical sensor links to carbon variables; carbon relevant ECVs in the initial iterations of ECV Gap Analysis; review of the IPCC TFI Guideline process; CEOS Carbon Portal; and defining the characteristics of a GHG monitoring constellation.
- Recent progress on Biomass, with WGCV/LPV on the CEOS Biomass Protocol.
- **Action T71 from GCOS IP 2016 (Prepare for a carbon-monitoring system):** References CEOS and CGMS preparatory work in a coordinated international context, which has led to the **GHG Monitoring Roadmap** activity (next item).
- **Next steps:** Consider next phase for the CEOS Carbon Strategy; much of the "what" needs to be done is still valid even if the "how" and the "where" may be a bit dated; proposal is to wait till the end of a subsequent round of Actions to think about revising the Strategy text; this will present an opportunity to consider new activities.
- **Future Effort and Next Phase:** additional Actions in the GCOS IP (GCOS-200) which are relevant to Carbon and GHG; addressing actions resulting from GHG Monitoring Roadmap; assess actions that can be proposed in support of the AFOLU carbon aspects in support of UNFCCC; implementation of Biomass Protocol; and, (OCR-VC) prepare a special journal issue on Carbon.

GHG Roadmap [PPT]

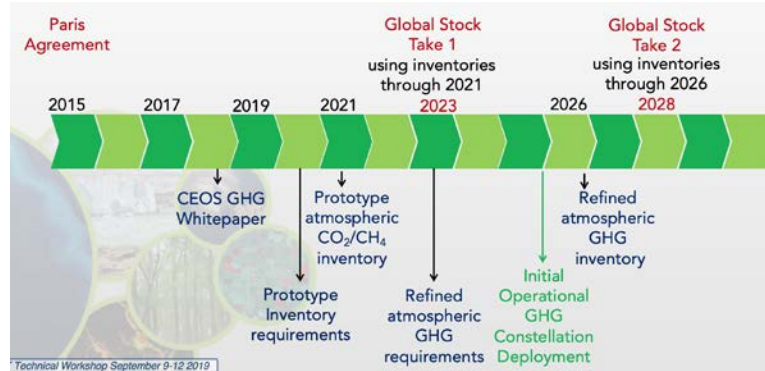
Presenters: David Crisp (AC-VC, NASA), Mark Dowell (COM)

Main points:

- The white paper defines a global architecture for monitoring atmospheric CO₂ and CH₄ concentrations from instruments on space-based platforms. Spatial scale covers both local (*e.g.*, power plants) as well as global (*e.g.*, Inventories).
- Recommended approach: refine requirements for atmospheric flux inventories; produce a **prototype atmospheric CO₂ and CH₄ flux inventory in time to inform the bottom-up inventories for the 2023 global Stocktake**; and, use lessons learned from the prototype flux inventory to refine requirements.

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- A comprehensive Roadmap for the GHG activities to be conducted by WGClimate, WGCV, and AC-VC is being drafted. The main outputs are: Prototype Atmospheric inventory requirements (2020); Prototype Inventory (2021); Architecture for an Operational GHG System (2023-2026 and beyond).



- **Three broad categories of resources are envisaged and requested for consideration by Agencies: staff resources from CEOS Members** and external experts supported through Agency programs and grants; support for travel and hosting of workshops, networking activities with inventory community Support research, development and infrastructure for priorities identified by GHG Task Team and Roadmap Implementation (annual updates will be provided to Agencies).
- **Agencies are asked to continue/increase support to the GHG relevant staff (time and travel) contributing to the technical implementation tasks in AC-VC and WGCV.**
- **GHG Task Team:** a number of specific ‘profiles’ are required: core team ensuring linkages; Agency staff representing GHG missions/programs; staff from “operational” agencies; and, Agency Staff/Experts with links to the Inventory Community and involved in modelling aspects. The Task Team would include ~12 members, typically dedicating 1-2PM/yr.

Main discussion points:

- Mauro Facchini (COM) noted that the recent ‘mandate letters’ issued as a part of the transition of EU government directly references Copernicus CO₂ observations. CEOS is part of the context for enabling this, and there is also now an obligation to deliver. Mauro also intimated that DG-GROW is likely to become DG Defense and Space.
- Paula Bontempi (NASA) encouraged both continuity from Agencies already supporting and engagement by additional Agencies.
- Osamu Ochiai (JAXA) noted the importance of recent CEOS and SIT Chair support to the GOSAT-2 follow-on mission.

SIT-TW-2019-08	WGClimate GHG Team Leader	Provide Principals at the 33 rd CEOS Plenary an idea of resources envisioned to support the proposed GHG Roadmap.	30 September 2019
<i>Rationale: Provide Principals with an estimate of resources needed for the proposed GHG Roadmap and ask them to consider and respond before SIT-35 in April 2020.</i>			

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Working Group on Information Systems and Services (WGISS) [PPT]

Presenter: Mirko Albani (WGISS Chair, ESA)

Main points:

- Several white papers produced on **Data Stewardship Best Practices**.
- **WGISS Connected Data Assets (includes IDN/CWIC/FedEO)** are now classified as a CEOS Service, with GEO one of the main users.
- **CEOS Future Data Architecture (FDA)** activities in WGISS are addressing: services/tools/elements discoverable; interoperability; showcasing support to CEOS/GEO Initiatives; and, outreach and awareness.
- **Cooperation with WGCV:** ESA PDGS Data Cube (<https://preops.eodatacube.eu/>) provides services to RadCalNet, and ACIX (In-situ and S-2/L-8) data, including Jupyter notebooks to reproduce ACIX use cases: <http://calvalportal.ceos.org/results>.
- Exploring topics related to Artificial Intelligence and Machine Learning.
- A number of activities with other CEOS Teams (*e.g.*, Carbon/WGClimate, WGDisasters, WGCV, VCs, WGCapD, SEO, and SDG AHT), as well as a number of contributions to GEO.
- Robert Woodcock (CSIRO) will take over as WGISS Chair after the 2019 CEOS Plenary, with Makoto Natsuisaka (JAXA) as Vice Chair.

Working Group on Calibration and Validation (WGCV) [PPT]

Presenter: Cindy Ong (WGCV Chair, CSIRO)

Main points:

- WGCV will work with AC-VC and GSICS to calibrate space-based GHG sensors and to define approaches to cross-validate retrieved XCO₂ and XCH₄ concentrations.
- A new effort is underway on a field Surface Reflectance “Round-Robin” inter-comparison exercise, and development of community endorsed SR validation protocols. ESA is the lead agency.
- Also new is work on SAR Supersites for multi-mission SAR radiometric / geometric calibration, cross-calibration and validation. A work plan with resources and timelines will be prepared by the WGCV SAR subgroup for discussion at the SAR Subgroup meeting in November 2019 in Frascati, Italy.
- There are plans to reactivate the Terrain Mapping Subgroup (TMSG) of the CEOS-WGCV to work towards a comparison of state-of-art global DEMs based on a set of harmonized metrics.
- CEOS WGCV LPV Biomass meeting planned for 4-5th March 2020, Brisbane Australia - focused on recommendations of the biomass protocol and relevance for TERN and other available network (FORESTGEO, FORESTPLOTS, etc.).
- Opening for Vice Chair position; Europe is the next on list of the rotation but any nominations from qualified candidates will be considered; interested candidates please contact cindy.ong@csiro.au or kuze.akhiko@jaxa.jp.

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SIT-TW-2019-09	CEOS Agencies	Consider nominating qualified candidates for Vice Chair of the Working Group on Calibration and Validation (WGCV).	For 33rd CEOS Plenary
	<i>Rationale: WGCV Vice Chair position will be vacant at the conclusion of 34th CEOS Plenary.</i>		

Working Group on Disasters (WGDisasters) [PPT] [WG Disasters ToR 2019 v5]

Presenter: David Green (WGDisasters Vice Chair, NASA) via GTM

Main points:

- **CEOS Work Plan 2019-2021:** Nine deliverables related to the main initiatives are on track, including three supporting GEO Initiatives (GSNL, GEODARMA, GEO4DRM), DRM Initiatives (Landslide Pilot, Recovery Observatory, Volcano and Seismic Demonstrators), and CEOS WG Disasters Crosscutting Initiatives (GeoHazards Lab).
- **WG Disasters ToR review:** Terms of Reference (ToR) revised to reflect alignment with Sendai Framework for Disaster Risk Reduction 2030 focus on EO for disaster risk reduction, recently reviewed, shared with CEOS leadership for discussion at SIT TW, and expect to propose for endorsement at the 33rd CEOS Plenary. Main changes: Introduced high-level objectives with clear reference to Sendai Framework goals, targets, and indicators emphasizing “Understanding Risk” (hazard, exposure, and vulnerability), taking a user driven approach, and addressing multi hazards.
- **Blue Planet Collaboration:** Evaluating opportunities to include EO for coastal risks; modeling and mapping of coastal reef-lined islands prone to flooding; oil spill monitoring and response; and, possible crosscut on polar coastal ice, snow and flooding activities.
- **GEO/LEO and WGDisasters** see opportunities for a new Pilot study on EO for flood risk monitoring, including a partnership among CEOS and CGMS. The pilot would be focused on data integration, processing and mapping, and capacity development through studies selecting a small number of areas known to be at high flood risk with access to rich volumes of GEO/LEO and in concert with multi-frequency and multi-temporal SAR data from both CEOS and CGMS Agencies.
- **One long-term goal** of WGDisasters is to demonstrate sustainable viability of international coordination of satellite tasking for global volcano monitoring and provision of data products to users (observatories) in decision support.

Main discussion points:

- Steven Hosford (CEO, ESA/CNES) noted the need to prepare for the updated ToR at Plenary.

WGCapD Capacity Building Activities [PPT]

Presenter: Lauren Childs-Gleason (WGCapD, NASA)

Main points:

- Since the last Plenary, webinars and Massive Open Online Courses (MOOCs) supported for SDG AHT, FDA, and radar remote sensing.
- The CEOS training calendar is now live at <https://training.ceos.org>, and inputs are welcomed.
- **Work Plan 2019-2021:** deliverables include MOOCs on radar and optical data, GEOGLAM, and hyperspectral. Hyperspectral training resources to be increased.
- ROSCOSMOS has recently joined WGCapD.

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- The WG needs a new Vice Chair at the conclusion of 33rd Plenary. VNSC has proposed a candidate, and we are awaiting formal letter that will be sent to CEOS leadership.
- **GEO Synergies:** supporting both AmeriGEO and AfriGEO, and thematically with GFOI and GEOGLAM.

Main discussion points:

- Kerry Sawyer (SIT Chair Team, NOAA) asked whether VNSC had concurred, and Lauren noted WGCapD is awaiting a formal letter. Lam Dao Nguyen (CEOS Chair Team, VNSC) confirmed that the letter is in work.

SIT-TW-2019-10	VAST/VNSC	VAST/VNSC to formally submit for CEOS endorsement its nomination of a candidate for Vice Chair of the Working Group on Capacity Building and Data Democracy (WGCapD).	For 33 rd CEOS Plenary
	<i>Rationale: VAST/VNSC has indicated interest in nominating a candidate for WGCapD Vice Chair position; a formal letter of nomination is needed.</i>		

5. Reports from Virtual Constellations

Atmospheric Composition Virtual Constellation (AC-VC) [PPT]

Presenter: Jay Al-Saadi (AC-VC Co-Lead, NASA) via GTM

Main points:

- The CEOS Atmospheric Composition Virtual Constellation (AC-VC) white [paper](#) defines a **global constellation architecture for monitoring atmospheric CO₂ and CH₄** concentrations from instruments on space-based platforms. The document now has ISBN/DOI numbers.
- The total ozone part of CEOS VC-02 task is now completed. Total ozone ECV products will continue to be produced operationally. The VC now proposes a **new target deliverable for tropospheric ozone column products**.
- **“Validation needs for the AQ Constellation” white paper** final review was at AC-VC-15. AC-VC now ready to submit the white paper for CEOS endorsement (or acceptance as appropriate) by the 33rd CEOS Plenary and to proceed with implementation of the recommendations.
- AC-VC would now like to propose a **new deliverable on satellite-informed products for air quality associated with aerosol** - motivated by SDG 3.4 human health mortality goal and Global Burden of Disease report. The notional target deliverable is a white paper or peer-reviewed journal article [by Q4 2021].

Main discussion points:

- The AQ White Paper is [available on the TW web site for review](#). It needs to be shared widely if endorsement is sought at the 33rd CEOS Plenary.
- Paula Bontempi (NASA) noted support for the new tasks proposed by AC-VC.

SIT-TW-2019-11	AC-VC Co-Leads	Circulate AQ White Paper widely for review ahead of request for 33 rd CEOS Plenary endorsement. Work with SIT Chair Team to prepare letter to circulate with the Paper explaining the context and implications to Principals.	30 September 2019
	<i>Rationale: Provide Principals and Agencies with sufficient time to review the AQ White Paper prior to 33rd CEOS Plenary.</i>		

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Ocean Colour Radiometry Virtual Constellation (OCR-VC) [PPT]

Presenter: Paula Bontempi (NASA)

Main points:

- **CEOS Work Plan 2019-2021:** main contributions for climate (GCOS ECV, CDRs), carbon (aquatic), and water quality (applications, IOCCG).
- Implementation of the **INSITU-OCR White Paper** is advancing and following a modular approach coordinated across the space agencies.
- Planning for a **journal special issue on Aquatic Carbon from Space**.
- **Hyperspectral OCR:** benefits in detailed quantification of in-water constituents (*e.g.*, phytoplankton and sediment differentiation, plastics, substrates). An IOCCG/OCR-VC Hyperspectral Task Force is being formulated to look at quantitative estimation of advantages, and demonstration of methodologies.
- In addition to hyperspectral, OCR work is ongoing to assess the potential for geostationary observations, polarimetry, and LiDAR.
- OCR-VC has provided several technical recommendations to the **COVERAGE** initiative. This has been a clear example where expertise in the Ocean VCs is needed.

Main discussion points:

- Jorge Vazquez (NASA) asked about making ocean color matchup databases, and Paula Bontempi noted a global *in situ* database for all space agencies has been discussed, and NASA supports one, SeaBass. To date, links between databases and focus on protocols to enable interoperability have been the focus.
- Mark Dowell (COM) asked about specific carbon-related actions that could be undertaken in the next three years, and Paula noted that NASA has been pushing the evolution towards more advanced data products, as well as services related to climate and GHGs.
- Steven Hosford (CEO, ESA/CNES) asked if all the OCR-VC activity is well-reflected in the current one CEOS Work Plan deliverable, and suggested we encourage the OCR-VC to translate the activities into multiple deliverables in the next Work Plan as more exposure here could help with communications and coordination. Paula agreed, and noted that she will pass this along to the group at the next IOCCG meeting in March 2020 (which has a half day dedicated to OCR-VC discussions). Steve Volz (SIT Chair, NOAA) stressed the communication value of the Work Plan.
- Steve Volz (SIT chair, NOAA) asked about suggestions for dedicated missions. Paula noted that the OCR-VC would likely resist prioritization, but may be very supportive of dedicated missions. This is likely true for all VCs.

Ocean Surface Topography Virtual Constellation (OST-VC) [PPT]

Presenter: Remko Scharroo (OST-VC Co-Lead, EUMETSAT) via GTM

Main points:

- After 2+ years without an active Co-Lead from CNES, the **OST-VC again has two Co-Leads: Annick Sylvestre-Baron (CNES), Remko Scharroo (EUMETSAT)**.

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- **A new OST-VC User Requirements Document (action VC-43) is planned for Q4 2020.** This will update the “Next 15 years of altimetry”, 2009 Constellation User Requirement Document. It will address: user needs; swath altimetry + nadir altimetry; recommendations for an ‘operational constellation’ (targets: Copernicus Next Generation, Chinese and Japanese altimetry programs); recommendations for additional science missions and techniques (e.g., GNSS-R).
- Sentinel-3B started mission in tandem with Sentinel-3A; CFOSAT was launched October 2018.

Main discussion points:

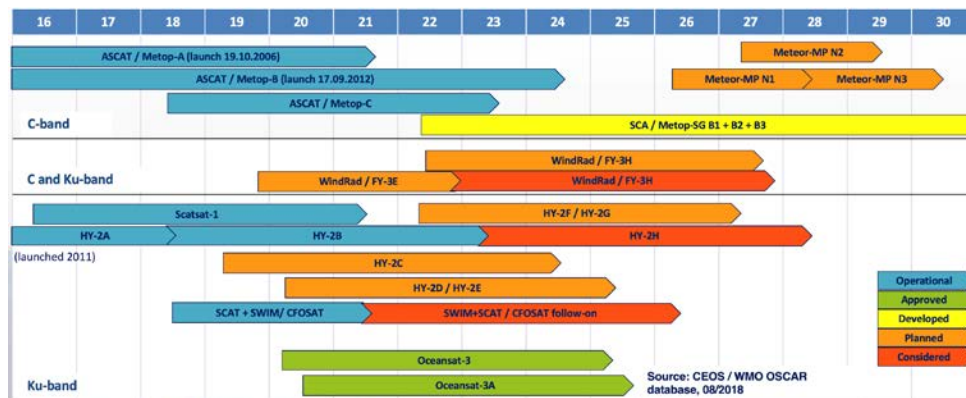
- Raj Kumar (ISRO) asked about the aims of the User Requirements Document (URD), and Remko confirmed they hope to set out the requirements to cover the needs of the OST community. (i.e., addressing resolution and repeat). It will be an update of the document created 10 years ago.
- Steve Volz (SIT Chair, NOAA) asked about the timeframe for the updated URD, and Remko confirmed it will be future-looking - considering new observing types and techniques.
- Steve raised the topic of terminology (“virtual”, “actual coordinated”, “real”, “operational”) when referring to constellations and stated that we need to be cautious about how we refer to constellations and come to agreement on a common lexicon. He stressed that the role of the VCs is to coordinate observations. Paul Counet (EUMETSAT) noted that the definition of ‘operational’ constellation is actually originating in Europe and refers specifically to altimetry missions moving from research to operational.

Ocean Surface Vector Wind Virtual Constellation (OSVW-VC) [PPT]

Presenter: Raj Kumar (OSVW-VC Co-Lead, ISRO)

Main points:

- **OSVW-VC Status:** Currently the VC is anchored by scatterometer missions from EUMETSAT and ISRO, with a large number of upcoming Chinese Agency scatterometer missions.



- **Local time coverage assessment (ground track):** discussion around requirements (e.g., 6-hourly) to address a coverage gap from 00:00 - 06:00.
- There is an **ongoing community discussion of observing system requirements** for accuracy and resolution. Requirements vary greatly depending on the spatial and temporal scales of phenomena that need to be captured in a model, and sampling requirements are driven by the need to capture variability. Discussions also continue on cross-calibration and the quality assessment of data products and wind retrievals.

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- There is a discussion around how new technologies beyond the standard C-, Ku-band compare, and where they fit within the OSVW observing system portfolio. (*e.g.*, multi-frequency, polarimetric, L-band, SAR, GNSS-R, HF radars).
- **Objective assessment of requirements for the OSVW-VC**, including a workshop, to be planned end of 2019 or early 2020. Seeking the backing of the IOVWST.

Main discussion points:

- Ivan Petiteville (ESA) asked whether the requirements have been established, or will they be created in this report.
- Paul Counet (EUMETSAT) noted that current requirements are being met for China and Europe through coordination, though the discussion is ongoing. Raj noted that all CEOS Agencies should be providing their data but the OSVW-VC is not receiving Chinese mission data. Paul noted they do press this point with their partners in China.
- Steve Volz (SIT Chair, NOAA) noted the proposed requirements paper will be quite useful, and asked if Principal support could help to prioritize to initiate the process this year. He suggested coming to Plenary with these requests.

Precipitation Virtual Constellation (P-VC) [PPT]

Presenter: Gail Skofronick-Jackson (P-VC Co-Lead, NASA)

Main points:

- VC-17: ‘Support to ECV precipitation parameters’ has recently been completed.
- The next P-VC meeting will be held at the NASA Precipitation Measurements Science Team meeting on 4 November 2019.
- There are no P-VC items that need to be taken to 33rd CEOS Plenary for decision.
- Looking to re-energize the P-VC. Looking for synergies with other groups, including in CGMS (specifically the International Precipitation Working Group [IPWG]). Precipitation is a key Earth system component and is crosscutting to several VCs and WGs, including AC-VC, WGDisasters, GEOGLAM AHWG, and freshwater activities.

Main discussion points:

- Marc Paganini (SDG AHT, ESA) noted the challenge for the SDGs in finding a precipitation dataset, and Gail suggested that some collaboration here may be helpful.
- Mitch Goldberg (NOAA) noted that there are both scientific and operational products in this area, and Steve Volz (SIT Chair NOAA) noted that we are in a world where there will be products like these side by side, and there is a need to help users understand the nature and applicability of each. Jörg Schulz (WGClimate, EUMETSAT) supported the joint nature of scientific and operational work. Mitch noted this is part of the value of having operational agencies within CEOS.
- Doug Cripe (GEO Secretariat) asked about the connection to GEO activities, and Gail suggested follow-up discussions.

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Sea Surface Temperature Virtual Constellation (SST-VC) [PPT]

Presenter: Ken Casey (SST-VC Co-Lead, NOAA)

Main points:

- **SST-VC continues to focus on a narrow group of objectives**, completing activities of the last few years and transitioning to new focus areas. Membership is strong, with active participation and leadership rotations in place. SST-VC operating well as a SST-only focused VC.
- Eighth CEOS SST-VC meeting held in Frascati, 7th June 2019, following the annual GHRSSST Science Team meeting.
- **White paper on next generation SST constellation now completed** and the finished draft is currently under final review by SST-VC members - ready to distribute in October.
- **Increasing concern from SST community regarding increasing impact of Radio Frequency Interference (RFI) and 5G networks** on the quality of Sea Surface Temperature retrievals and therefore downstream applications. **SST-VC would like to raise the issue to CEOS SIT and stimulate discussion and identify mitigation approaches.**
- Ed Armstrong (NASA) will replace Ken Casey (NOAA) as co-lead in October 2019. Christo Whittle (representing SANSAs) to replace Anne O’Carroll (EUMETSAT) as co-lead in October 2020.
- **Future themes for the VC** are: Engaging early career scientists and how to encourage them to participate in GHRSSST / SST-VC; Improved search relevancy/decision tree based GHRSSST product search; an integrated SST / sea-ice temperature dataset, southern ocean; integrated cross-VC products, to advance ARD concepts; an SST “CEOS Data Cube”; assessing and monitoring of RFI impacts; more explicit collaboration with the other VCs; improving and standardizing SST granule quality documentation and descriptions.

Main discussion points:

- Jonathon Ross (SIT Vice Chair Team, GA) noted that the coastal activity would be a primary activity to bring land and SST (oceans) datasets into a Data Cube. Ken agreed, and this is something they would be ready to pursue. Jorge Vazquez (NASA) noted there is a new focus on gridding in GHRSSST which will likely help with this effort.
- Werner Balogh (WMO) asked whether the frequency issues have been raised with the International Telecommunication Union (ITU), noting that WMO has a link there. Ken wasn’t aware of this link having been made yet.
- Kerry Sawyer (SIT Chair Team, NOAA) noted that at the 2009 CEOS Plenary there was an agreement that coordination on radio frequencies would be handled at a national level, rather than within CEOS. CEOS could be involved in producing a technical assessment/white paper on impacts which might be useful for agencies. Mark Dowell (COM) noted that CEOS Plenary also recognized WMO’s link to the ITU, and that CEOS could pass messages via EUMETSAT, which coordinates with WMO on this topic.
- Steve Labahn (LSI-VC, USGS) noted that LSI-VC will likely look towards the likes of SST-VC when considering interoperability.
- Paula Bontempi (NASA) recognized Ken Casey’s leadership of the SST-VC and the SIT TW attendees applauded Ken’s contributions.



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Land Surface Imaging Virtual Constellation (LSI-VC) [PPT]

Presenter: Steve Labahn (LSI-VC Co-Lead, USGS)

Main points:

- **CEOS Analysis Ready Data for Land (CARD4L) Framework:** Product Family Specifications (PFS) for Optical Surface Reflectance, Surface Temperature, and Normalized Radar Backscatter have been developed. Additional radar PFSs are under consideration. Product self-assessment process developed and being exercised for the first time, with support from WGCV. Initial products likely Landsat Collection 2, Sentinel-2 L2A, and ALOS-2 PALSAR-2 mosaics. The Collection 2 self-assessment package is likely to go to WGCV next week.
- KARI attended LSI-VC-8 with an interest in CARD4L for their data, which is sub-10m spatial resolution, and that require a new PFS or PFS revisions to address.
- **3rd Joint Meeting of LSI-VC, CEOS SDCG for GFOI, and CEOS GEOGLAM Ad Hoc Working Group (AHWG)** took place last week. Main topics were CARD4L, discussions around incoming SIT Chair Analysis Ready Data (ARD) priority, and a joint session with WGClimate.
- The WGClimate discussion may result in a collaboration on Land Surface Temperature CDRs and continuity.
- Zoltan Szantoi/COM/JRC was nominated to succeed ESA as the third VC Co-Lead. (Contingent on final approval from COM).
- There will be a **'Big EO: Big Data' Key Side Event during GEO Week** in Canberra, Australia (4-9 Nov 2019) with substantial input from LSI-VC and participating agencies.

Main discussion points:

- Mark Dowell (COM) confirmed that the COM will support Zoltan Szantoi as LSI-VC Co-Lead.
- Steve Labahn noted the CEOS participation in industry ARD event arranged by Planet.
- Paula Bontempi (NASA) welcomed the idea of thematic subgroups in LSI-VC, and hoped to see evolution of CEOS efforts in ARD to other domains.
- David Crisp (NASA) noted that atmospheric and GHG observations are very interested in the LSI calibration targets and finding new sites for their observations. It is a possible area for AC-VC, LSI-VC and WGCV. Alex Held (SIT Vice Chair, CSIRO) noted that Australia is looking to set up a national facility focused on calibration (AusCalVal) that could mitigate the loss of Railroad Valley. Partnerships may be possible.
- Astrid Koch (COM) noted the potential to expand LSI-VC, including via support and collaboration with other areas (*e.g.*, Oceans, validation).
- Osamu Ochiai (JAXA) noted ALOS-2 and ALOS-4 data policy is gradually progressing towards providing free and open datasets.

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Advancement of the COVERAGE Initiative

Presenter: Jorge Vazquez (COVERAGE, NASA/JPL)

Main points:

- **Phase A (scoping) of COVERAGE has been completed.** Phase B Implementation (1-year duration) commenced September 2019 and will include a prototype COVERAGE technical infrastructure with core features. Phase C planning is included, which will address full COVERAGE implementation and roadmap to operations.
- **Phase B includes:** Thematic demonstration application development: “High-seas tuna fisheries in relation to the environment”. This integrates: a coherent set of select global ocean satellite data products for the key Ocean VCs parameters (0.25 degree COVERAGE baseline products, NRT where possible); RFMO spatial catch/effort series; fishery vessel (Automatic Identification Systems); AIS products from Global Fishing Watch; electronic tagging datasets on fish movements.

Steve Volz (SIT Chair, NOAA) asked whether COVERAGE is engaging NOAA Fisheries colleagues with regard to U.S. electronic tagging data that could be included in the demonstration COVERAGE application. Vardis Tsontos, who had dialed in for the discussion, responded that this is of interest and that there had been periodically over the past couple of years, contact with the NOAA lead coordinator of the Animal Telemetry Network (ATN), Bill Woodward, regarding areas of possible technical collaboration (*e.g.*, gave presentation also on COVERAGE at an ATN meeting in August 2017).

VC Leadership Succession [PPT]

Presenter: Kerry Sawyer (SIT Chair Team, NOAA)

Main points:

- **Two CEOS governing documents require changes per SIT-34 Actions:** The *CEOS Governance and Processes* document provides guidelines on the structure, operations, and processes CEOS employs to achieve its goals. *Virtual Constellations Process Paper* defines the roles, responsibilities, and plans of the Virtual Constellations.
- **Updated New Governance wording proposed*** is: *Each Virtual Constellation will have at least two and no more than three Co-Leads. Co-Leads shall be from any interested CEOS Member or Associate Agency and should be an active, engaged, and relevant contributor to the VC. Every two years, the Co-Leads will be reviewed by the Constellation membership, with a decision to either maintain current leadership or transition to new leadership, as outlined in the CEOS Virtual Constellation Process Paper.*
- For parity, propose to add the following clause in the *Governance and Processes about Working Groups* (taken essentially verbatim from the *Working Group Process Paper*): *Each Working Group is led by a Chair and a Vice Chair, with a two-year term for each position. Additional information on leadership requirements for the Working Groups is detailed in the Working Group Process Paper.*
- **New VC Process paper wording proposed*:** *Each Constellation will have at least two and no more than three Co-Leads. Co-Leads shall be from any interested CEOS Member or Associate Agency and should be an active, engaged, and relevant contributor to the VC. At a minimum, Co-Lead positions will be reviewed biennially by the Constellation membership to ensure appropriate Constellation leadership is maintained and to allow for interested individuals to be considered for Constellation leadership (some Constellations have a set rotation and turnover of Co-Leads detailed in existing Terms of Reference). The expectation is that any Constellation leadership changes will be staggered to ensure*

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leadership continuity and expertise are optimized. There are no limits on how long an individual may continue as a Co-Lead as long as they are biennially reviewed and have their agency endorsement. The decision of Constellation leadership resides with the Constellation but leadership changes must be reported immediately to CEOS leadership (CEOS Chair, SIT Chair, SEO, and Permanent Secretariat) following any decision.

- *Co-Leads will be responsible for the implementation of Constellation’s goals, identification of agency support and commitments, and working with the CEOS SIT Chair in addressing CEOS and SIT priorities. Co-Leads should adhere to these basic requirements:*
- *Nominated on an ad hominem basis; the **existing Co-Lead’s agency is not responsible to provide a replacement Co-Lead if its respective Co-Lead rotates out.***
- ***Endorsed biennially** from their respective agencies (verbal or written).*
- *Affiliated with a CEOS Member or Associate Agency.*

** text in red changed since Monday’s VC/WG/AHT Day and based on further offline discussions during SIT TW.*

- *Virtual Constellations Process Paper* was last updated in 2013 and it might be time for a rewrite of the document. At CEOS Plenary, the SIT Chair will submit only changes to the Process Paper that deal with the SIT-34 action and not attempt a rewrite of the Paper at this time.

Main discussion points:

- Paula Bontempi (NASA) suggested a change to indicate that, “Co-Leads should be subject matter experts.” The objective is to ensure the nominees can represent the science. Christine Bognar (NASA) added that these suggestions are made in the spirit of clarity for the VCs, internally and externally, *i.e.*, for CEOS Agencies already contributing to a VC, and for CEOS Agencies that may want to identify someone with expertise to join a VC.
- Astrid Koch (COM) suggested a key need is coordination and leadership skills, and did not support specifying “subject matter experts” are required.
- Kerry noted that ultimately, the decision on who to select for Co-Leads is with the VCs, and we do not want to limit the VCs ability to select who they deem is the most appropriate and qualified Co-Lead.
- Steve Volz (SIT Chair, NOAA) suggested using the term “should be a subject matter expert” to make it less binding.
- Paul DiGiacomo (NOAA) supported Paula’s suggestion that the Co-Lead should be a subject matter expert, and having a clear statement of rules may make it easier for the VCs themselves to reference.
- Paula noted that this was not a ‘deal breaker’, and suggested some follow-up/offline discussion.
- Kerry presented revised text reflecting this offline discussion, which included the qualifier that *Co-Leads shall be from any interested CEOS Member or Associate Agency and should be an active, engaged, and relevant contributor to the VC.* This text is included above and in the [updated presentation materials](#). It was noted that the text as proposed will be submitted for endorsement at CEOS Plenary, and no further points were raised.

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SIT-TW-2019-12	SIT Chair Team	Finalize and circulate the changes to the VC Leadership Succession Text that will be presented for endorsement at the 33 rd CEOS Plenary.	30 September 2019
<i>Rationale: Provide Principals and Agencies with sufficient time to review prior to potential endorsement at the 33rd CEOS Plenary.</i>			

6. Reports from *Ad Hoc* Teams/Working Group

Space Data Coordination Group (SDCG) for Global Forest Observations Initiative (GFOI) [PPT]

Presenter: Osamu Ochiai (GFOI Lead for CEOS, JAXA) and Stephen Ward (SDCG Secretariat)

Main points:

- GFOI has been a key GEO activity since 2011, and recently Phase 2 was initiated with a continued emphasis on Capacity Building aspects and country engagement to develop National Forest Monitoring Systems (NFMS) and Monitoring, Reporting and Verification (MRV). **GFOI is working with UNFCCC to discuss a “Policy Mandate” associated with the Paris Agreement** (*i.e.*, NDC, Global Stocktake (meeting in Bonn 24-25 September).
- In Phase 2, the **Satellite Data Component has been renamed and re-scoped as a Data Component**. One of its first activities has been a Consistently Assessing Levels of Maturity (CALM) tools assessment, with 34 tools registered including from CEOS Agencies and CEOS SEO. Further submissions are welcome, including from CEOS Agencies with related activities.
- CEOS continues to coordinate on EO data acquisition and availability as a part of the Data Component. Baseline space data are somewhat taken for granted (Landsat, Sentinel-1 and -2), but need to assure advocacy still addressed.
- SDCG participation has shrunk as those agencies interested in supporting the GFOI R&D program have stepped away due to a lack of activity - however a core of the group remains intact. **A new USGS Co-Lead has been nominated with links to the GFOI Capacity Building Component** (via SilvaCarbon). The Work Plan has been simplified and streamlined, but with a continued focus on the core business of assurance of data suitable for annual NFMS reporting.
- Key emerging activity around **accelerating the policy relevance of new biomass datasets**, which accords well with efforts to have IPCC Good Practice Guidelines to incorporate these datasets. Biomass may become an important topic for CEOS in the forthcoming years, and has no current formal home in the CEOS structure. The proposed ‘*Forest and Biomass*’ thematic subgroup in LSI-VC is suggested as a first step whilst discussing the way forward with the main investor agencies.

Main discussion points:

- Mark Dowell (COM) suggested, that in the short term, it would be useful to look at the Agriculture, Forestry, and Other Land Uses (AFOLU) aspects of the Convention, including new methods around biomass and existing capabilities, and contributions around the agricultural sector.
- Alex Held (SIT Vice Chair, CSIRO) highlighted plans for the Biomass Validation Workshop, and noted this would address other types beyond forests (*e.g.*, grasslands, croplands).
- Steve Volz (SIT Chair, NOAA) noted the suggestion to include biomass in the CEOS structure, and that CEOS continue to follow and discuss longer-term structure. Stephen Ward noted there are new missions and teams who would need to be engaged and are not currently active in CEOS.

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- Steve Volz confirmed that SDCG is proposing to evolve to become a thematic subgroup of LSI-VC and asked how reporting on these activities would move forward, noting that technically, they should be rolled up in the reporting of the LSI-VC. Steve Labahn (USGS) noted that past discussions suggested that support of GEO initiatives could be reported under the GEO session in CEOS agendas. Steve Volz suggested this approach could lead to a proliferation of reporting, and that it should be agreed based on importance of topic presented and discussion/consensus by the incoming SIT and CEOS Chairs. Reporting at every CEOS meeting should never be an expectation. A related example has been the AC-VC work around the GHG Roadmap.
- Jonathon Ross (SIT Vice Chair Team, GA) confirmed the incoming SIT Chair would look at this issue and confirmed that where there is important content being discussed in VCs, that content should be brought forward and shared at major CEOS meetings.
- Brian Killough (SEO, NASA) noted that the GFOI and GEOGLAM Flagship work is well integrated into CEOS work, and we should not lose that or the reporting to the key meetings.
- Osamu noted that the connection through him as the CEOS Lead for GFOI provides a useful top-down and bottom-up connection.

GEO Global Agricultural Monitoring (GEOGLAM) Ad Hoc Working Group [PPT]

Presenter: Brad Doorn (GEOGLAM AHWG Co-Lead, NASA)

Main points:

- The policy landscape has shifted since 2011, and GEOGLAM is evolving, though the G20 mandate is still the core of the program.
- The **GEOGLAM Requirements Reboot** is complete, and a [draft CEOS Response](#) has been prepared. After consultation within CEOS, the plan is to present this for **endorsement at Plenary**. The update did address observations, but the GEOGLAM approach was more holistic (*e.g.*, Capacity Building, Cal/Val), which has broadened the number of issues CEOS has to consider.
- The AHWG has considered the value of the CEOS-link, with much of the value being that EO data is core to GEOGLAM activities. GEOGLAM provides CEOS with observation requirements, processing requests, and helps develop implications for future missions. It provides an opportunity for interaction with “next users” and to hear “end user” needs. Much work remains in these areas.
- **Future of AHWG:** Proposal to transition from AHWG to a GEOGLAM subgroup under LSI-VC.

Main discussion points:

- Jonathon Ross (SIT Vice Chair Team, GA) raised the nature of ‘essential’ variables, noting there is a credibility issue when the label “essential” is used too broadly and asked about GEOGLAM’s thinking there. In particular around the ‘policy blessing’ aspect there. Brad noted this is still being discussed, and the specific labeling needs to be confirmed, including confusion around the term ‘essential’.
- Mitch Goldberg (NOAA) suggested the inclusion of geostationary datasets, and Brad agreed and noted that hyperspectral is also coming quickly. This can be added as a comment to the requirements.
- Steve Volz (SIT Chair, NOAA) asked if a deadline for comments of 27 September is sufficient, and if there are specific areas that need feedback. Brad noted that at present, the draft is ready and comments are welcomed but not required.

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Sustainable Development Goals (SDGs) Ad Hoc Team [PPT]

Presenter: Marc Paganini (SDG AHT Co-Lead, ESA) and Alex Held (SDG AHT Co-Lead, CSIRO)

Main points:

- Deliverables from the six SDG CEOS Work Plan actions are available on the CEOS DMS.
- There are a number of **key criteria for streamlining CEOS engagement on SDGs**, including: a focus on the unique role; tangible benefits to all CEOS Agencies; CEOS entities (*e.g.*, WGs, VCs, SEO) must be involved; complement rather than duplicate the GEO community efforts; connected to the SDG processes in place in the UN; embedded in the GEO Federated Approach; and, commensurate with the resources available.
- Pilot support on **Indicators 6.6.1, 11.3.1, and 15.3.1** has progressed with EO contributions to Indicator Support Sheets, satellite data requirement tables, SEO-developed Open Data Cube workflows, and Capacity Building (with WGCapD).

		Satellite Data Providers	Information Providers	End Users	
	#	Activity Title	Activity Deliverables	Target Audience	CEOS bodies support
SHORT TERM ACTIVITIES	1	Satellite Data Requirements	<ul style="list-style-type: none"> Technical Notes on "Satellite Data Requirements" (one TN for each SDG indicator) CEOS Community Portal on SDG for EO data discovery and access (based on WGISS IDN/CWIC/FedEO) 	X	LSI-VC (3 indicators) WGISS
	2	EO Enabling Infrastructures	<ul style="list-style-type: none"> Technical Notes on EO enabling infrastructures for SDG indicators (one TN for each SDG Indicator) 	X	WGISS, SEO
	3	EO Capacity Building	<ul style="list-style-type: none"> Capacity building webinars/training (organized by SDG indicator) Support to EO4SDG MOOCs on SDGs (one MOOC per SDG goal) 	X	WGCapD WGISS
MID TERM ACTIVITIES	4	EO Good Practices Guidance	<ul style="list-style-type: none"> EO Good Practice Guidance for SDG indicators (one GPG for each SDG indicator) R&D agenda on improved methods for SDG indicators (one R&D Agenda for each SDG indicator) 	X	LSI-VC (CARDL)
	5	EO Demonstration Cases	<ul style="list-style-type: none"> Collection of EO Demonstration Cases for SDG indicators. (one per SDG indicator) Deployment of EO workflows for SDGs on the CEOS Data Cube 	X	SEO
	6	EO Quality Standards	<ul style="list-style-type: none"> EO Quality Standards for SDG indicators (one guideline per indicator) 	X	WGCV/LPV

- As a result of the AHT's effort, Sentinel-2 coverage over Pacific Island countries has been increased.
- The AHT will ask for a one-year extension at Plenary to continue its work and to come to Plenary 2020 with a proposal on how CEOS should organize itself to respond to the UN/GEO request for CEOS support on SDGs. The AHT also presented plan to organize into six sub-teams and would quantify the commitment required to staff the proposed sub-teams to be presented at Plenary.

Main discussion points:

- Mauro Facchini (COM) asked about the work to convince national statistical offices of the value of EO, and Argie Kavvada (NASA) noted that based on a survey there are 25 examples of EO in use (out of 70 responses). The AHT will make a summary available shortly. There are also cases where EO has been used to upgrade an existing methodology to allow its acceptance. Marc noted the example of the Global Surface Water product, though this is not (yet) a Copernicus Service. Mauro noted that the only use of EO accepted within the EC has been around ocean acidification.
- Trevor Dhu (GA) agreed the more examples the better, and that within the AHT sub-teams (*e.g.*, water) try to expand their scope (*e.g.*, to water quality). He also suggested focusing on those methodologies promoted to Tier 2.

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- Doug Cripe (GEO Secretariat) asked about the engagement of the sub-team leads, and Marc noted that the current Work Plan is a proposal is a draft.
- Paula Bontempi (NASA) asked for more specifics in Marc’s call for CEOS Agencies to support the SDG AHT efforts. Alex suggested contribution of experts aligned with the three sub-teams.
- Werner Balogh (WMO) noted that national statistical agencies have responsibility for in-country capacity building, and often there are deficiencies in environmental data. Engagement with UN Social Commissions (like UN-ESCAP) may help address this.
- Mark Dowell (COM) suggested a multi-pronged engagement strategy through both national statistical agencies, and in parallel via the custodian and technical agencies responsible for implementation.
- Paul DiGiacomo (NOAA) suggested they could contribute to 6.6.1 on water quality, and this will be discussed.

Ad Hoc Team (AHT) Lifecycles [PPT]

Presenter: Kerry Sawyer (SIT Chair Team, NOAA)

Main points:

- **Proposed CEOS Governance and Processes Changes:** *In the event that the permanent mechanisms described in the preceding paragraphs are judged to be insufficient for CEOS to undertake a particular activity, the capability exists for the Plenary to create Ad Hoc Teams. The Plenary assigns short-term objectives to each Ad Hoc Team and ensures that the New Initiatives Process Paper is properly referenced. <Moved from here.> Within two months of creation, the Ad Hoc Team will prepare a defined objective and appropriate path forward for meeting that objective to include identifying needed resources and estimating a completion date for the Ad Hoc Team. Each Ad Hoc Team will have an initial two-year term and will be required to report on progress **and final implementation plan** annually at CEOS Plenary. It is expected that Ad Hoc Teams will be transitioned or completed within three years of creation. If it is clear that the objective of the Ad Hoc Team will exceed initial two-year term, the Ad Hoc Team will either: identify an existing permanent mechanism for the activities of the Ad Hoc Team; recommend Plenary consider the creation of a new permanent mechanism; or request Plenary grant a one-year extension of the Ad Hoc Team. The primary reporting path for an Ad Hoc Team is either to the CEOS Chair or to the SIT Chair, as designated by the Plenary according to the purpose and function of the Ad Hoc Team.*
- **AHT Proposals for Plenary:** SDCG for GFOI – transition as subgroup to LSI-VC; GEOGLAM AHWG – transition as subgroup to LSI-VC; and, SDG AHT requests a 1-year extension.

Main discussion points:

- Paula Bontempi (NASA) suggested that *ad hoc* groups will not sunset before the end of the time they are given, and suggested making the initial period one year. Steve Volz (SIT Chair, NOAA) noted that the challenge is to gather viable resources to execute in one year.
- Ivan Petiteville (ESA) raised the example of the SDG AHT, and in that case there hasn’t been any way to speed the pace and progress of that group due to complexity and external factors and resources.
- Kerry will circulate updated *Governance and Processes* language shortly for consideration.
- Astrid Koch (COM) suggested we ask the SDG AHT to present their transition plan at SIT-35.

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- Mark Dowell (COM) noted that not all Principals will be briefed before Plenary. It was suggested that as a part of the process, we include a requirement for AHTs to include an executive summary two weeks prior to the Plenary.

SIT-TW-2019-13	SIT Chair Team	Finalize and circulate the changes to the AHT Life Cycle Text that will be presented for endorsement at the 33 rd CEOS Plenary.	30 September 2019
<i>Rationale: Provide Principals and Agencies with sufficient time to review prior to potential endorsement at the 33rd CEOS Plenary.</i>			

7. Other CEOS Activities

GEO-LEO Activities Update [PPT]

Presenter: Mitch Goldberg (SIT Chair Team, NOAA)

Main points:

- **Update on CGMS Flood Pilot Study:** NOAA updated their Flood Mapping website to include GEO/LEO for both JMA-AHI and NOAA-ABI.
- Collaboration with WGDIsasters to **integrate synthetic aperture radar** and to better utilize the global constellation with focus on coastal flooding, including on the combined value of LEO/GEO and SAR.
- CGMS responded to the CEOS call for LEO/GEO applications with the **CGMS pilot study demonstrating the use of operational satellites** with VIS/NIR/IR imagers for flood mapping. The outcome will be operational services at NOAA and CMA. Software is freely available for local use: NOAA and CMA LEO satellites have direct broadcast, and JMA, CMA, KMA NOAA have geostationary real-time broadcast.
- Incoming SIT Chair interest in continuing focus with dedicated pilots and demonstration projects on Coastal Mapping in Pacific Region.

Main discussion points:

- Alex Held (SIT Vice Chair, CSIRO) commended the work and hoped to see more such demonstrations.

Observations for Coasts [PPT]

Presenter: Paul DiGiacomo (SIT Chair Team, NOAA)

Main points:

- There are a number of internal and external emerging and current activities related to coastal and ocean observations and applications. **Internal:** GEO/LEO/SAR Integration; WGDIsasters potential WGCV, WGCapD, WGISS engagement; CEOS ARD potential coastal pilot; and, COVERAGE (SDG-AHTs, SDG-6/14 potential). **External examples:** IOC/GOOS, WMO, UN Environment, GEO Initiatives (Blue Planet et al.). CEOS direct engagement with stakeholders has not been extensive to date, but opportunities exist (esp. via Blue Planet). Details in the presentation materials.
- The question of how CEOS should engage internally and externally needs to be considered. **There is a suggestion to form a Study Team to initiate the discussion on Coastal observations.** This would need a specific objective or regional scope to be defined, and the key topic would be moving from multi-sensor observations through the value chain to extract information which users can exploit.

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- The current interface with Oceans end users is complicated, and needs to be addressed. Atmosphere could also be a key area of focus for the coastal zones, since air quality is often at its worst in coastal cities, and **CARD4Coast** may be an interesting concept to consider.
- **Proposed next steps:** recommend SIT establish Coastal Study Team (COAST); request SIT Action for Agencies to express their interest in participating on COAST; define objective/scope, priorities, value chain approach, potential pilots, and engagement strategy with stakeholders; and, evaluate potential role of GEO Blue Planet to facilitate and coordinate CEOS ocean and coastal stakeholder engagement.

Main discussion points:

- Doug Cripe (GEO Secretariat) was very supportive of the proposed way forward, in particular with reference to Blue Planet.

SIT-TW-2019-14	Paul DiGiacomo, SIT Chair Team, and SIT Vice Chair Team	Develop a Coastal Study Team proposal for consideration as a crosscutting CEOS activity, and present the proposal for discussion and decision on the establishment of a Study Team at the 33 rd CEOS Plenary.	30 September 2019
<i>Rationale: Follow-up on discussions around coordination on coastal observations between several CEOS VCs, including as a demonstration of how Oceans VCs could work together on a focused topic.</i>			

Data Cubes as an Analysis Ready Tool [\[PPT\]](#)

Presenter: Brian Killough (SEO, NASA)

Main points:

- Since the start of the Open Data Cube project, there have been **many examples of successful adoption of this technology** to exploit the use of CEOS ARD and create impactful products: *e.g.*, UNEP-GRID, Taiwan, African Regional Data Cube (ARDC - Kenya, Tanzania, Sierra Leone, Senegal, Ghana) based on Landsat, Sentinel-1 and ALOS data.
- The **Ghana government** is learning how to use interoperable Sentinel-1 and Landsat ARD to search for illegal mining and measure land change.
- The success of the ARDC pilot project has led to an expansion of the effort to an operational platform for all of continental Africa. **Digital Earth Africa (DE-Africa) commenced in mid-2019** with \$20M+ of initial donor funding. DE-Africa will host a targeted side event at GEO Week on Nov 5 in Canberra, Australia.
- **GEO awarded \$1.5M of Amazon Cloud credits** to developing countries to support hosting, processing and analysis of EO data for sustainable development. CEOS participated in the review of the proposals. 21 proposals were awarded - of which 15 plan to use CEOS satellite data (mostly Landsat and Sentinel) and 5 plan to use the Open Data Cube.

Main discussion points:

- Trevor Dhu (GA) stressed the importance of ARD supply in positioning Digital Earth Africa for success. He thanked CEOS Agencies for making this happen.
- Alex Held (SIT Vice Chair, CSIRO) noted that building links to other data stores (*e.g.*, Google Earth Engine) has great potential to reduce duplicative data processing.

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- Mitch Goldberg (NOAA) asked if the flood extent datasets could be ingested if they were in the right format (e.g., GEOTIFF, COG), and Brian confirmed this was possible.

GEO Plenary Preparations [PPT]

Presenter: Steven Hosford (CEO, ESA/CNES)

Main points:

- **CEOS Participation at GEO / Delegation:**
 - Head of Delegation: Rajeev Jaiswal, CEOS Chair Team
 - Alternate Head of Delegation: Adam Lewis, CEOS SIT Chair
 - Delegate: Alex Held, CEOS SIT Chair
 - Delegate: Brian Killough, CEOS SEO
 - Delegate: David Green, CEOS WGDIsasters Chair
- A CEOS booth will be arranged by SEO.
- CEOS currently participates in GEO Programme Board (PB) (Kerry Sawyer, Principal and Steven Hosford, Alternate); and is a PB Participating Organization (PO) Observer to GEO ExCom (Alex Held, Principal and Kerry Sawyer, Alternate).
- Going forward the proposal for GEO Programme Board is:
 - CEOS Principal: SIT Chair Team (Andreia Siqueira)
 - CEOS Alternate: SIT Chair Team (CSIRO TBD)
 - CEOS Alternate: Open to nominations until 24th September
- For one of three PB PO observer positions to GEO ExCom: self-nominate to continue as a PO PB observer to GEO ExCom in accordance with existing GEO PB procedures detailed in separate email (~Nov/Dec 2019 nomination process and decision) unless three other satisfactory PB POs are found, in which case CEOS could step down.

SIT-TW-2019-15	CEOS Agencies	CEOS Agencies that are interested in proposing a candidate to represent CEOS as an Alternate to the GEO Programme Board are asked to submit names to CEOS Executive Officer.	Nominations due 24 September 2019
	<i>Rationale: Ensure continuity of CEOS representation on the GEO Programme Board.</i>		
SIT-TW-2019-16	SIT Chair Team and CEO	SIT Chair Team and CEO to confirm the proposed CEOS representatives to GEO Programme Board (PB) and prepare nomination package for signature by the CEOS Principal/Alternate to GEO; send package to GEO Secretariat confirming the CEOS nomination to continue as Participating Organization on GEO PB.	27 September 2019
	<i>Rationale: Ensure continuity of CEOS representation on the GEO Programme Board.</i>		

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8. CEOS Business and Prep for CEOS Plenary

WGST and OVCMST Next Steps

Presenter: Steve Volz (SIT Chair, NOAA)

Main points:

- Steve reviewed the drivers of the WGST and OVCMST as discussed at SIT-34.
- Paul DiGiacomo’s suggestion on the pilot coastal activity would provide an opportunity to exercise some of the aspects of the merged oceans VCs.

Main discussion points:

- Mark Dowell (COM) suggested tasking the SEO to lead the effort to define the “CEOS External Request Process Paper” rather than creating a new entity to develop the process. Brian Killough (SEO, NASA) was not present to agree but Mark confirmed he had spoken to Brian previously and Brian agreed to lead the development of the External Request Process Paper, but not the market analysis.

CEOS Leadership Continuity [PPT]

Presenter: Steve Volz (SIT Chair, NOAA)

Main points:

- **Status of CEOS Leadership Positions**

Position	2019	2020	2021
CEOS Chair	VAST (P. A. Tuan)	ISRO (DK Das)	NASA
SIT Chair	NOAA (S. Volz)	CSIRO (A. Held)	CSIRO (A. Held)
SIT Vice Chair	CSIRO (A. Held)	ESA	ESA
CEO	ESA/CNES (S. Hosford)	TBD	TBD
DCEO	-	TBD	TBD
WGCapD Chair	ISRO (P. Chauhan)	NASA (N. Searby)	NASA (N. Searby)
WGCapD Vice Chair	NASA (N. Searby)	VAST-VNSC (P. T. M. Thy)	VAST-VNSC (P. T. M. Thy)
WGCV Chair	CSIRO (C. Ong)	CSIRO (C. Ong)	JAXA (A. Kuze)
WGCV Vice Chair	JAXA (A. Kuze)	JAXA (A. Kuze)	TBD
WGClimate Chair	EUMETSAT (J. Schulz)	EUMETSAT (J. Schulz)	DLR (A. von Bargaen)
WGClimate Vice Chair	DLR (A. von Bargaen)	DLR (A. von Bargaen)	TBD
WGDisasters Chair	ASI (S. Zoffoli)	NASA (D. Green)	NASA (D. Green)
WGDisasters Vice Chair	NASA (D. Green)	CNES	CNES
WGISS Chair	ESA (M. Albani)	CSIRO (R. Woodcock)	CSIRO (R. Woodcock)
WGISS Vice Chair	CSIRO (R. Woodcock)	JAXA	JAXA

- **CEOS Chair** has now been identified for 2021 (pending endorsement at the 33rd CEOS Plenary). Overall, the geographic regional distribution of CEOS leadership roles (Chair, SIT Chair) has been pretty evenly distributed.
- The **CEO/DCEO** issue remains unresolved despite proactively searching over the last 12 months. The significant discussion at SEC-254 did not provide a clear way forward, but brought some suggestions to mitigate the issue of searching for future CEOs. The group of past CEO contributing agencies continue to contribute significantly to CEOS leadership in many areas and do not anticipate stepping up to fill the role at this time. A more deliberate forward-looking approach may also help in filling the

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position in the future, but this will not solve the immediate issue. The geographic distribution provides CEOS with a lot of operational flexibility to cover meetings and other obligations.

- The challenge for incoming CEOS Chair and SIT Chair will be to manage and integrate the numerous responsibilities of the CEO. Critical tasks at risk include: CEOS Work Plan; CEOS meeting support; CEOS-GEO liaison; CEOS GEO Work Programme Task inputs, reports, coordination; CEOS leadership support; support to new initiatives; fielding outside queries; and, CEOS admin duties (refer to the *CEOS Executive Officer Terms of Reference*). For CEOS to continue to operate smoothly, CEOS entity leads from VCs, WGs, and AHTs will need to be proactive in providing their inputs.
- When Steve Volz speaks to the Principals over the next two weeks, he will raise this topic to try and identify a candidate.

Main discussion points:

- Christine Bognar (NASA) reflected on the discussion at SEC-254 and reiterated Astrid Koch’s suggestion to identify the chief CEO functions and deliverables that will be impacted without a CEO. Steve Volz confirmed he will work with Steven Hosford to prepare a ‘life without a CEO’ summary for presentation at the 33rd CEOS Plenary. He reiterated however, that the issue will impact most of incoming CEOS leadership – CEOS Chair and SIT Chair – and they will need to take ownership of finding a solution.
- Tim Stryker (USGS) noted that if there is no name put forward, we should keep in mind with the recently increased workload CEOS will be able to accomplish less of that work despite best possible contingency planning.
- Steve noted that even if a candidate cannot be identified now, there may be a way to encourage, prepare, and nurture the next CEO to take over in future by possibly introducing a geographic rotation for CEO whereby Agencies are made aware a few years in advance that they are being asked to provide a CEO. This will allow Agencies time to identify a viable candidate within their agency and “groom” them for the CEO role.

SIT-TW-2019-17	CEO	Prepare for Principal review and consideration at the 33 rd CEOS Plenary, a listing of executive officer functions and deliverables that will be impaired and/or delayed as a result of the vacancy.	For 33rd CEOS Plenary Consideration
	<i>Rationale: Present a report on CEO functions while CEOS leadership works with CEOS Agencies to identify a new CEO, and possibly, a Deputy CEO.</i>		

CEOS SIT Vice Chair Priorities for 2020-2021 SIT Chair Term [PPT]

Presenter: Alex Held (SIT Vice Chair, CSIRO)

Main points:

- CSIRO and GA will take on Chairmanship of the CEOS Strategic Implementation Team (SIT) at CEOS Plenary in October 2019 for a two-year term, and ESA is anticipated to serve as SIT Vice Chair during this term and to take on the role of SIT Chair in late 2021.
- Incoming SIT Chair Team would find it challenging to pick up the CEO duties in the absence of a CEO.
- The team will be focused on a few priorities and continue to work to fulfill the original vision for SIT of making best use of Principals’ time in SIT meetings.

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- The team will seek to differentiate and optimize the role of the two SIT annual meetings, noting that all meetings cannot accommodate reporting of all CEOS business.
 - SIT: Significant debate and decision - for Principals
 - TW: Working Teams reporting, interaction, and preparation for Plenary
- **The three priorities will be:** CEOS ARD Strategy, Carbon and Biomass, and SDGs, and draft detailed timelines for the two years for these three areas have been developed and shared for comment with CEOS and key stakeholders.
- There will be efforts to streamline annual meetings and processes, and focused work areas to consult directly with Working Team (VC, WG, AHT) leadership.
- SIT-35 is planned for the week of 30th March 2020, but this date is under review assessing options to mitigate some meeting calendar conflicts.
- SIT-TW 2019 is planned for Zagreb, Croatia in week of 7th September 2020.

Main discussion points:

- Steve Volz (SIT Chair, NOAA) asked about plans for the 3-4 ‘all hands telecons’ and , noted the challenge his team had in getting the just two or three Working Team leadership together for joint calls. Alex noted the exact mechanics for the ‘all hands telecons’ are being considered.
- Steve suggested the CSIRO/GA Team provide specific elements and activities in support of the incoming SIT Chair priorities that Principals may wish to consider committing to at Plenary.

SIT-TW-2019-18	SIT Vice Chair	Develop a draft set of specific elements and activities that CEOS Agencies may want to contribute to during the 2020-2021 SIT chairmanship of CSIRO and Geoscience Australia.	For 33rd CEOS Plenary Consideration
<i>Rationale: Provide CEOS Agencies with options to consider contributing to or supporting.</i>			

Incoming CEOS Chair Objectives [PPT]

Presenter: Raj Kumar (Incoming CEOS Chair Team, ISRO)

Main points:

- ISRO plans continuity of the priorities and initiatives identified by the 2018 Chair (European Commission), 2019 Chair (VNSC) and current SIT Chair (NOAA), and discuss priority Work Plan tasks with CSIRO.
- In addition, ISRO will pursue promoting ‘Real Constellations’ (RC); developing a geo-processing tool for disasters; initiating a Data Cube for Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation (BIMSTEC) Region (Bangladesh, India, Myanmar, Sri Lanka, Thailand, Bhutan, and Nepal); and, sharing and expanding an Indian-developed renewable energy assessment from space initiative.

Main discussion points:

- Steve Volz (SIT Chair, NOAA) suggested developing specific requests that CEOS Principals could consider supporting in preparation for and during Plenary and providing that list well before Plenary so Principals have an opportunity to review and assess possible contributions.

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SIT-TW-2019-19	Incoming CEOS Chair	Develop a draft set of specific elements and activities that CEOS Agencies may want to contribute to during ISRO's terms as the 2020 CEOS Chair.	For 33rd CEOS Plenary Consideration
	<i>Rationale: Provide CEOS Agencies with options to consider contributing to or supporting.</i>		

CEOS Plenary Preparations

Presenter: Lam Dao Nguyen (CEOS Chair Team, VNSC)

Main points:

- A [CEOS Plenary Guidebook](#) has been prepared which includes details of CEOS Plenary. Nguyen encouraged all to submit their travel visa applications as soon as possible.
- The hotel block booking ends Friday 13 September.
- [CEOS Plenary Agenda v0.5](#) has recently been circulated for comment.

AOB

No AOB was raised.

Review of Actions [PPT]

Presenter: Steve Volz (SIT Chair, NOAA)

Main discussion points:

- [2.5:](#) Werner Balogh (WMO) asked whether this item should be expanded beyond OSCAR, and Steve Volz suggested keeping it tangible and related to OSCAR. There was also a suggestion from Paula Bontempi (NASA) to add a WMO point of contact to this item.
- [3.2:](#) Suggestion to task SEO with leading the development of the new process.
- [3.3:](#) Noting the suggestions that coasts is a good pilot integrator for the merger of Oceans VCs considered. (Noted under [7.2.](#))
- [4.7:](#) Understanding is that VNSC is interested and has nominated a candidate for WGCapD Vice Chair; awaiting formal letter of nomination to be presented for endorsement at the 33rd CEOS Plenary.
- [7.2:](#) Initial scoping by 33rd CEOS Plenary.
- The VC leadership matters will be discussed during the SIT Chair session during Plenary.

Kerry Sawyer (SIT Chair Team, NOAA) thanked Ken Casey (SST-VC, NOAA) for his consistent contributions to SST-VC, the OVCMST, and CEOS overall, noting that this was Ken's last CEOS meeting in leadership role.

Mauro Facchini (COM) thanked Steve and the NOAA team personally for their efforts in chairing SIT over these past two years.

SIT Chair Closing Remarks

Steve Volz thanked the University of Alaska, Fairbanks (UAF) staff who supported the meeting and all SIT Technical Workshop attendees and closed the meeting.



List of Participants

Organization	Participant	Organization	Participant
ESA/CNES	Steven Hosford	NASA	Christine Bognar
COM	Astrid-Christina Koch	NASA	<i>Brad Doorn (GTM)*</i>
COM	Mauro Facchini	NASA	Dave Jarrett
COM	Mark Dowell	NASA	David Crisp
COM	Kamil Kiljanski	NASA	Brian Killough
CSA	Paul Briand	NASA	<i>David Green (GTM)*</i>
CSIRO	Alex Held	NASA	Argyro Kavvada
CSIRO	Cindy Ong	NASA	Wenyng Su
DLR	Albrecht von Bargaen	NASA	Lauren Childs-Gleason
ESA	Ivan Petiteville	NASA	Lawrence Friedl
ESA	Marc Paganini	NASA	David Borges
ESA	Mirko Albani	NASA	<i>Jay Al-Saadi (GTM)*</i>
EUMETSAT	Paul Counet	NASA	Gail Skofronick-Jackson
EUMETSAT	Robert Husband	NASA	Jorge Vazquez
EUMETSAT	Jörg Schulz	NOAA	Steve Volz
EUMETSAT	<i>Ewa Kwiatkowska (GTM)*</i>	NOAA	Kerry Sawyer
EUMETSAT	<i>Remko Scharoo (GTM)*</i>	NOAA	Paul DiGiacomo
GA	Trevor Dhu	NOAA	Ken Casey
GA	Jonathon Ross	NOAA	Albert DeGarmo
GA	Andreia Siqueira	NOAA	Charles Wooldridge
GCOS	<i>Carolin Richter (GTM)*</i>	NOAA	Mitch Goldberg
GEO Secretariat	Doug Cripe	NOAA/Symbios	Stephen Ward

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GOOS	<i>Albert Fischer (GTM)*</i>	NOAA/Symbios	George Dyke
ISRO	Harikrishnan G	UKSA	Bertie Archer
ISRO	Raj Kumar	USGS	Jenn Lacey
JAXA	Osamu Ochiai	USGS	Tim Stryker
JAXA	Hitoshi Tsuruma	USGS	Steve Labahn
JAXA/RESTEC	Tsugito Nagano	USGS	Steve Covington
JAXA	<i>Akihiko Kuze (GTM)*</i>	VNSC	Lam Dao Nguyen
NASA	Paula Bontempi	WMO	Werner Balogh

**GTM - joined via GoToMeeting*

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Record of Actions from the 2019 SIT Technical Workshop

SIT-TW-2019-01	CEO	Distribute the updated information on the new online CEOS Deliverables Tracker to CEOS Agencies and request inputs.	ASAP (Inputs due before end September)
	<i>Rationale: Reinforce the credibility of CEOS as an organization through a “define-monitor-report” approach to work planning.</i>		
SIT-TW-2019-02	Werner Balogh	Work with SIT Chair to draft a letter from WMO to CEOS leadership explaining the outlook for OSCAR and how space agencies might assist with inputs. The letter should provide the appropriate WMO point of contact with whom CEOS Agencies can follow up.	30 September 2019
	<i>Rationale: Inform CEOS Agencies of what OSCAR requires so Principals can consider before and discuss at Plenary. Include in the letter a brief description of what the WMO will do with the information and how CEOS will also benefit from the effort.</i>		
SIT-TW-2019-03	WGST	Integrate feedback from SIT TW and finalize the Study Team report for SIT Chair presentation to the 33 rd CEOS Plenary.	30 September 2019
	<i>Rationale: Provide Plenary with the findings and recommendations to consider at Plenary.</i>		
SIT-TW-2019-04	SEO	Develop a “CEOS External Request Process Paper.”	SIT-35
	<i>Rationale: The External Request Process Paper is expected to streamline and guide the processing of requests from external partners.</i>		
SIT-TW-2019-05	SIT Chair Team	Propose the creation of a Task Team to conduct an assessment of the potential user community needs and external demand for CEOS observations (a “market analysis”).	For 33rd CEOS Plenary
	<i>Rationale: The market analysis will help CEOS assess the potential associated workload.</i>		
SIT-TW-2019-06	OVCNST	Integrate feedback from the SIT TW and finalize the Study Team Report for SIT Chair presentation to the 33 rd CEOS Plenary.	30 September 2019
	<i>Rationale: Provide Plenary with the findings and recommendations to consider at Plenary.</i>		
SIT-TW-2019-07	SIT Chair Team	Develop a set of recommendations and observations regarding communication and engagement by Virtual Constellations with CEOS leadership and other elements. To be presented at the Plenary.	For 33rd CEOS Plenary
	<i>Rationale: Insufficient two-way interactions between some VCs and other elements of CEOS was identified as a recurring theme at the SIT TW.</i>		
SIT-TW-2019-08	WGClimate GHG Team Leader	Provide Principals at the 33 rd CEOS Plenary an idea of resources envisioned to support the proposed GHG Roadmap.	30 September 2019
	<i>Rationale: Provide Principals with an estimate of resources needed for the proposed GHG Roadmap and ask them to consider and respond before SIT-35 in April 2020.</i>		
SIT-TW-2019-09	CEOS Agencies	Consider nominating qualified candidates for Vice Chair of the Working Group on Calibration and Validation (WGCV).	For 33rd CEOS Plenary
	<i>Rationale: WGCV Vice Chair position will be vacant at the conclusion of 34th CEOS Plenary.</i>		
SIT-TW-2019-10	VAST/VNSC	VAST/VNSC to formally submit for CEOS endorsement its nomination of a candidate for Vice Chair of the Working Group on Capacity Building and Data Democracy (WGCpD).	For 33rd CEOS Plenary
	<i>Rationale: VAST/VNSC has indicated interest in nominating a candidate for WGCpD Vice Chair position; a formal letter of nomination is needed.</i>		

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SIT-TW-2019-11	AC-VC Co-Leads	Circulate AQ White Paper widely for review ahead of request for 33 rd CEOS Plenary endorsement. Work with SIT Chair Team to prepare letter to circulate with the Paper explaining the context and implications to Principals.	30 September 2019
	<i>Rationale: Provide Principals and Agencies with sufficient time to review the AQ White Paper prior to 33rd CEOS Plenary.</i>		
SIT-TW-2019-12	SIT Chair Team	Finalize and circulate the changes to the VC Leadership Succession Text that will be presented for endorsement at the 33 rd CEOS Plenary.	30 September 2019
	<i>Rationale: Provide Principals and Agencies with sufficient time to review prior to potential endorsement at the 33rd CEOS Plenary.</i>		
SIT-TW-2019-13	SIT Chair Team	Finalize and circulate the changes to the AHT Life Cycle Text that will be presented for endorsement at the 33 rd CEOS Plenary.	30 September 2019
	<i>Rationale: Provide Principals and Agencies with sufficient time to review prior to potential endorsement at the 33rd CEOS Plenary.</i>		
SIT-TW-2019-14	Paul DiGiacomo, SIT Chair Team, and SIT Vice Chair Team	Develop a Coastal Study Team proposal for consideration as a crosscutting CEOS activity, and present the proposal for discussion and decision on the establishment of a Study Team at the 33 rd CEOS Plenary.	30 September 2019
	<i>Rationale: Follow-up on discussions around coordination on coastal observations between several CEOS VCs, including as a demonstration of how Oceans VCs could work together on a focused topic.</i>		
SIT-TW-2019-15	CEOS Agencies	CEOS Agencies that are interested in proposing a candidate to represent CEOS as an Alternate to the GEO Programme Board are asked to submit names to CEOS Executive Officer.	Nominations due 24 September 2019
	<i>Rationale: Ensure continuity of CEOS representation on the GEO Programme Board.</i>		
SIT-TW-2019-16	SIT Chair Team and CEO	SIT Chair Team and CEO to confirm the proposed CEOS representatives to GEO Programme Board (PB) and prepare nomination package for signature by the CEOS Principal/Alternate to GEO; send package to GEO Secretariat confirming the CEOS nomination to continue as Participating Organization on GEO PB.	27 September 2019
	<i>Rationale: Ensure continuity of CEOS representation on the GEO Programme Board.</i>		
SIT-TW-2019-17	CEO	Prepare for Principal review and consideration at the 33 rd CEOS Plenary, a listing of executive officer functions and deliverables that will be impaired and/or delayed as a result of the vacancy.	For 33rd CEOS Plenary Consideration
	<i>Rationale: Present a report on CEO functions while CEOS leadership works with CEOS Agencies to identify a new CEO, and possibly, a Deputy CEO.</i>		
SIT-TW-2019-18	SIT Vice Chair	Develop a draft set of specific elements and activities that CEOS Agencies may want to contribute to during the 2020-2021 SIT chairmanship of CSIRO and Geoscience Australia.	For 33rd CEOS Plenary Consideration
	<i>Rationale: Provide CEOS Agencies with options to consider contributing to or supporting.</i>		
SIT-TW-2019-19	Incoming CEOS Chair	Develop a draft set of specific elements and activities that CEOS Agencies may want to contribute to during ISRO's terms as the 2020 CEOS Chair.	For 33rd CEOS Plenary Consideration
	<i>Rationale: Provide CEOS Agencies with options to consider contributing to or supporting.</i>		