Committee on Earth Observation Satellites

CGMS

Space agencies support to UNFCCC needs for global observations

Jörg Schulz, EUMETSAT, WGClimate Chair

2018 CEOS Plenary

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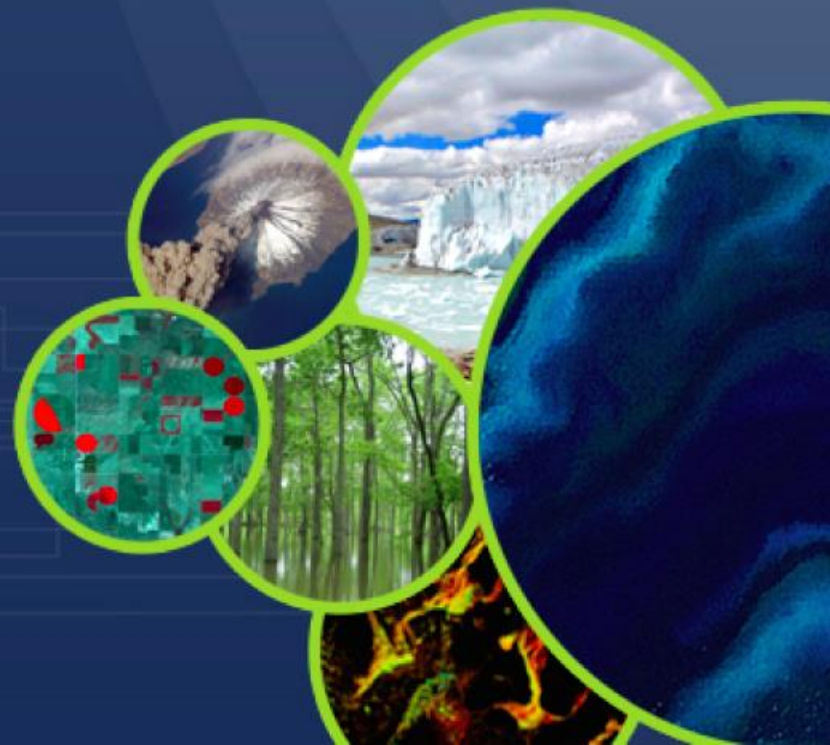

COP-23/SBSTA-47 Conclusions

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.

United Nations

Framework Convention on Climate Change

FCCC/SBSTA/2017/L.21

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Agenda item 8
Research and systematic observation

Research and systematic observation

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]

GCOS Essential Climate Variables – ECVs

- grouped by measurement domain and area covered;
- The groups show how observations across all the measurement domains are needed to capture specific phenomena or cycles;
- Satellite data can contribute to red bold printed ECVs

	Atmosphere	Terrestrial	Ocean
Energy & Temperature	**Surface Radiation Budget, Earth Radiation Budget, Surface Temperature, Upper Air Temperature, Surface and Upper Air Wind Speed**	**Albedo, *Latent and Sensible Heat* fluxes, Land Surface Temperature**	**Ocean Surface Heat Flux, Sea Surface Temperature**, Subsurface Temperature
Other Physical Properties	**Surface Wind, Upper Air Wind**, Pressure, **Lightning, Aerosol Properties**		**Surface Currents**, Subsurface Currents, **Ocean Surface Stress, Sea State**, Transient Tracers
Carbon Cycle and other GHGs	**Carbon Dioxide, Methane, Other long-lived GHG, Ozone, Precursors for Aerosol and Ozone**	Soil Carbon, **Above-ground Biomass**	Inorganic Carbon, Nitrous Oxide
Hydrosphere	**Precipitation, Cloud Properties**, Water Vapour (Surface), **Water Vapour (Upper Air), Surface Temperature**	**Soil Moisture**, River Discharge, **Lakes, Groundwater**	**Sea Surface Salinity**, Subsurface Salinity, **Sea Level, Sea Surface Temperature**
Snow & Ice		**Glaciers, Ice Sheets and ice shelves, Permafrost, Snow**	**Sea Ice**
Biosphere	**Table Courtesy of GCOS, 2018**	**Land Cover, Leaf Area Index (LAI), Fraction of Absorbed Photosynthetically Active Radiation (FAPAR), Fire**	Plankton, Oxygen, Nutrients, **Ocean Colour,** Marine Habitat Properties
Human Use of Natural Resources		Water Use, **Greenhouse Gases**, (GHG) Fluxes	Marine Habitat Properties

Resource for Coordinated Response

http://climatemonitoring.info

Action G11:	Review of availability of climate data records
Action	Provide a structured, comprehensive and accessible view as to what CDRs are currently available, and what are planned to exist, together with an assessment of the degree of compliance of such records with the GCOS requirements for the ECV products indicated in Annex A

Action G12:	Gap-analysis of climate data records
Action	Establish a gap analysis process and associated actions, to: (a) address gaps/deficiencies in the current available set of CDRs; and (b) ensure continuity of records, and address gaps through the appropriate planning of future satellite missions for the ECV products indicated in Annex A

- ECV Inventory fully describes current and planned implementation arrangements for GCOS ECV;
- Fully verified content for almost 1000 data records;
- Updated annually with approval from CEOS and CGMS;
- Derived Recommendations and Coordinated Actions inform space agency planning, improves availability and interoperability of climate data;
- Feeds material for all future responses to the GCOS IP.

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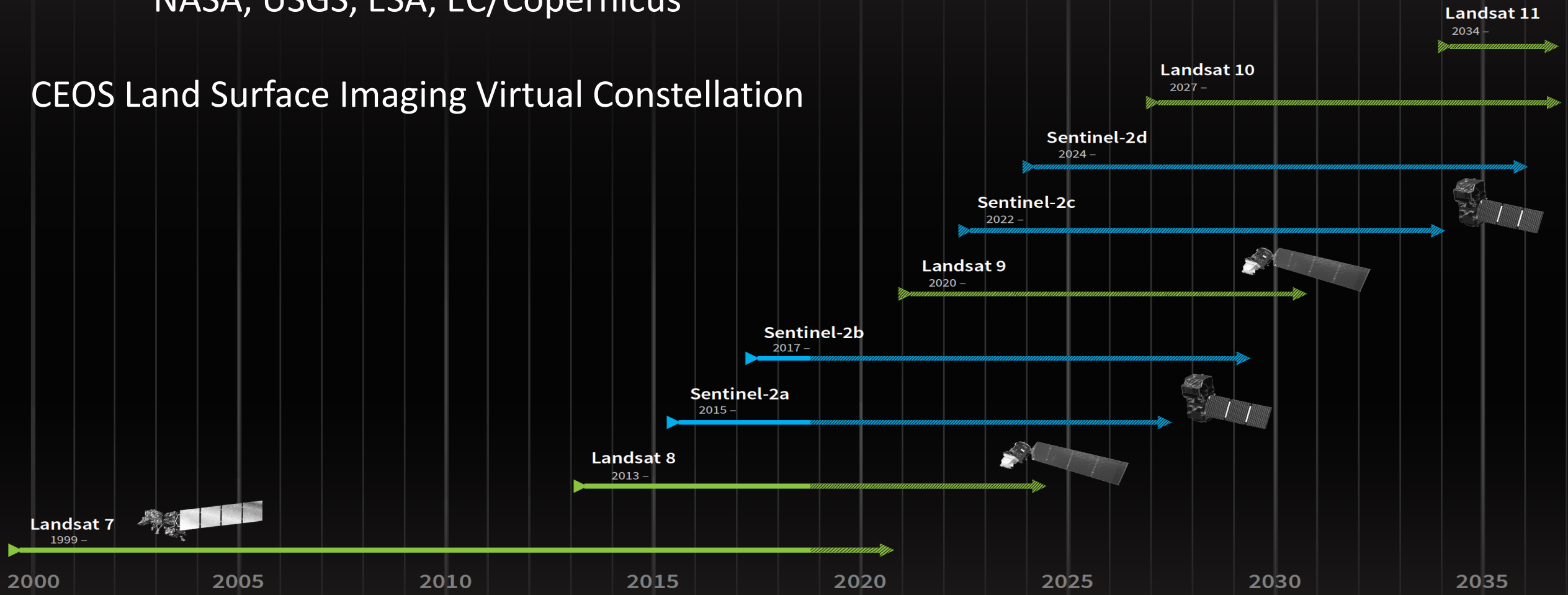
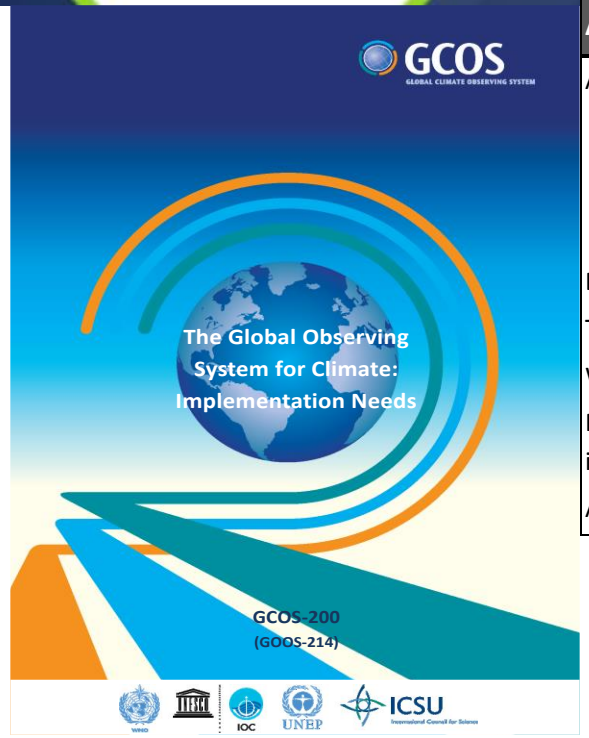
Sustainable Land Imaging – Moderate Resolution, Multi-Spectral

NASA, USGS, ESA, EC/Copernicus

CEOS Land Surface Imaging Virtual Constellation



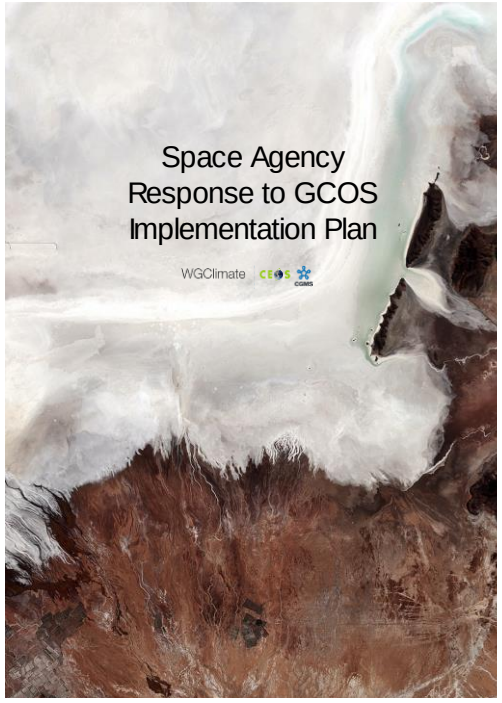
Action in GCOS IP 2016 (GCOS-200)



Action T71:	Prepare for a carbon-monitoring system
Action	Preparatory work to develop a carbon monitoring system to be operational by 2035; Development development of comprehensive monitoring systems of measurements of atmospheric concentrations and of emission fluxes from anthropogenic area and point sources to include space-based monitoring, in situ flask and flux tower measurements and the necessary transport and assimilation models
Benefit	Improved estimates of national emissions and removals
Time frame	Initial demonstration results by 2023 – complete systems unlikely before 2030
Who	Space agencies
Performance indicator	Published results
Annual cost	US$ 10–100 billion

"Specifically CEOS and CGMS will undertake, over the next few years, dedicated preparatory work in a coordinated international context:

- Definition of an architecture of space component elements to address the requirements of a CO_2 and GHG monitoring system;
- The documentation of best practices on the relationships between individual space agencies and their counterparts working on the modelling aspects, the inventories and in-situ data provision, …
- The further consolidation of partnerships and collaborations between the relevant international entities including: the relationship between CEOS and CGMS on the space component aspects, the partnership with the WMO and GEO on the broader framework, … and finally the relationships with GCOS itself, UNFCCC and IPCC TFI process in better defining the role for space-based observation in the inventory guideline process."



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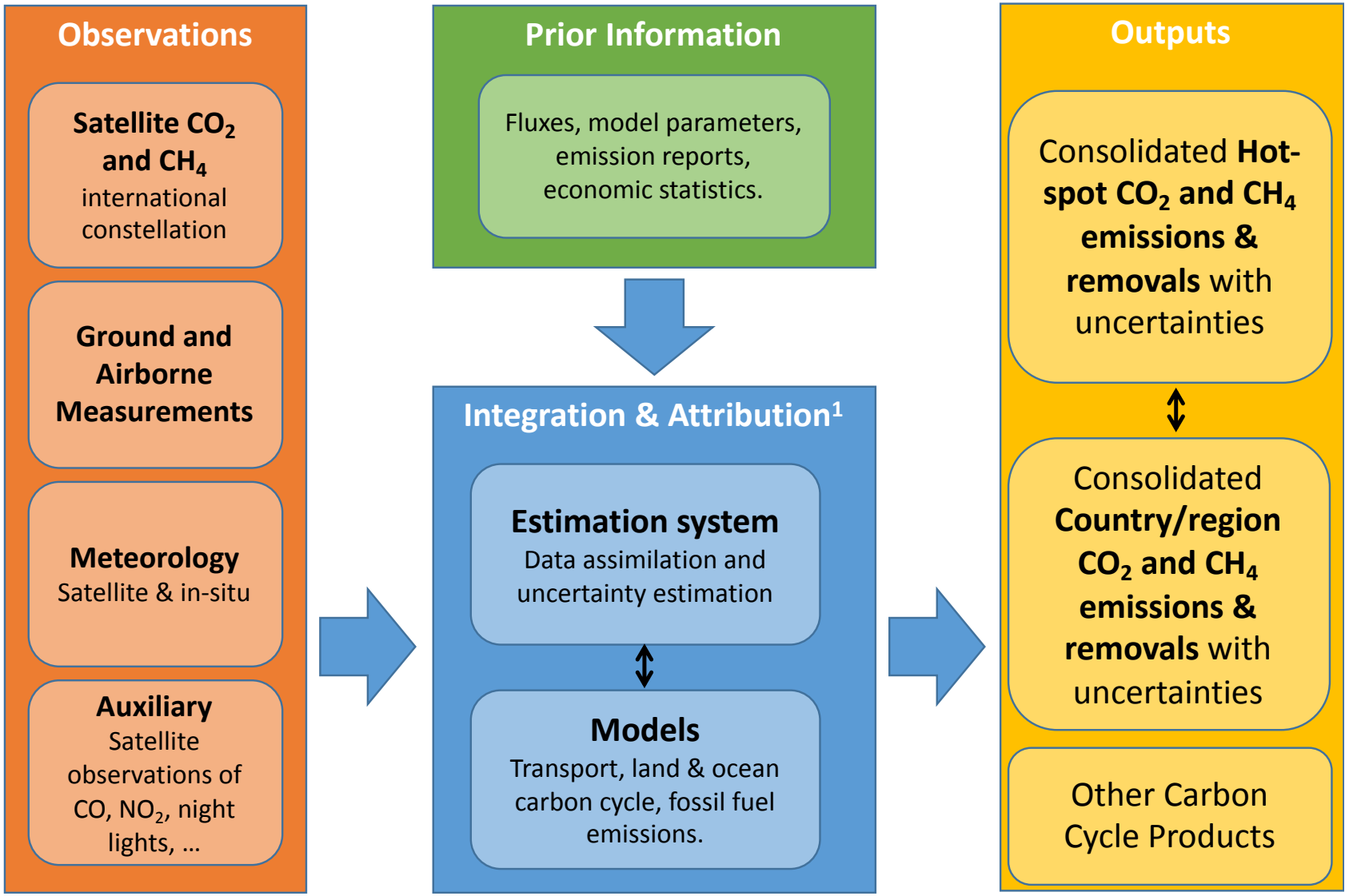
Support to NDCs

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;
2. Provide an additional mechanism for validating the consistency between reported emissions and output from the system.



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Major Messages

- Space agencies continue to evolve their systematic observation of the Earth's climate system, now over several decades by implementing the Architecture for Climate Monitoring from Space;
- The Inventory of climate data records for GCOS Essential Climate Variables is a major resource for a coordinated response of space agencies to UNFCCC observation needs facilitated by GCOS;
- Comprehensive gap analysis for ECVs provided recommendations and actions to space agencies are sufficient for future coordinated planning of needed satellite missions. This is updated annually;
- CEOS published: *A Constellation Architecture for Monitoring Carbon Dioxide and Methane from Space*. This contains a three-step plan to implement a system for GHG monitoring to support future global stocktakes in the coming years;
- CEOS and CGMS members decided that the Joint CEOS/CGMS Working Climate will oversee the implementation of the GHG monitoring system and will partner and collaborate with GCOS, UNFCCC and the IPCC TFI process for a better definition of the role for space-based observation in the inventory guideline process report to UNFCCC/SBSTA;
- Please read the CEOS/CGMS statement and the report on space agencie support to the implementation of the Paris Agreement available on the SBSTA web page on systematic observations.

Three step plan for GHG monitoring

- Link the atmospheric GHG measurement and modelling communities and stakeholders in the national inventory and policy communities (through UNFCCC/SBSTA), to refine requirements;
- Exploit the capabilities of the CEOS and CGMS 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
- 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.