Committee on Earth Observation Satellites

CEOS/CGMS status on GHG monitoring

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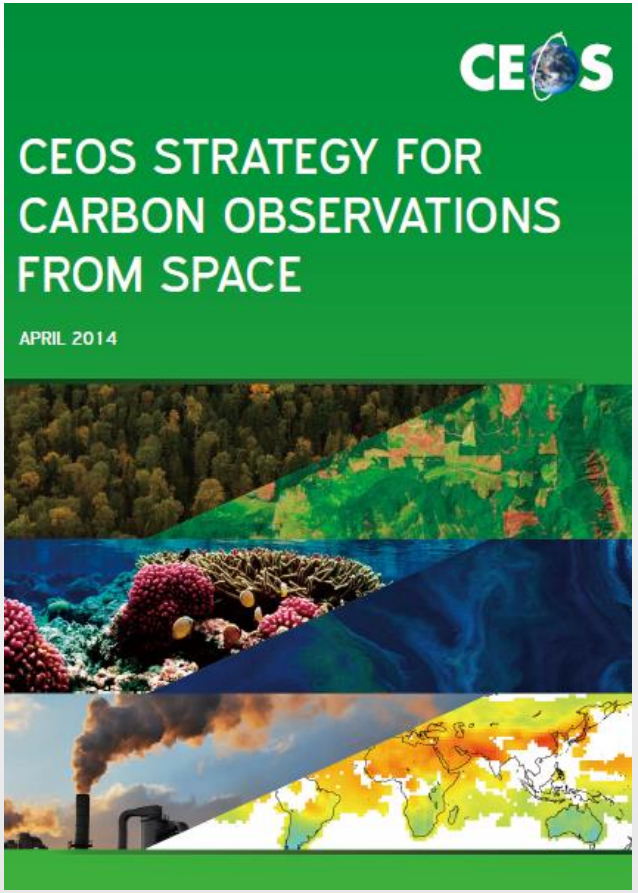
WGClimate 10

CEOS Strategy for Carbon Observations from Space

- ***CEOS Strategy for Carbon Observations from Space* – written in response to *GEO Carbon Strategy*, endorsed by CEOS Plenary in March 2014 – *Wickland et al.***
  - Proposed results and Actions were presented to CEOS SIT Technical Workshop (Sep 2013) and CEOS Plenary (Nov 2013)
  - 42 Actions identified in the report for specific response including Action for a "Carbon Team" to manage response via CEOS(/CGMS) Working Group on Climate
    - Relevant actions were discussed with WGClimate in Mar 2014
    - …



Laying the foundation for an international CO2 and GHG monitoring system

Three specific activities are foreseen for advancing this effort in 2017-2018:

1. Facilitate the completion and follow-on activities of the **AC-VC whitepaper on defining an optimum constellation for CO2 and GHG monitoring**, including the joint competences of CEOS and CGMS, and in the general framework of the continued implementation of the CEOS Carbon Strategy
2. **Advance the relationship with CGMS for an operationally implemented and sustained observation capability**. Consider establishing a formal working relationship between CEOS and CGMS as with the successful ongoing relationship on Systematic Observations of ECVs in support of UNFCCC.
3. **Place the space segment in the broader context of a fully sustained system for CO2 monitoring**. Individual CEOS Agencies have counterparts in their individual countries/regions who have responsibility for Inventories, the required modelling, in-situ infrastructure and the ground segment elements.

Recognition

United Nations

Framework Convention on Climate Change

FCCC/SBSTA/2017/L.21

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Original: English

Subsidiary Body for Scientific and Technological Advice
Forty-seventh session
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

CEOS Chair Workshop

- Workshop organised from a CEOS – Space Agency point-of-view
- Emphasis of workshop is on **extracting and documenting best practices** on interactions between CEOS Agencies/Associates, and counterparts working on modelling, in-situ and inventory,
- Identify open issues and have some specific recommendations on efforts that CEOS Agencies could target in the future.
- This should build open the existing recent efforts both within CEOS (i.e. the AC-VC Whitepaper on GHG Constellation) and efforts lead by other international efforts (e.g. WMO/IG3IS, GEO-C, GCOS, UNFCCC/SBSTA, IPCC-TFI)

June 18-19th European Commission – JRC , Ispra (IT)

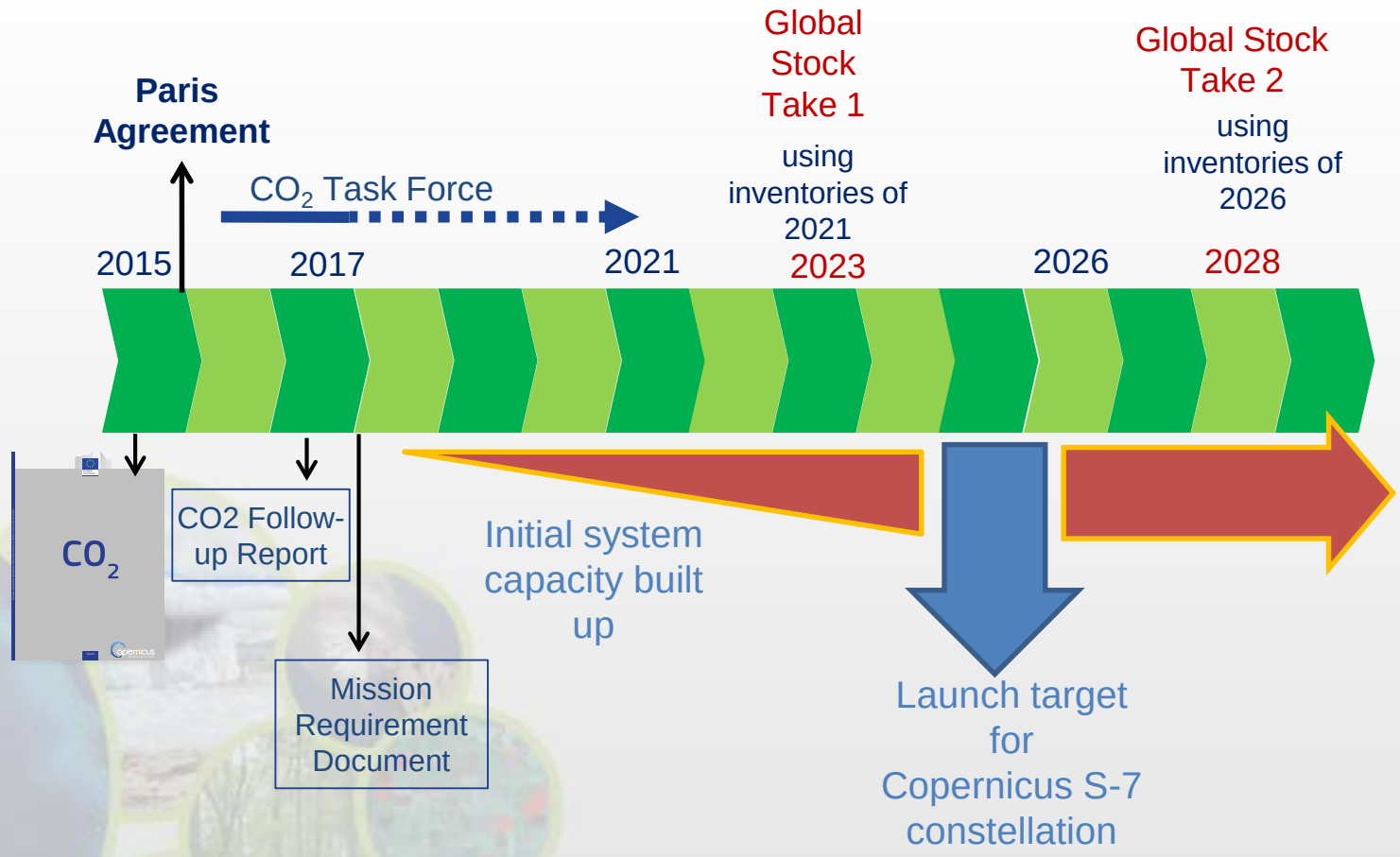
- **9 CEOS Agencies attended 2-4 people each, 3 CEOS Associates – around 40 attendees in total**

Scope

1. Help countries improve their estimates of CO_2 and CH_4 emissions and removals in support of their Nationally Determined Contributions (NDCs) under the Paris Agreement; and,
2. Provide an additional mechanism for validating the consistency between reported emissions and output from the system.

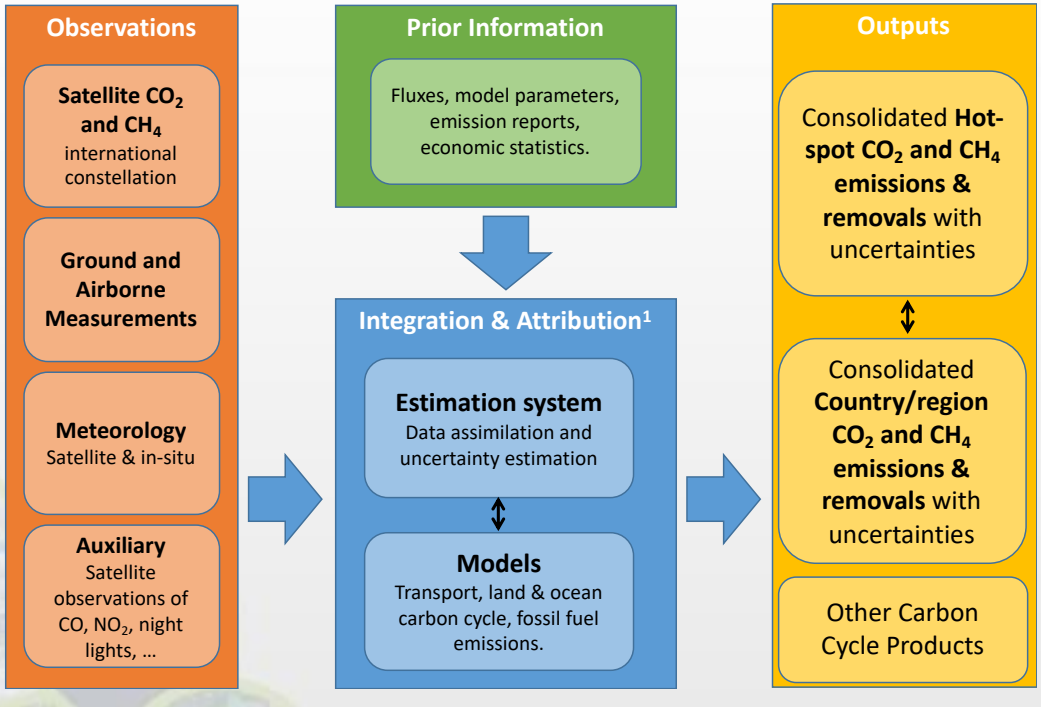
Agreed that scope is CO_2 and CH_4

Timely inputs to Policy context



System Approach

1. Consensus that a system approach is required in addressing the needs/requirements
2. Agreed on a high level representation of the system overview



AC-VC White Paper Approach

- Incorporates contributions from
  - 88 authors representing 47 organizations
- White Paper Structure, content, and intended audiences
  - Executive Summary (2 pages)
    - Overview of objectives and approach
    - Intended for policy makers and CEOS/CGMS Agency leads
  - Body of report (76 pages)
    - Documents science background and requirements, current and near-term mission heritage, and system implementation approach
    - Intended for program scientists and project managers
  - Technical Appendices (43 pages) and references (38 pages)
    - “Textbook” summarizing state-of-the-art in observation capabilities and analysis methods to justify system-level requirements
    - Intended for scientists, engineers, and the inventory community

White Paper Contents – Main Text

Executive Summary

Chapter 1: Introduction

Chapter 2: Estimating Emissions from Atmospheric CO_2 and CH_4 Measurements

Chapter 3: Space-based CO_2 and CH_4 Measurement Capabilities and Near-term Plans

Chapter 4: The Transition from Science Missions to an Operational Constellation

Chapter 5: Designing an Operational LEO Constellation for Measuring Anthropogenic CO_2 Emissions – The Sentinel CO_2 Initiative

Chapter 6: Integrating CO_2 and CH_4 Satellites into Operational Constellations

Chapter 7: Conclusions and Way Forward

Proposed CEOS Actions

1. Link the atmospheric GHG measurement and modeling communities and stakeholders in the national inventory and policy communities (through UNFCCC/SBSTA), to refine requirements;

2. Exploit the capabilities of the CEOS and CGMS member agencies and the WMO Integrated Global Greenhouse Gas Information System (IG^3IS) to integrate surface and airborne measurements of CO_2 and CH_4 with those from available and planned space-based sensors to develop a prototype, global atmospheric CO_2 and CH_4 flux product in time to support inventory builders in their development of GHG emission inventories for the 2023 global stocktake; and

3. Use the lessons learned from this prototype product to facilitate the implementation of a complete, operational, space-based constellation architecture with the capabilities needed to quantify atmospheric CO_2 and CH_4 concentrations that can serve as a complementary system for estimating NDCs in time to support the 2028 global stocktake.

White Paper Status and Plans

- The AC-VC GHG White Paper is completed
  - Incorporated changes from the CEOS SIT Technical Workshop
  - Should close Action CARB-12 - White paper on a carbon observation constellation
- Proposed actions have been brought to the CEOS Plenary for disposition
  - AC-VC will work with CEOS and CGMS to implement a (new) CO_2/CH_4 focus within WGClimate
    - WGClimate is already a joint working group with CEOS and CGMS and has existing interfaces with GCOS, WMO, and IPCC
      - Mark Dowell has agreed to lead this activity
    - AC-VC will continue to support GHG constellation development and synergistic GHG and atmospheric composition observations and modeling efforts
      - Dave Crisp will continue to lead this activity

Proposal

- Create a well identified task within WGClimate addressing GHG monitoring (Action WGClimate to decide how this would be implemented - by SIT-34)
- WGClimate to details roadmap based on activities from whitepaper + output from Ispra GHG workshop (draft SIT-34)
- WGClimate to establish appropriate links, cross-representation, with AC-VC and WGCV ACSG.
- Relevant CEOS Agencies to dedicate appropriate resources to task
- Task would also include existing coordination layer for CEOS Carbon Strategy
- Update of WGClimate ToR (also to be confirmed by CGMS)

Asked to Plenary – for Decision

1. *Confirm the interest in pursuing a structured collaboration between CEOS and CGMS in the area Greenhouse Gas observations and monitoring*
2. *Confirm that the options considered for this collaboration, were appropriate*
3. *Agree that the proposed solution is appropriate, and that the implications of it's implementation are understood and acceptable*
4. *Agree that the proposed timeline for implementation is appropriate and that the draft ToR and governance arrangement are acceptable*

CEOS-32 Plenary

Decision 04	CEOS Plenary endorsed the report *'A Constellation Architecture for Monitoring Carbon Dioxide and Methane from Space.'* It is emphasised that the three-step plan to implement the architecture contained in the paper, as well as the identified activities in the way forward, should be interpreted as recommendations to CEOS Agencies, for their consideration.

GHG Monitoring

Decision 05	Plenary confirmed CEOS interest in continuing collaboration with CGMS through a specific task in WGClimate on GHG monitoring, with dedicated resources and activities based on the mapping table of the actions identified in the Way Forward chapter of the report *'A Constellation Architecture for Monitoring Carbon Dioxide and Methane from Space.'* Plenary also endorsed the revision of the Terms of Reference of the WGClimate to accommodate these changes.	
CEOS-32-05	WGClimate to report on internal implementation for the way forward on CEOS-CGMS coordination on GHG monitoring, including a roadmap based on the mapping of the GHG report recommendations and the JRC workshop conclusions.	**SIT-34**