

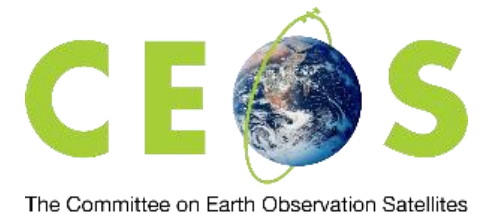
# Status of Joint CEOS/CGMS WGClimate

Jörg Schulz, EUMETSAT

Chair Joint CEOS/CGMS Working Group on Climate

Albrecht von Barga, DLR

Vice Chair Joint CEOS/CGMS Working Group on Climate



- Goals for this meeting
- Achievements since WGClimate #12
- Data record definitions
- ECV Inventory, gap analysis, action plan
- GCOS status report and next IP
- WGClimate and UNFCCC
- Collaboration with WCRP, GSICS, and SCOPE-CM on the example of ISCCP-NG
- CEOS and CGMS Action Status
- Next meeting?

# Goals for this meeting

- Discuss WGClimate elements presented in status report including ECV Inventory, (F)CDR definitions, GCOS (requirements process), UNFCCC, WCRP, etc.
- Discuss use case exercise, in particular how we work the received cases up to publication;
- Prepare for CEOS Plenary on GHG roadmap, products for GST-1, CEOS AFOLU activity and further engagement in UNFCCC;
- Inform on new GEO Climate Change Working Group;
- Hand over chair function to Albrecht!

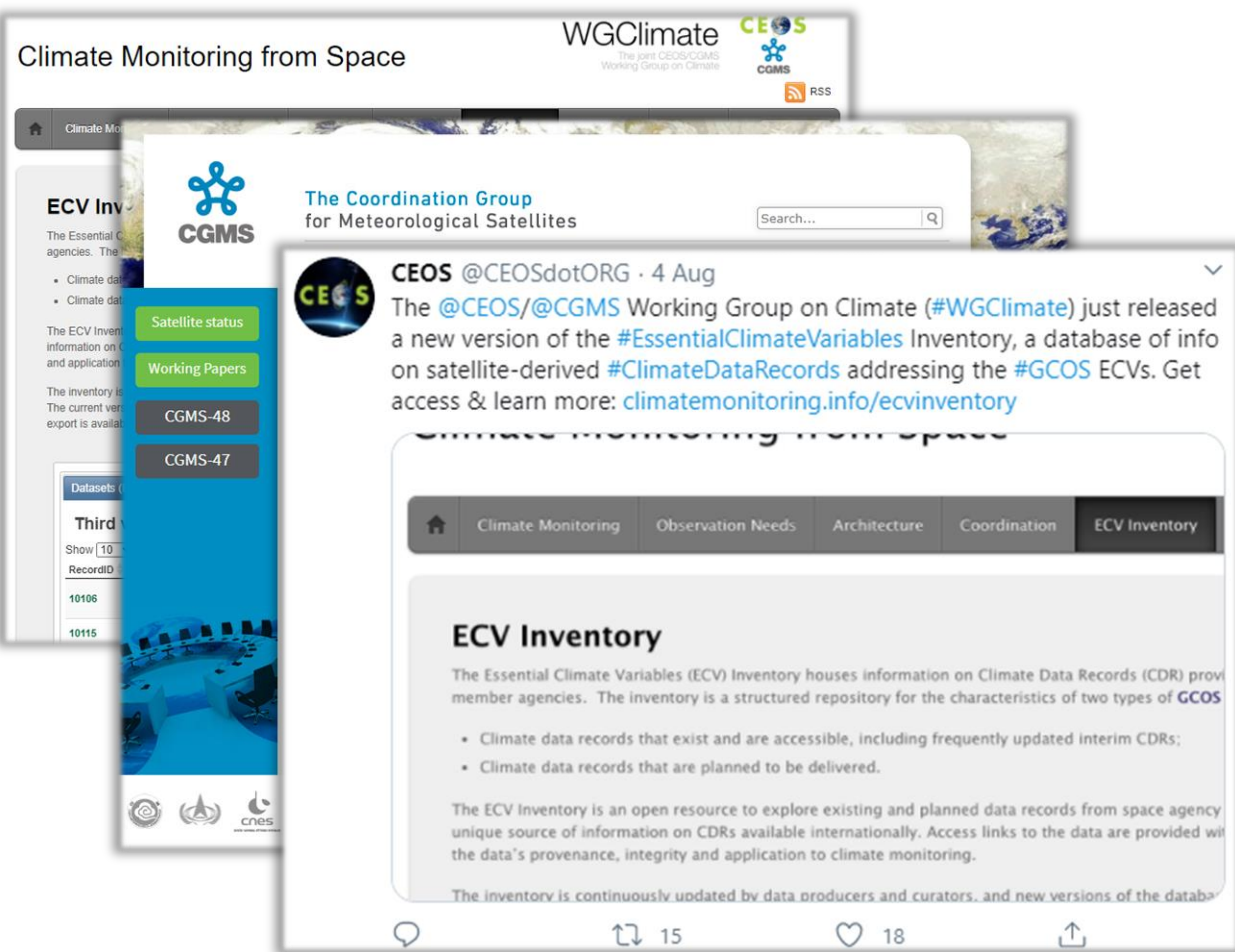
- Published ECV Inventory #3.0, July 30, 2020 on <https://climatemonitoring.info/ecvinventory>;
- Continued work on gap analysis but are behind schedule, still hampered by COVID-19, and will not make it for endorsement at CEOS Plenary
- Published call for new Use Case Exercise, July 27, 2020 on <https://climatemonitoring.info/use-cases> and received 5 case descriptions – **Agenda Item 2**
- Achieved endorsement of GHG Roadmap at CGMS-48 including way forward for CGMS engagement. - **Agenda Item 4**
- Updated CGMS High Level Priority Plan - Monitoring of Climate including Greenhouse Gases is now a separate section and not only a new challenge

# Achievements since last meeting - II

- Had good discussion with GCOS at CGMS-48 Plenary and CEOS TW on possible evolution of GCOS requirements framework
- Engaged with new GEO Climate Change Working Group – **Agenda Item 3**
- Had further consultations with UNFCCC on first Global Stocktake - **Agenda Item 4**
- Supported WCRP GEWEX to get a collaboration with CGMS on the ISCCP-NG project going
- Supported SCOPE-CM at CGMS-48 to get new Implementation Plan endorsed
- Received endorsement for new Vice Chair Jeff Privette at CGMS-48 and will do at CEOS Plenary as well

# Data record definitions

- Did not make a lot of progress since May 2020, but are still on it and have a first draft entitled: *A Reference Framework for Satellite-derived Climate Data Records*;
- Encouraged feedback from GSICS Executive Panel did not arrive;
- Writing team: Jeff Privette, Chris Merchant, Kurt Thome, and Jörg Schulz – could still add a GSICS person if felt necessary
- Internal review team: did not collect names in May but should be within WGClimate or known experts close to WG to enable fast progress
- Broader review: GCOS, ECV Inventory responders, GSICS, ...
- Schedule: Draft by December 2020 – review by March 2021 – consider status at next WGClimate meeting



The collage includes:

- A screenshot of the "Climate Monitoring from Space" website header with the WGClimate logo.
- A sidebar menu with "Satellite status", "Working Papers", "CGMS-48", and "CGMS-47".
- A Twitter post from @CEOSdotORG dated 4 Aug, announcing the release of the new version of the Essential Climate Variables Inventory.
- A screenshot of the "ECV Inventory" website page, showing a navigation menu and introductory text: "The Essential Climate Variables (ECV) Inventory houses information on Climate Data Records (CDR) provided by member agencies. The inventory is a structured repository for the characteristics of two types of GCOS..."

Publication of the ECV Inventory v3.0 (end of July)

- Database live on <https://climatemonitoring.info/ecvinventory> (30<sup>th</sup> July)
- Announcement / advertising e-mail message sent to WGClimate and ECV Inventory contributors (31<sup>st</sup> of July) [followed by dissemination through CEOS and CGMS mailing lists in early August]
- Publication of a news story on the CGMS website (<https://www.cgms-info.org/index.php/cgms/news>) and Twitter note from CEOS [followed by re-tweet by EUMETSAT] (<https://twitter.com/CEOSdotORG/status/1290703991563857921?s=20>) (early August)
- Big THANKS to all agencies and involved people!

Domain	Existing	Planned	Total
Atmosphere	535	266	801
Ocean	90	43	133
Land	141	62	203
Total	766	371	1137

- GCOS IP space-observables: 37 ECVs (13 Atmosphere, 15 Land, and 9 Ocean) – 35 ECVs covered with some contribution in Inventory V3
- ECVs Lightning, Permafrost, and Above-ground Biomass represented for the first time
- From current ECVs only Ocean Surface Currents and Anthropogenic GHG fluxes appear as gaps, but some more ECVs can be addressed from space, e.g., river discharge.

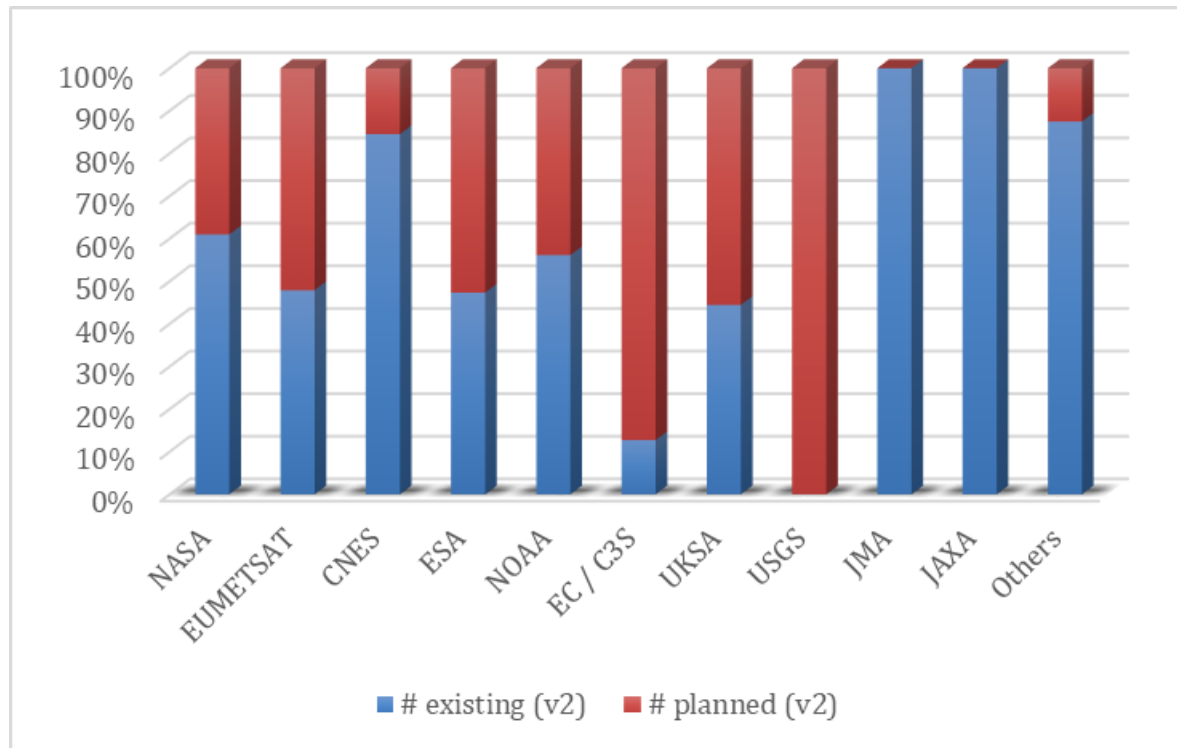


# Gap analysis and coordinated action plan

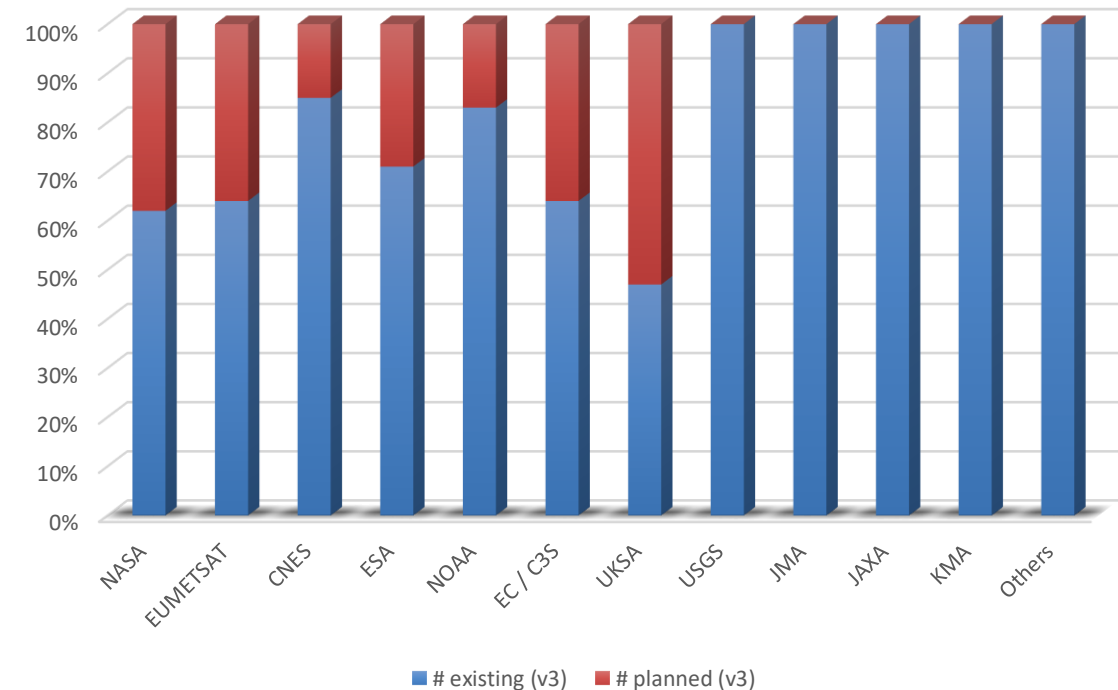
- The delivery of the Cycle 3 Gap Analysis and Coordinated Action Plan has moved to autumn 2020 (due to COVID-19 impact on EUMETSAT contractors), and is not ready for CEOS Plenary (20-22 October) approval. Aim at virtual endorsement until end of 2020
- Gap analysis process will be further rationalised to ensure affordability. It will involve an annual workshop to which agencies are requested to send experts on ECVs
- Many of the Coordinated Actions found their way into the CEOS work plan, not all though
- CGMS Action 47.11 and CEOS Routine Action is kept open until endorsement

# Relative number of existing and planned data records per agency

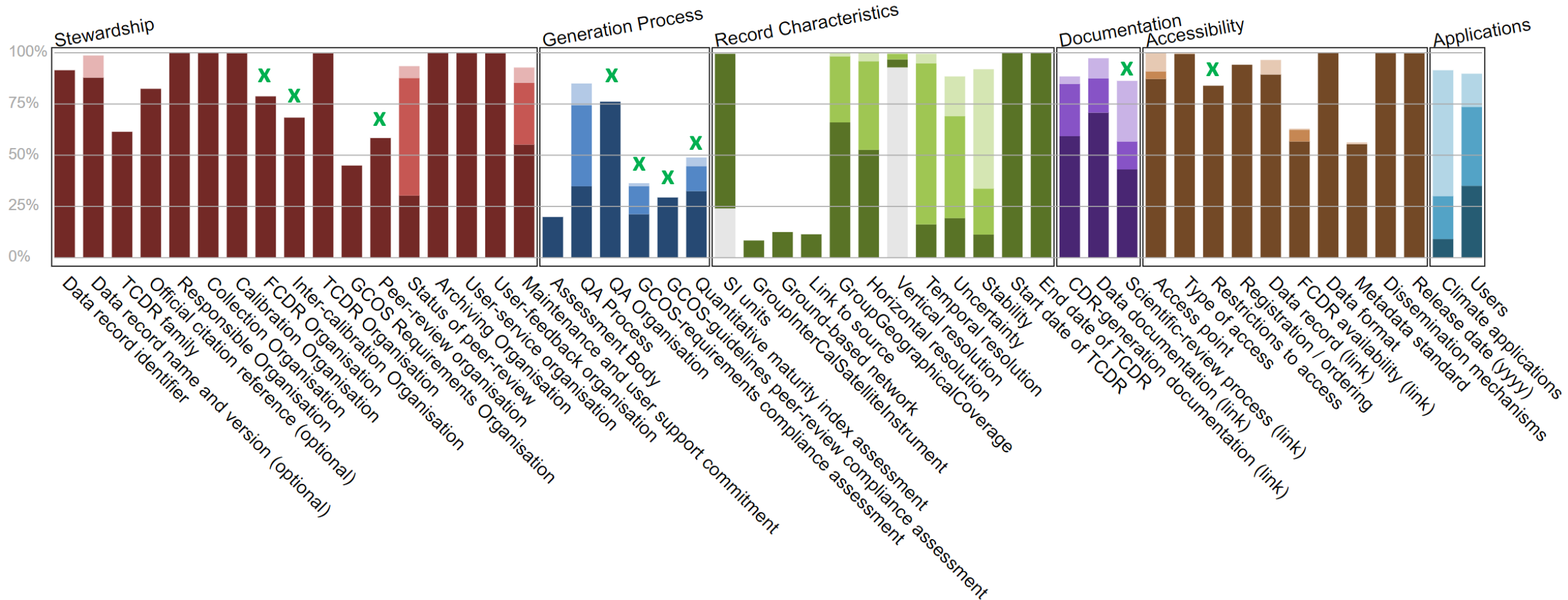
## ECV Inventory #2



## ECV Inventory #3



# Assessment of GCOS Criteria for existing data records



\* mid-October ← (continuous data collection) ← [\*] delta wrt. WGC#12 [early May]

1686 records in the database ↑ [+131*]		
1557 records "available" ↓ [+129*]		129 records "deleted"
1478 records "submitted" ↓ [+148*]		
1080 records "verified" ↓ [+6*]	398 records "TBC"	79 records "in progress"

[GCOS-200 (space-observed): 37 ECVs = 13 Atmosphere + 15 Land + 9 Ocean]

ECV Inventory ("submitted"): 35 ECVs = 13 Atmosphere + 14 Land + 8 Ocean

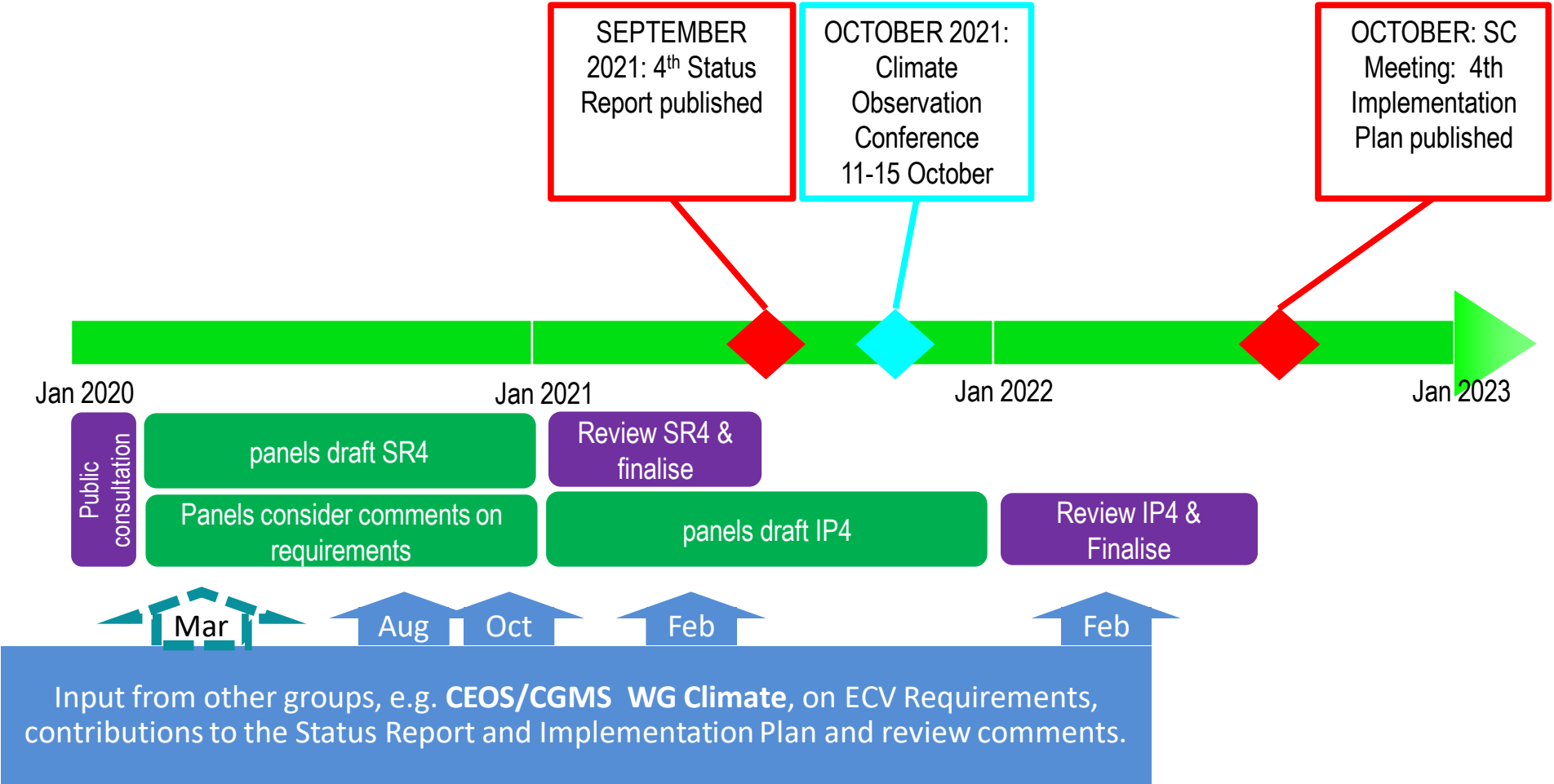
- Total gaps [Level of ECV]: 0 Atmosphere + 1 Land (Anthropogenic GHG fluxes) + 1 Ocean (Surface currents)
- (Additional) Partial Gaps [Level of ECV Product]: 0 Atmosphere + 6 Land (Albedo, LAI, FAPAR, Glaciers, Lakes, Soil moisture) + 1 Ocean (Ocean-surface heat flux (radiative flux))

Progress:

- More entries on AGB (NASA)
- MODIS Fire products (NASA) [identified missing datasets in GA Report]
- *Existing* entry on Temperature of deep atmospheric layers [(A)MSU: 1978-] (NOAA)
- CMA has initiated its contribution process
- JAXA and KMA consolidating contribution
- C3S and CCI started update process
- "Pen-testing" revealed some potential exposure of ECV Inventory server to hackers [no attacks recorded!] → fixing is requiring re-design of some tools/features → delay in migration to the new URL [~late October], verification process, and evolution of tools

Way forward: Resume verification process in October [priority to leftovers from v3.0!] & try to fill identified gaps → **publish v4.0 in Q1.2021**

# GCOS Timeline



Courtesy of GCOS

# Discussion at CEOS TW: Efficiencies in GCOS Requirements process

- GCOS has been an effective partner, and the GCOS IP and requirements are the primary framework against which agencies make substantial investments in the space segment for climate and climate data record production
- There is increasing need for application specific requirements (e.g. for GHGs)
- Would make the space agency coordination, as well as individual agency investment more efficient. Our preference is to maintain GCOS as primary “source” of EO requirements.
- **CGMS-48 Recommendation:** WMO to ensure that the GCOS requirements, as well as the process to define them, are designed in such a way that requirements stemming from the agencies need to assess performances can be captured.
- Can we define a typology of requirements for ECV products in all domains, i.e., linking the requirements with the GCOS objectives?
- Can we use the WGClimate Case Study Exercise to emerge some additional and refined requirements?
- What are opportunities for gathering requirements, e.g., for adaptation through other initiatives e.g. WMO GFCS, GEO Climate Change WG?
- Can the envisaged GCOS study team help in this process? What could be realistically achieved for next GCOS IP?
- What are the implications for ECV Inventory, Gap Analysis, and Action Plan process?

# GCOS Discussion at CEOS TW: Outcome

- CEOS is asked to be more specific on their points and needs and to make proposals to GCOS to address the points made on the structure of requirements and dialogue can go from there.
- Changes to the GCOS IP can be addressed by GCOS Secretariat and the current GCOS Steering Committee
- GCOS is underway to organise a telecon soon to further discuss our concerns on the ECV requirements and to devise a way forward. A starting point could be carbon related requirements, where already material exist.
- GCOS Study team will be getting kicked off soon as well and will look at governance and outputs. The proposal made at CEOS TW on interim updates of the ECV requirements could be looked at by the study team. This would be interesting to improve the situation incrementally and not only every 5 years.
- Brought also up the question if anyone has checked back on GCOS IP Land chapters if AFOLU related requirements, e.g. related to biomass are captured. AFOLU team could engage to help evolution of requirements.



- SBSTA-52/COP-26 has been postponed to 2021 due to the COVID-19 pandemic. No formal statements will be made in 2020
- An Earth Info Day is planned for the second week of the climate change dialogues – week beginning 30 Nov 2020
- The CEOS/CGMS WGClimate will further provide support to the UNFCCC Secretariat and the Parties in the Synthesis and Assessment phase of the first Global Stocktake process and will actively engage in the newly established *adhoc* group on Systematic Observations on support of the Global Stocktake.
- CEOS nominated 3 people: David Crisp, Osamu Ochiai, Jörg Schulz



# New Cloud Property Climate Data Records: Motivation, Aims, Challenges and First Steps

- Completion of the new geo-ring with advanced geostationary imagers in ~2022 motivates a redesign of cloud data records to exploit these new capabilities and bring them to the climate and process-study communities
- The new sensors provide additional information absent from the original GEWEX ISCCP and other cloud data records, such as cloud dynamics, cloud microphysics, aerosol, and diurnally consistent cloud climatology
- A first Workshop on such new data records was held Oct 28-30, 2019 at EUMETSAT organized by WCRP/ GEWEX. 50 participants from CMA, EUMETSAT, JMA, KMA, NOAA, NASA, and other interested institutes attended. Major results are:
  - WCRP/GEWEX plans a project (currently called ISCCP-NG) with international partners including CGMS (estimated length approx. 10 years)
  - New data records shall be consistent with past climatology for common information
  - There is a clear need for cross-calibrated radiometric data for all involved geostationary instruments
  - A Polar satellite component is not yet specified but will likely have an equal-role as the geo component
  - Creating and maintaining the data records and the unimagined applications achieving manageable data volumes is the challenge
  - Cloud Computing and other infrastructure developments are making the project more appealing

- The workshop realised:
  - Generating climate-quality radiometric data records from advanced geostationary imagers is a complex process
  - Consistency with past climatology for common information is achievable, but most likely requires a reprocessing of historic data
  - New methods for data rescue, quality control, re-calibration, and uncertainty estimation for past sensor radiances are available to improve historic radiometric data records
- **The new project plans to leverage the work of space agencies in the Global Space-based Intercalibration System (GSICS), the Sustained COordinated Processing of Environmental Satellite Data for Climate Monitoring (SCOPE-CM) and the CGMS International Cloud Working Group (ICWG)**
  - GSICS would be required to provide calibration and cross-calibration information for all channels (some are still missing), solve issues at cold temperatures needed for cloud retrievals, provide uncertainty estimates for radiances, which is important for cloud microphysical properties, aerosol retrieval, etc..
  - SCOPE-CM is encouraged to retain the IOGEO project and make it fit to produce a consistent 'geo-ring' L1 radiance climatology including uncertainty estimates
  - CGMS ICWG is requested to discuss, advise, and assess L2 products of cloud properties



# Project Organisation and Engagement of CGMS Agencies

- The new international project plans a next Workshop in 2021 to further develop its plan
- Once the planning contains specific data records those will be added into the planned category of the CEOS/CGMS WGClimate GCOS ECV Climate Data Record Inventory <https://climatemonitoring.info/ecvinventory/>
- The new project should be considered a project within an international framework close to space agencies. GSICS and SCOPE-CM as well as CGMS ICWG coordination mechanisms are seen as important to coordinate and execute the work with scientific guidance from the GEWEX Data and Analysis Panel (GDAP)
- The GEWEX Science Steering Group and the **CEOS/CGMS WGClimate** are seen as suitable bodies providing oversight
- **Space agencies, in particular those operating geostationary satellites, are encouraged to make commitments within GSICS and SCOPE-CM that enable the creation and maintenance of the cross-calibrated 'geo-ring' radiance climate data record and in second step to a project for the cloud property data records**

More detailed information about the project can be found in the CGMS WG II presentation: *ISCCP-NG-JWGClimate White Paper on clouds* by (A. Heidinger, J. Schulz, G. Stephens, R. Roca, T. L'Ecuyer, B. Kahn) (<https://www.cgms-info.org/agendas/agendas/CGMS-48>)

No.	Action	Due Date
<b>CEOS-32-02</b>	WGClimate to develop a 'decision-maker' version of the Statement of Space Agency Contributions in Support of Each Article of the Paris Agreement.	In Progress Targeting completion by the next CEOS Plenary.

Was not possible, may discuss if action shall be retained.

New Action from CGMS-48.

No.	Action	Due Date
<b>CGMS-48</b>	JWGC/GHG TT Chair to define priorities for CGMS WG contributions (The CGMS WG have an action to identify the relevant PoCs in each of the 4 standing WGs)	CGMS-49

Number	Title	Status	Creation year	Completion date	Description
CMRS-20-01	Implement plan for case studies on CDRs	open	2020	30/09/2022	Based on the plan presented at CEOS Plenary 2019 case studies will be collected and presented in similar style as in first WMO publication 2015. A subset will be published as WMO report and the rest will be presented on <a href="https://climatemonitoring.info">https://climatemonitoring.info</a> .
CMRS-19-06	Implements Coordinated Actions 5 on FCDR Inventory; 6 on nomenclature document for CDRs; 10 on meta data standards	open	2019	30/09/2021	Upgrade the ECV Inventory technically that it can provide information on Level 1 base data records (FCDRs) used for CDRs of GCOS ECVs. Provide to CEOS agencies documentation on CDR related nomenclature and meta data standards.
CMRS-19-04	Provide oversight to the implementation of the greenhouse gas monitoring activities (Coordinated Actions 11; 13; and 14).	open	2019	30/09/2026	Three tasks are described: <ul style="list-style-type: none"> <li>Establish a roadmap for the development of a GHG monitoring system</li> <li>Deliver first data from a prototype GHG monitoring system to the Global Stocktake 2023 and engage users with it</li> <li>Develop the initial operational GHG monitoring system</li> </ul>
CMRS-19-05	Update definitions for FCDR, CDR, ICDR (Coordinated Action 1)	open	2019	30/09/2020	Update definitions for Fundamental Climate Data Records; Climate Data Records for GCOS ECVs and Interim Climate Data Records for both types of data records. It is planned to agree on definitions at 10th and 11th WGClimate meetings during 2019.
CMRS-19-03	Support to the GCOS Status report on observing systems for climate monitoring	open	2019	30/09/2021	WGClimate shall support to the assessment of the fulfilment of the 2016 GCOS IP. Outputs from the gap analysis reports shall provide a solid picture of space agencies contributions. In addition; WGClimate will provide direct inputs to the text of the GCOS Status Report for relevant sections.

# Relevant CEOS Carbon Actions

Number	Title	Status	Creation year	Completion date	Description
CARB-20-01	Develop a CEOS AFOLU roadmap	open	2019	31/12/2021	The AFOLU roadmap is part of the broader convention engagement strategy; seeking for a more integrated; connected and end-to-end system for interaction between space data providers and policy users including the convention community in UNFCCC; IPCC etc; as well as national inventories people. The roadmap will be similar to that developed for GHG observations; with a view to integration of the two in the medium term. It will address agriculture; forestry and other land use (AFOLU) observations including CEOS interests in GFOI and GEOGLAM. New biomass capabilities will be included.
CARB-20-02	Integrated Carbon Cycle interface between CEOS and the UNFCCC	open	2019	31/12/2021	<p>Building on the important connections established by WGClimate, this task will explore enhancement of the relationship between space data providers and the policy needs of conventions and the parties to the conventions - seeking to ensure an integrated process that assures policy relevance of CEOS data and links to the space agency planning processes from conventions and parties. First steps will include a number of events in 2020:</p> <ul style="list-style-type: none"> <li>• a virtual GHG-AFOLU workshop;</li> <li>• invitations to UNFCCC SEC and GCOS to SIT TW virtual session in collaboration with WGClimate. Topics will include the opportunity for space agency and CEOS support to the Global Stocktake process. Inventory and Global Carbon Project experts were invited to SIT-35.</li> </ul> <p>SIT Chair will revisit the issue of CEOS observer status in UNFCCC.</p>



5. Advance the Architecture for Space-based Monitoring of Climate Including Greenhouse Gas Monitoring (through the joint CEOS-CGMS Working Group on Climate)
  - a. **Update ECV Inventory** (with traceability to satellite CDR holdings) of Climate Data Records, Gap Analysis and Coordinated Action Plan (CAP) of CEOS and CGMS and JWG Climate and report on status of JWG actions the implementation of the CAP (This target is cyclic and all three parts are covered every year including endorsement by CEOS and CGMS);
  - b. **Report to and interact with the UNFCCC Subsidiary Body for Scientific and Technological Advice – Research and Systematic Observation (SBSTA-RSO)** to foster usage of satellite data in the context of the Paris Agreement, in particular results from the operational GHG monitoring system. (This target is also part of the cyclic regular annual reporting);
  - c. **Respond to the GCOS IP** after new versions of it issued by GCOS (every 5 years). Provide support to GCOS mid-term assessment on progress in time for the GCOS status report (1 year ahead of the new GCOS IP);
  - d. **Engage with the implementation of a global GHG monitoring system using the CEOS/CGMS whitepaper on a constellation architecture for monitoring atmospheric CO<sub>2</sub> and CH<sub>4</sub> concentrations** and their natural and anthropogenic fluxes from space to support climate policy as reference;
    - **JWGClimate Task Team on GHG monitoring to coordinate the specific CGMS contributions to the operational GHG constellation**, covering activities on mission coordination, inter-calibration, product prototyping, data distribution, exchange, formatting, and on training and outreach.
  - e. Foster the implementation of the architecture for climate monitoring from space **by strengthening the analysis of use cases for climate data records** to increase usage in climate services and science uptake by users.
  - f. JWGClimate to **publish updated definitions for the for Fundamental, Thematic, and Interim Climate Data Record**.

(CEOS Working Group on Information Systems and Services) Carbon Community Portal  
(<https://gis.csiss.gmu.edu/carbon/cwicport/>),

---

<b>WGClimate11-1</b>	<b>Explore capabilities of the WGISS Carbon Portal and synergies with GHG monitoring activities and provide guidance.</b>	<b>All</b>	<b>Next WG Climate meeting</b>
----------------------	---	------------	--------------------------------

---



# The role of non-GCOS ECVs for the ECV Inventory

## Status at WGClimate #11:

- Discussion of the relationship on non-GCOS climate variables and the ECV Inventory;
- Discussed the non GCOS-exclusiveness, and proposed some criteria that could be used to decide whether CDRs addressing such non-GCOS variables should be included in the Inventory;
- Concerns were raised that this may lead to even more data records in the ECV Inventory, and may dilute the ECV Inventory's authority if we detach from GCOS reference;
- Discussed if we do it, we need to set a high bar, asking the data producers to show that the variable being proposed for inclusion is of high value for climate applications;
- On variables that might be accepted we proposed orientation along variables referenced in GCOS IP, but not being ECV, and IPCC reports.

---

<b>WGClimate11-3</b>	<b>Prepare process for selection of non-GCOS climate variables to be accepted in the ECV Inventory.</b>	<b>Jeff Privette,</b>	<b>Next meeting</b>	<b>WGClimate</b>
----------------------	---	-----------------------	---------------------	------------------

---

## Status at WGClimate #11:

- All the official information about the WGClimate membership, meetings and respective material (agendas, minutes, supporting documents) would still be placed exclusively on the CEOS website.
- Case Studies to be considered as a shop window to have applications as a central point, based on the fact that the current EC funding for the ECV Inventory aims at supporting the policy decision-making.
- Contents and appearance of the front page are the key to capture the users' interest. Climate monitoring from space should be presented in its key roles on decision making for agriculture, energy production, transportation, city planning, etc..

---

### WGClimate11-9

**Compose list of climate applications to be displayed on the front page of climatemonitoring.info and prepare a mock-up of the web site with two or three possible versions.**

**Robert  
Husband,  
Privette**

**Next  
Jeff meeting**

**WGClimate**

## Status at WGClimate #11:

- Discussion of the WMO catalogue of climate data: <https://climatedata-catalogue.wmo.int/>. 18 data sets (in situ and satellite) with the WMO Stewardship Maturity Matrix for Climate Data (SMM-CD) applied (results not accessible);
- We expressed concerns on criteria for selecting data records, which is done by Subject matter Experts and in some cooperation effort with GCOS, and overlap with ECV Inventory;
- Our view is that links between WMO and the WGClimate databases should be established to avoid the coexistence of two different approaches at least in what satellite-derived CDRs are concerned. There is openness to cooperate with the WGClimate and find synergies with the ECV Inventory.

**WGClimate11-4**

**Review / provide feedback to WMO Catalogue to make sure that the satellite information available there is consistent with that of the ECV Inventory.**

**Jörg Schulz, Next  
Werner Balogh meeting**

**WGClimate**

# Next Meeting - WGClimate#14

- Albrecht to tell you sometime in the future ...