



Space Agencies response to the needs for GHG monitoring and reporting

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United Nations

FCCC/SBSTA/2017/L.21



Framework Convention on
Climate Change

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Bonn, 6–15 November 2017
Agenda item 8
Research and systematic observation

Research and systematic observation

9. The SBSTA recognized the progress made by the satellite community (see para. 4(e) above), in close collaboration with GCOS, in the development of the essential climate variable inventory.¹⁶ It noted the usefulness of the essential climate variable inventory for climate services. It invited CEOS and CGMS to report on progress at future sessions of the SBSTA, as appropriate.

10. The SBSTA noted with appreciation the information provided in the submission referred to in paragraph 4(a) above on the Global Framework for Climate Services (GFCS).¹⁷ It invited WMO to report on progress in implementing the GFCS at future sessions of the SBSTA, as appropriate.

11. The SBSTA invited the UNFCCC secretariat to communicate with the WMO secretariat, including with regional centres, to inform work on climate services.

12. The SBSTA noted the increasing capability to systematically monitor greenhouse gas concentrations and emissions, through in situ as well as satellite observations, and its relevance in support of the Paris Agreement.¹⁸

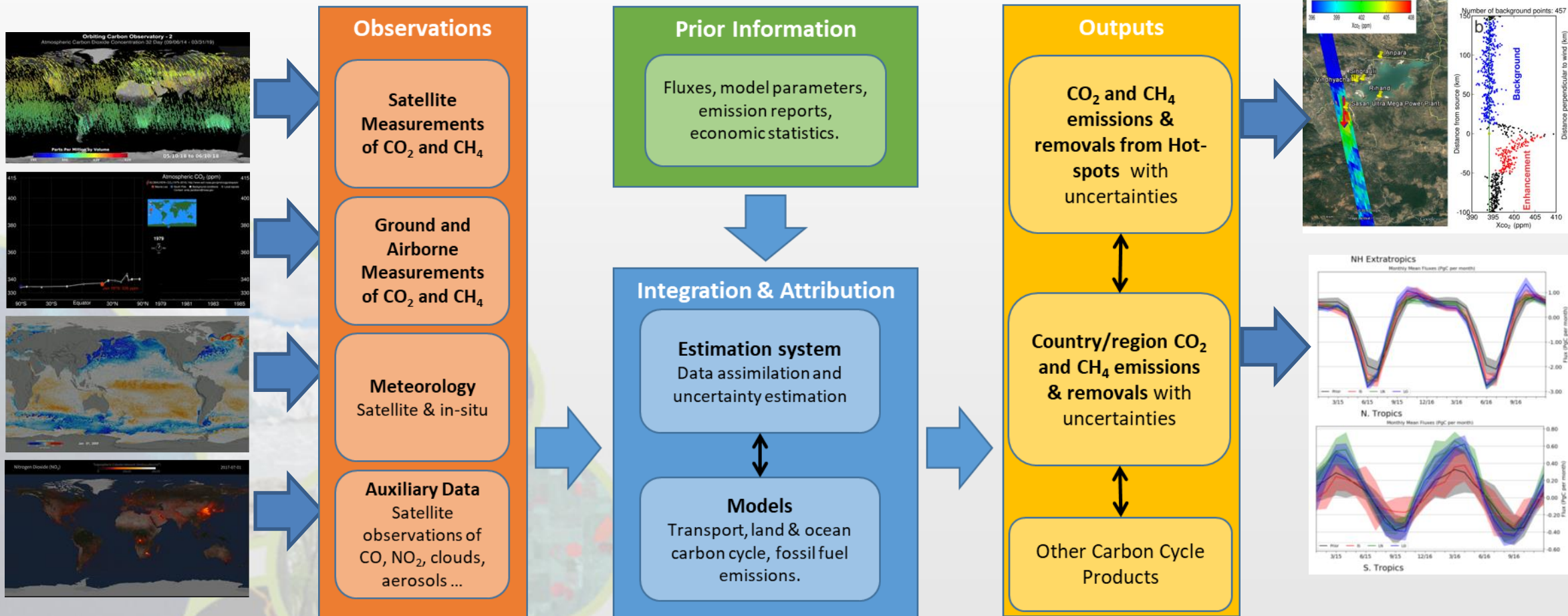
Considerable support in the RSO negotiations from Japan and EU delegations
Especially for Conclusions 9 & 12



- GHG examples



A System Approach adopted to deliver Atmospheric CO₂ and CH₄ Inventories



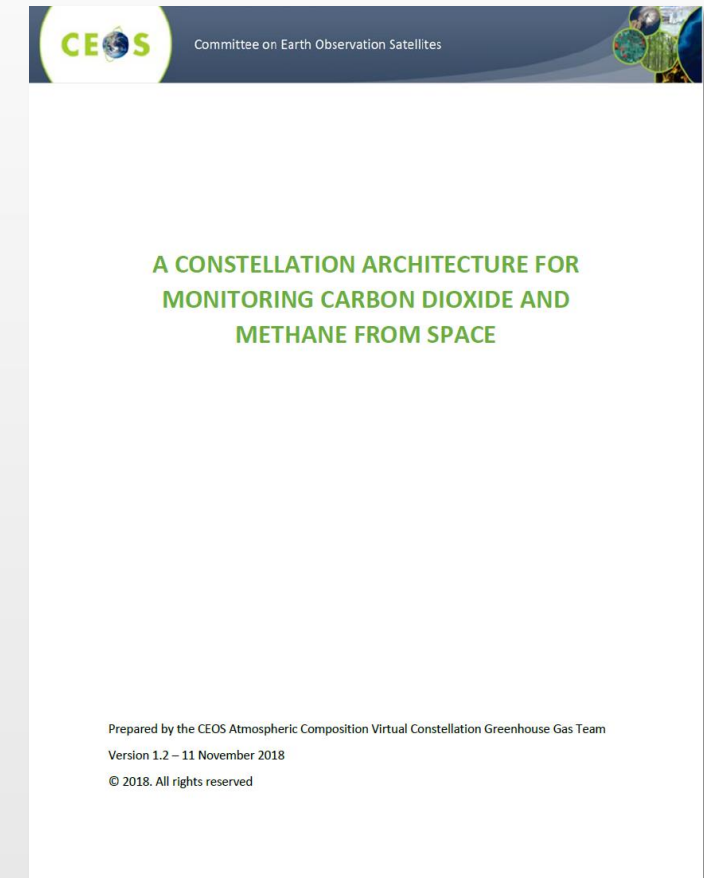


The CEOS Atmospheric Composition Virtual Constellation (AC-VC) white paper defines a global architecture for monitoring atmospheric CO₂ and CH₄ concentrations from instruments on space-based platforms

- 166-page document, 88 authors from 47 organizations
- Executive Summary (2 pages)
- Body of report (75 pages)
- Technical Appendices (42 pages)

DOI: 10.2760/468219

http://ceos.org/document_management/Virtual_Constellations/ACC/Documents/CEOS_AC-VC_GHG_White_Paper_Publication_Draft2_20181111.pdf





Paris Agreement

Global Stock Take 1
using inventories through 2021

Global Stock Take 2
using inventories through 2026

2015

2017

2019

2021

2023

2026

2028



↓
CEOS GHG
Whitepaper

↓
Prototype
Inventory
requirements

↓
Prototype
atmospheric
CO₂/CH₄
inventory

↓
Refined
atmospheric
GHG
requirements

↓
Initial
Operational
GHG
Constellation
Deployment

↓
Refined
atmospheric
GHG
inventory

1. **Link** the atmospheric GHG measurement and modeling communities and stakeholders in the national inventory and policy communities (through UNFCCC/SBSTA).
2. Exploit the capabilities of the **CEOS** and **CGMS** member agencies and the **WMO** Integrated Global Greenhouse Gas Information System (IG³IS) to integrate surface and airborne measurements of CO₂ and CH₄ with those from available and planned space-based sensors to develop a **prototype for the 2023 global stock take**.
3. to implement a complete, **operational**, space-based constellation architecture with the capabilities needed to quantify atmospheric CO₂ and CH₄ concentrations that can serve as a complementary system for estimating NDCs **in time to support the 2028 global stock take**.



- Biomass strategy





Biomass data

Many current and upcoming missions will provide data that will be used to map biomass

Mission	Funding Agency	Expected Launch Date	Data Type	Geographic Domain	Biomass Product	
					Resolution	Accuracy Requirement
ALOS-2	JAXA	2014	L-band SAR	Global	NA	NA
ICESat-2	NASA	Sept 15, 2018	532 nm photon counting lidar	Global	NA	Global
SAOCOM 1A	CONAE	October 8, 2018	L-band SAR	Global	NA	NA
GEDI	NASA	Dec 5, 2018	1064 nm waveform lidar	ISS (+/- 51.6°)	1 km	<20% SE for 80% of forested 1 km cells
SAOCOM 1B	CONAE	October 2019	L-band SAR	Global	NA	NA
ALOS-4	JAXA	2021	L-band SAR	Global	NA	NA
NISAR	NASA/ISRO	2021/2022	L/S-band SAR	Global	1 ha (<100 Mg/ha)	<20% RMS accuracy for <100 Mg/ha
BIOMASS	ESA	2022	P-band SAR	Global (excl N. America & Europe)	4 ha	Accuracy of 20%; 10 Mg/ha for <50 Mg/ha
MOLI	JAXA	~2022	1064 nm waveform lidar	ISS (+/- 51.6°)	500 m	NA
TanDEM-L	DLR	2022-2023?	L-band SAR	Global	1 ha	20% accuracy or 20 Mg/ha

Biomass set to become an increasingly important topic for CEOS to address from multiple points-of-view in the forthcoming years.

- GFOI requested CEOS improvements to biomass estimation
- Exploring potential contributions of biomass missions to the GHG Roadmap and Global Stocktakes would be a high-level and worthy goal for CEOS engagement, where, building on the current work of WGCV/LPV CEOS Biomass Protocol Team could be an important component.
- Encourage CEOS agencies to consider how to form the best and comprehensive structure/team in CEOS and partnerships with other organisations and include specialists for more discussion.





Data Component

(Country Needs Assessment, data accessibility, in-situ data, validation, country link and international policy link)

R&D

(Biomass Expert Meetings, funding opportunities for gap filling)

MGD

(Emission Factors, maturity assessment)

CB

(Capacity Building related to biomass estimation)



CARB-16
CARB-XX

LSI VC

SDCG / Forest SG

Multi-mission user interaction and data strategy, facilitate data uptake

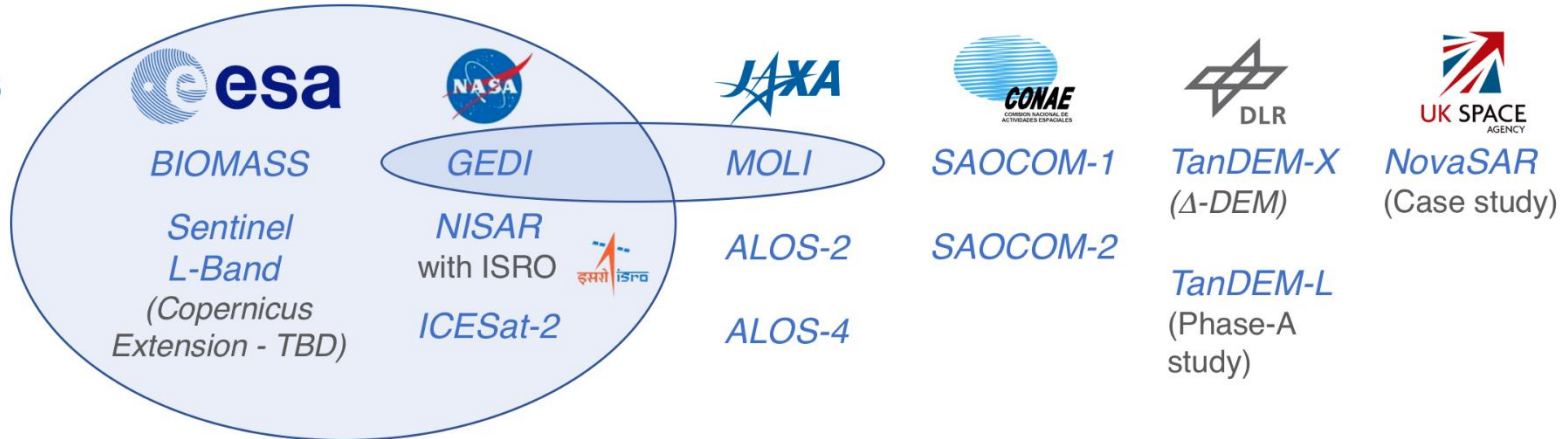
WGCV

LPV

Biomass Product Calibration, Cross-calibration, Validation Protocol

Space Agencies

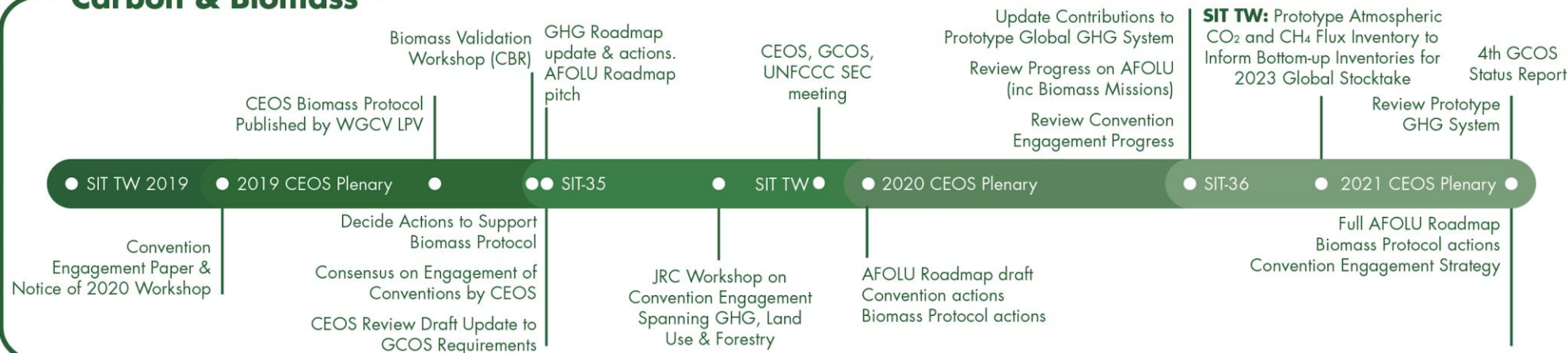
Biomass related Missions



Carbon & Biomass – One of the CEOS SIT Chair's Initiatives



Carbon & Biomass



Key Outcomes

1. Prototype atmospheric CO₂ and CH₄ flux inventory to inform the bottom-up inventories for 2023 Global Stocktake.
2. CEOS input to updated GCOS Requirements (GCOS IP complete late 2022).
3. New relationships with convention and inventories communities. More integrated and pro-active engagement of UNFCCC & IPCC for CEOS. Recognition of EO data in Global Stocktake, national practices, etc.
4. New CEOS AFOLU Roadmap, to complement the GHG Roadmap.
5. Accelerated policy relevance of CEOS biomass datasets making best use of the GFOI and GEOGLAM frameworks and through support for CEOS Biomass Protocol

- ❑ Supporting the GHG Roadmap process – escalating, elevating, and accelerating progress towards major milestones, including for the 2023 Global Stocktake. 2021 prototype flux products.
- ❑ Encouraging stronger and more systematic CEOS engagement with convention frameworks – building on IPCC outreach and national inventory communities as our future users
- ❑ Reflecting large investment (2018-2024) in Above-Ground Biomass missions and seeking to accelerate the policy relevance of these new data (GFOI, GEOGLAM...)
- ❑ Promote uptake of biomass datasets beyond science community – forest monitoring, inventories...



The CEOS SIT Chair, CSIRO, is hosting a CEOS WGCV LPV Supersite and Biomass Validation Workshop in Canberra, Australia, the week of 2-6 March, 2020.

Building on from the efforts described above and in relation to the broader context of seeking **to maximise policy impact of the new missions**, the following objectives have been set for the workshop (with feedback encouraged from the community):

1. To bring together the ground in-situ measurement networks such as GBOV, TERN supersite, NEON, Enviro-Net, ICOS, etc. and biomass teams to explore and build on synergies between the CEOS WGCV LPV supersites initiative and biomass protocol work, goals include:
 - evaluate and update the status of CEOS WGCV LPV supersites;
 - explore synergies between CEOS WGCV LPV supersites and other networks;
 - evaluate the potential extended use of these sites for biomass validation;
 - explore synergies between biomass and other biophysical measurements currently captured by supersites;
 - define site characteristics and instrumentation requirements for biomass and other biophysical product validation;



Workshop goals (cont'd)

- evaluate interoperability and harmonisation of data between sites in order to allow data exchange, use, integration with spatial and other datasets (linked to FDA, datacube initiatives);
 - define needs for more coordinated field and airborne data collection;
 - consider synergies and support of the WGCV Biomass Inter-comparison Exercise-2 (BRIX-2) activity and actions for individual CEOS agencies to support.
2. Working with the CEOS WGCV LPV Biomass protocol team to generate a 'pitch' to CEOS Principals at the CEOS SIT-35 meeting in Tasmania in late March
 - request for the resources that are needed to make a success of the newly-published protocol and to ensure its potential is fully realised.
 3. Addressing outreach to relevant policy implementation or inventory agencies such as UNFCCC
 - take the opportunity to explore potential links from CEOS agency biomass measurement coordination to the CEOS GHG Roadmap and their plan to contribute a prototype product to the 1st Global Stocktake in 2023
 - clarify the production schedules from the relevant CEOS mission programs and what might be practical.



Workshop schedule:

	Mon 2 Mar	Tue 3 Mar	Wed 4 Mar	Thu 5 Mar	Fri 6 Mar
Topics	Validation, Supersites, Networks	Validation, Supersites, Networks	Supersite trip	Biomass roadmap & CEOS support	Policy issues
Venue	CSIRO, Canberra	CSIRO, Canberra	Tumbarumba	CSIRO, Canberra	CSIRO, Canberra (Half day?)

Contact:

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Organizing Committee – to be called soon



- There are parallel engagement activities of Earth Observation community with UNFCCC and in support of the Parties
- The system approach adopted for GHG should be comprehensive and extend to include AFOLU aspects
- Workshop to bring together EO communities from GHG and AFOLU aspects including their respective users and colleagues working on the policy interface
- (TBC) 10-12 June 2020 at European Commission's Joint Research Centre

