

Joint CEOS/CGMS Working Group on Climate

A presentation to CEOS WG Cal/Val and Disaster
Albrecht von Bargaen (Chair, DLR)

*The over-arching goal of the CEOS/CGMS Working Group on Climate (WG Climate) will be **to improve the systematic availability of Climate Data Records** through the coordinated implementation, and further development of the **architecture for climate monitoring from space**.*

.....

In addition, it will

- *Ensure a plan is put in place for the development of a joint CEOS/CGMS response, which has broad consultation across the community, and provides the basis for future planning and priority setting by space agencies in response to climate information needs, including*
 - *CEOS/CGMS Response to GCOS requirements*
 - *The update of reports to SBSTA/UNFCCC on CEOS/CGMS climate action,....*

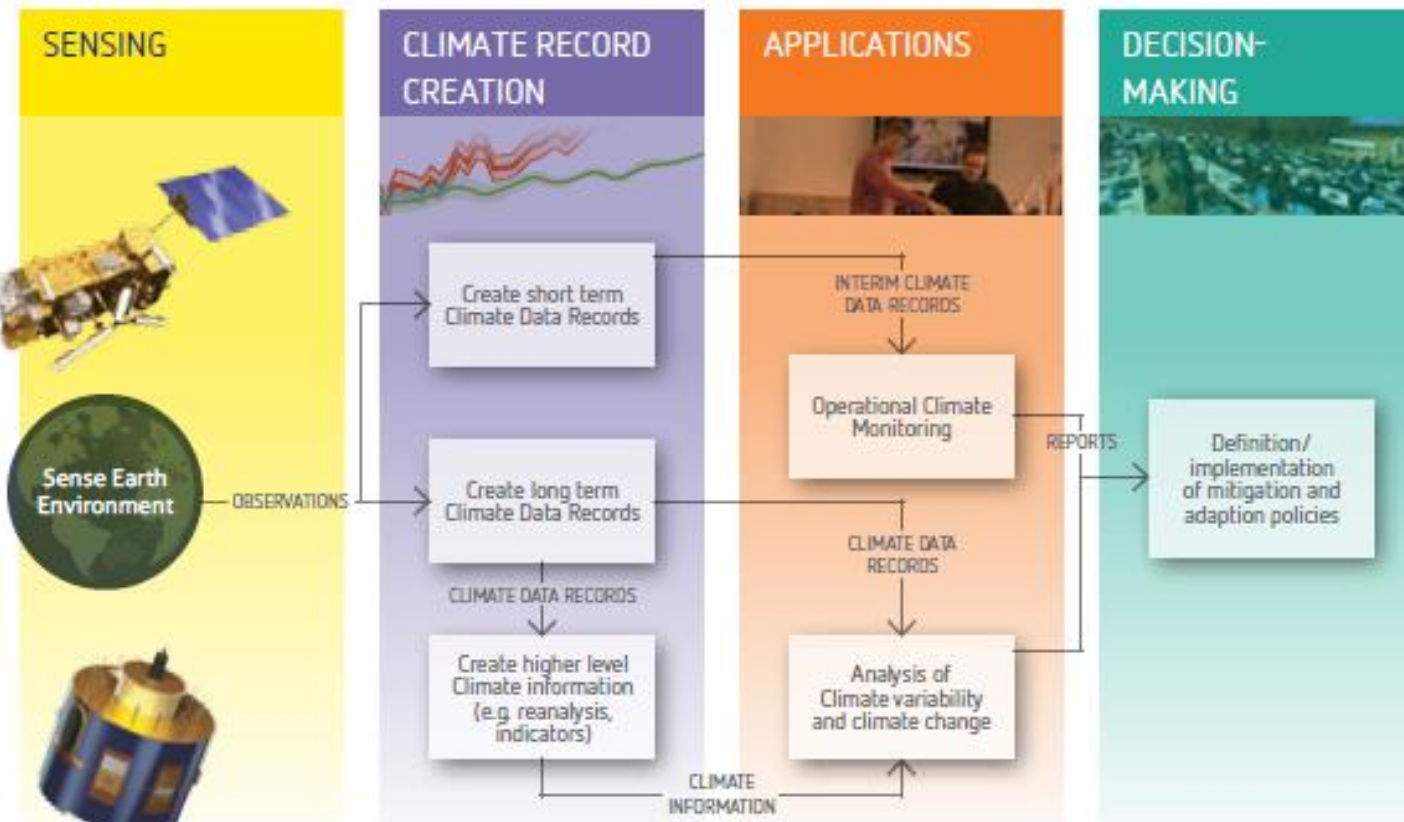
.....

- *Support and advice on the overall relation of CEOS and CGMS to the UNFCCC and its subsidiary bodies, to the IPCC and other international coordination mechanisms such as GFCS.*

..... *[further more details to be read in the ToRs]*

=> Interaction with all climate science & monitoring related entities such as WMO, WCRP, IPCC, et al.

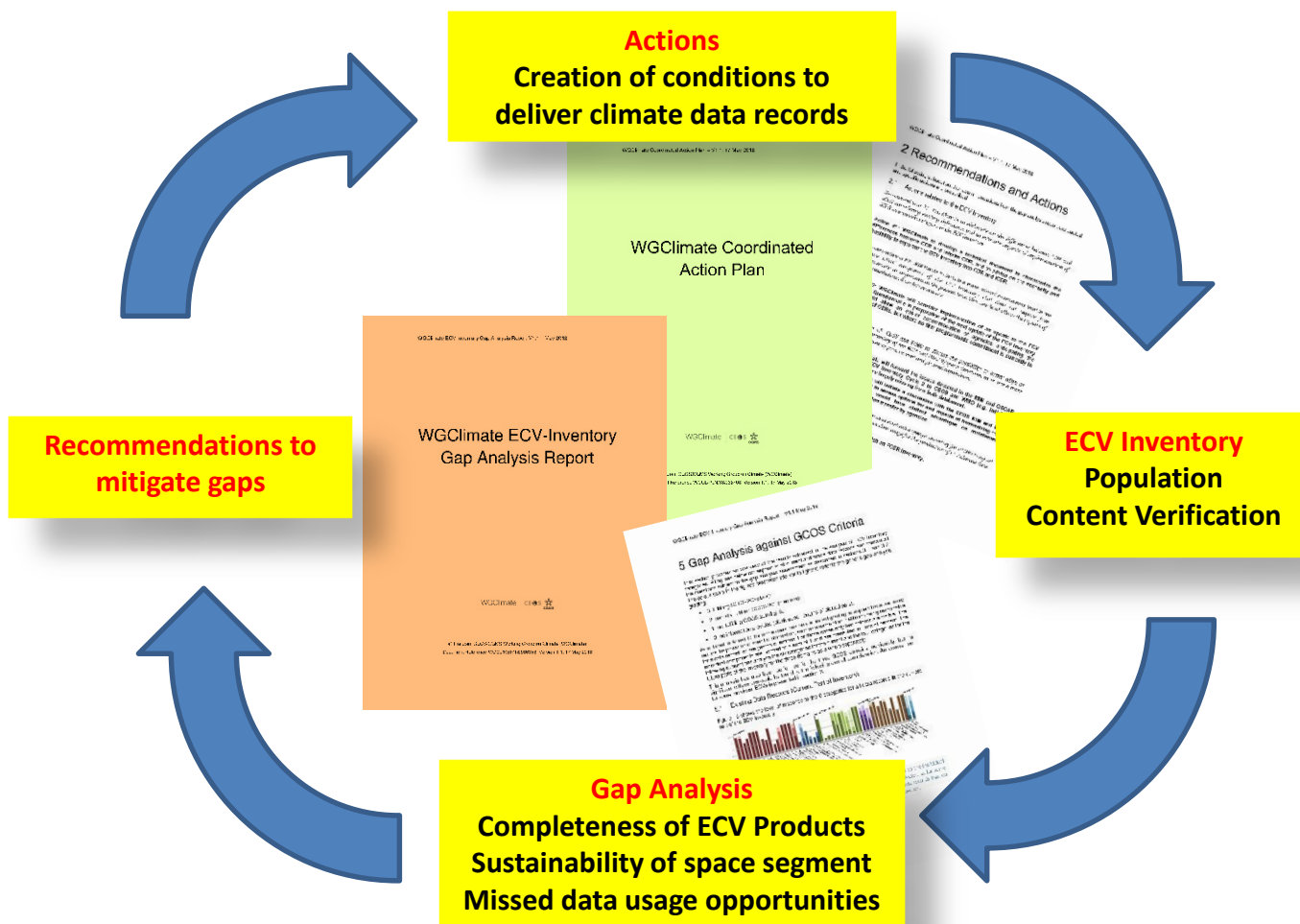
The Architecture for Climate Monitoring from Space



ECV Inventory & Gap analysis

SCOPE-CM & CDR Use Cases

http://ceos.org/document_management/Working_Groups/WGClimate/WGClimate_Strategy-Towards-An-%20Architecture-For-Climate-Monitoring-From-Space_2013.pdf



- The ECV Inventory fully describes current and planned implementation arrangements for ECVs
- **Data access is globally free and open without any constraint for more than 98% of the data records in the Inventory**
- **Everybody with an internet connection can download the ECV Inventory content for their own analysis, find direct access points to climate data records in the Inventory, and get access to WG Climate gap analysis results and resulting actions**
- The 2019 Inventory **fills previously identified gaps for the ECVs including lightning, sea-surface salinity, above ground biomass, and permafrost**
- The 2021 Inventory was baseline for a Gap Analysis Workshop related to the **Earth's Carbon Cycle**
<https://climatemonitoring.info/ecvinventory/>

- ECV inventory consolidated to version 4.1 (2022)
- Gap analysis workshop organized with focus on ECVs driving the Earth's climate Carbon cycle
- Workshop in hybrid format with excellent expert attendance
- Some of the ECVs had been target of the gap analysis two years before
- ECVs in focus: GHGs, Anthropogenic GHG fluxes, Above Ground Biomass, Land cover, Leaf Area Index, FAPAR, Fire, Permafrost, Ocean colour
- Guiding questions for the workshop
 1. GCOS ECV definition adequacy
 2. ECV coverage in ECV Inventory (existing/planned) identifying gaps in the inventory
 3. Situation of the space segment for the ECV products
 4. Situation of the ground segment for the ECV products
 5. Situation of the science to exploit the measurements
 6. Everything that is important in addition
 7. Recommendations if needed
- A brief report with findings related to GCOS IP draft had been submitted to GCOS secretariat Mid-June 2022
- Report of gap analysis containing the report of gap analysis carried out in 2019 / 2020 is under draft
- Feedback to GST strategy action #1 (and in parts to action #2)

- Best to explain with poster at COP-26 (2021)
- Briefly: Transform from questionnaires to internally reviewed publications
- Led by W. Su (NASA) and Z. Andreeva (WMO)
- NOAA edits the finalized
- Report by WMO planned

Submission of Use Case

1. **Organization/entity proposing the Use Case:**
European Space Agency and Future Earth

2. **Name and email contact details of focal point for the Use Case:**
Name: Marie-Fanny Racault and Sophie Hebden
Country: UK
Email Address: m.racault@uea.ac.uk and Sophie.Hebden@ext.esa.int

3. **Title of the Use Case:** Cholera risk and climate observations: a case study in coastal regions of the northern Indian Ocean

4. **Key points (up to three) of the Use Case:**

- Key climate data records of ECVs for forecasting cholera risk have been identified and used to develop an outbreak risk model
- The case highlights the importance of including socio-economic data and extreme events in the analysis
- A web portal has been developed as a proof-of-concept, and it has been presented to the UN Coordination of Humanitarian Affairs and UNFCCC COP26 Earth Information Day.

5. **Please indicate the Service/Thematic Area(s) of the Use Case (double click on the boxes to check them):**

- | | | |
|---|---|--|
| <input checked="" type="checkbox"/> Adaptation | <input type="checkbox"/> Fisheries | <input type="checkbox"/> Mitigation |
| <input type="checkbox"/> Agriculture | <input type="checkbox"/> Flood management | <input type="checkbox"/> Protocol monitoring |
| <input checked="" type="checkbox"/> Coastal management | <input type="checkbox"/> Food security | <input type="checkbox"/> Tourism |
| <input checked="" type="checkbox"/> Disaster risk reduction (DRR) | <input checked="" type="checkbox"/> Health | <input type="checkbox"/> Urban |
| <input type="checkbox"/> Energy | <input checked="" type="checkbox"/> Marine ecosystems | |
| <input type="checkbox"/> Other (specify below) | | |

Other:

6. **Please indicate the end user(s) category of the Use Case. Select "Other (describe)" if none of the listed categories is applicable (double click on the boxes to check them):**

- | | | |
|---|---|---|
| <input checked="" type="checkbox"/> General Public | <input checked="" type="checkbox"/> Local communities | <input checked="" type="checkbox"/> Researchers |
| <input checked="" type="checkbox"/> Government agencies | <input checked="" type="checkbox"/> Policymakers | |
| <input type="checkbox"/> Industry | <input type="checkbox"/> Reef managers | |
| <input type="checkbox"/> Other (describe below) | | |

Cholera risk and climate observations: a case study in coastal regions of the northern Indian Ocean



SUMMARY

Key Points

- Key climate data records of ECVs for forecasting cholera risk have been identified and used to develop an outbreak risk model
- The case highlights the importance of including socio-economic data and extreme events for further developments
- A web portal has been developed as a proof-of-concept, and it has been presented to the UNFCCC COP26 Earth Information Day.

Service

- Adaptation
- Coastal management
- Health
- Marine ecosystems

End User(s)

- Government agencies
- Local communities
- Policymakers
- Researchers

Intermediate User(s)

- Health services and response
- Environmental managers

Application(s)

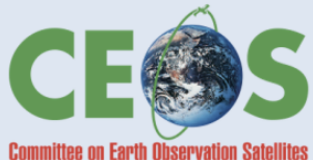
- Forecasting climate-sensitive disease cholera outbreaks in coastal waters in India to inform early health interventions and reduce mortality

Essential Climate Variables

—Atmosphere

- Precipitation
- Temperature

Climate Data Records in Action: Use Cases of Earth Observation Aiding Decision-Making



Wenying Su¹, Guangxin He², Jeffrey Privette³, Kenneth Holmlund², Albrecht von Bargaen⁴

on behalf of the Joint CEOS/CGMS Working Group on Climate and WMO

¹NASA, ²WMO, ³NOAA, ⁴DLR



Use case objectives:

- Demonstrate the value of Climate Data Records (CDRs) for decision making, including agriculture, coastal/flood management, food security, mitigation/adaptation, disaster risk reduction, and protocol monitoring, etc.
- Optimize the use of CDRs in climate service relevant applications.
- Support capacity building by providing use cases for training activities and receiving use cases from them.
- Achieve a better understanding of the application needs.
- Provide an opportunity to examine the *Architecture for climate monitoring from space* in the reverse order to ensure the observing system is designed for purpose and is tailored for the application and decision-making needs.



Marine climate change and the impact on coastal regions

Information on sea level rise, storm surge, wind speed, wave heights derived using satellite altimetry and in-situ measurements are used to develop plan to protect coastal ecosystems and communities.



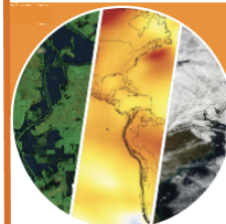
Developing a top-down carbon dioxide and methane inventory to aid the global stocktake

Comprehensive, spatially-resolved global CO₂ and CH₄ budgets are developed from space-based CO₂ and CH₄ measurements to support the global Stocktake.



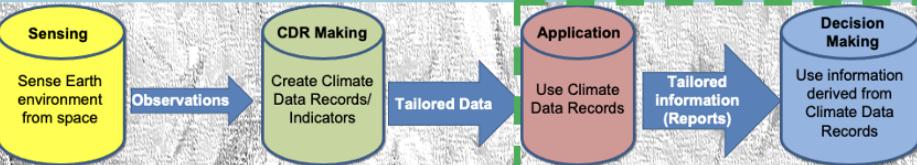
Seasonal forecasts for food security analysis in Kenya

Satellite data are used for food security analysis through digital food balance sheets to inform Kenya's Ministry of Agriculture, Livestock, Fisheries, and Cooperatives to focus on areas where financial and food aid is needed.



Space-based weather and climate extremes monitoring

Satellite-based precipitation data are used to monitor heavy rainfall and drought conditions over Southeast Asia and Western Pacific area to improve preparedness for these extreme events.



We invite the Earth observation and the user communities to submit their use cases through <https://climatemonitoring.info/use-cases/> to demonstrate the value of Earth observation in climate monitoring/service, food security, agriculture, adaptation/mitigation, capacity building, etc. Please contact Wenying.Su-1@nasa.gov if you have any questions.

WGClimate

The joint CEOS/CGMS Working Group on Climate



United Nations
Climate Change

COP-21 Paris Agreement: Adaptation (Article 7(c)):
Strengthening scientific knowledge on climate, including research, **systematic observation of the climate system** and early warning systems, in a manner that informs climate services and supports decision-making.

↑ Reports on Progress
@ SBSTA/COP



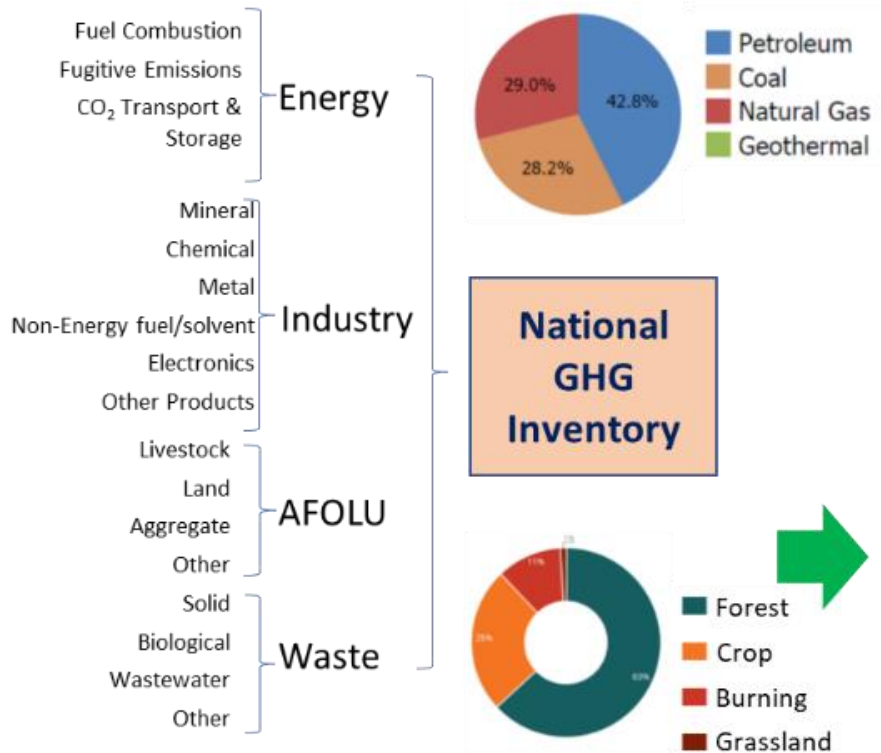
← Needs and Requirements

→ Coordinated Response

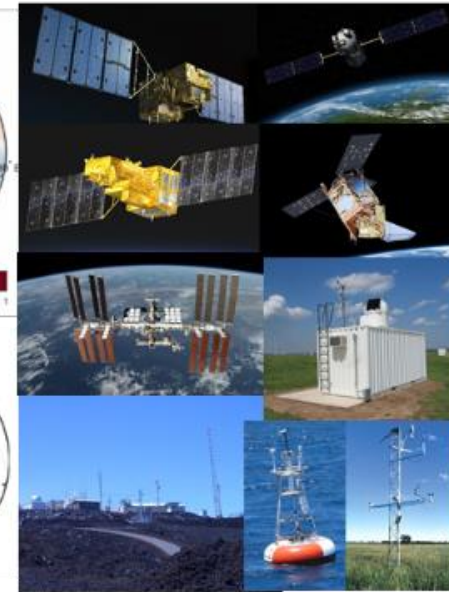
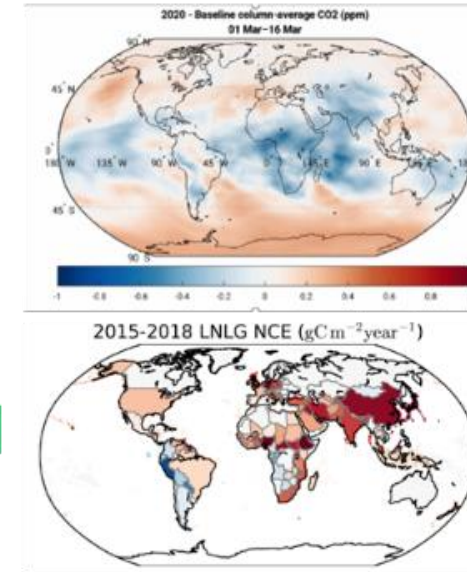
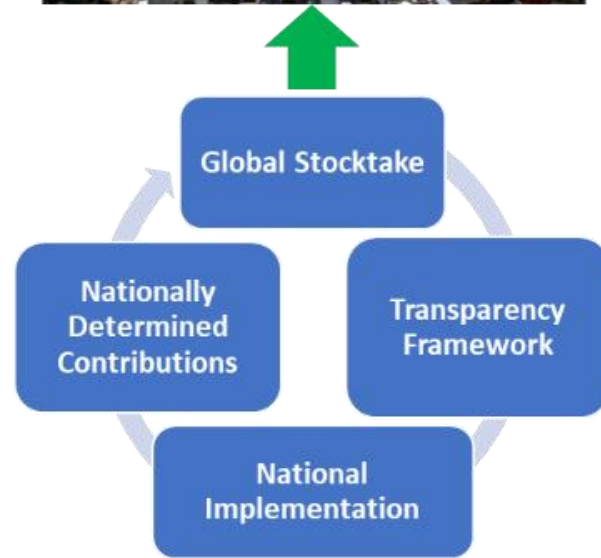


- Interface of space agencies to GCOS
- Continuous discussion about needs and requirements for a Climate observation system
- Response to updated GCOS Implementation Plan (update every 6 yrs; 2022!) => detailed response in 2023
- Drafting the CEOS/CGMS statement to SBSTA during COP

- Mitigation
 - Set-up of **GHG Task Team** in WGClimate as coordination mechanism within CEOS and CGMS; WGCV is member!!
 - In parallel AFOLU roadmap under development
- Adaptation / Loss & Damages
 - Space agencies can provide means through Earth Observation
- Global Stock Take process: Promoting the Earth Observation community vs. the Parties



National GHG Inventory



Bottom-up GHG Inventories

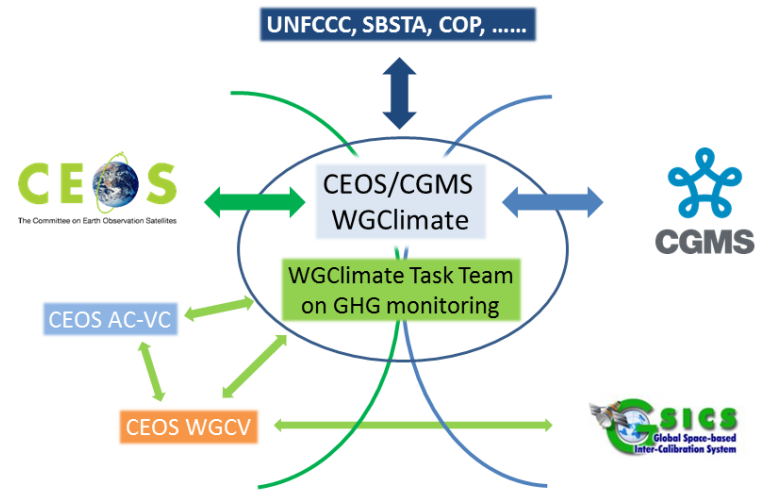
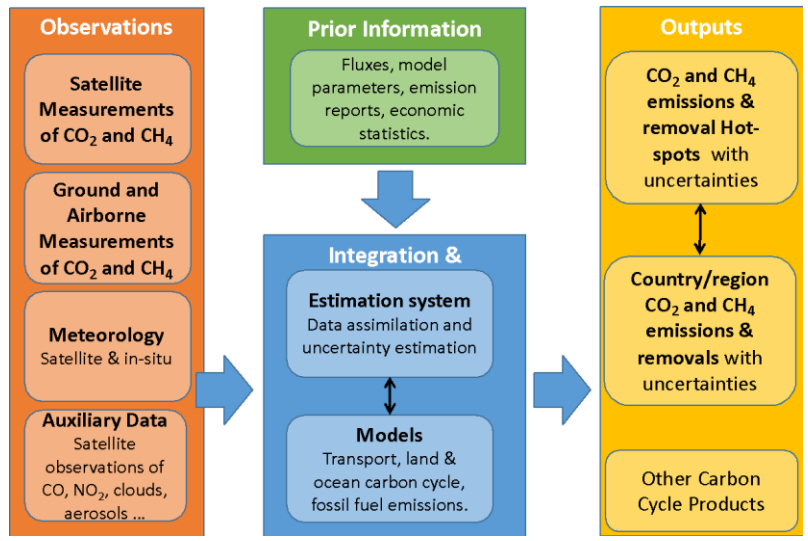
Top-down GHG Budgets



ROADMAP FOR IMPLEMENTATION OF A CONSTELLATION ARCHITECTURE FOR MONITORING CARBON DIOXIDE AND METHANE FROM SPACE

in cooperation with the

Coordination Group for Meteorological Satellites (CGMS) & WMO Global Space-based Inter-Calibration System (GSICS)



System

Space agency engagement in proposed WMO framework

Stakeholders

NB: Leadership transition in progress



Core WGClimate activities at a glance

- ECV Inventory** permanently populated and verified. Version 4.0 (06/07 2021) will have ~1,600 climate data record entries
- Gap analysis**
- Action plan**
- Continuous ECV inventory population

- Use Cases for CDRs** based on ECV inventory
- Demonstrates their value in climate applications and services
- Benefit: Web appearance and WMO-sponsored publication**

See also under <http://climatemonitoring.info>

- Unambiguous entry point to UNFCCC
- Coordinating SBSTA statements and CEOS contributions to SBSTA/RSO Earth Information Day
- Maintain Earth observation role to Global Stocktake
- Preparation of COP/SBSTA contributions

GHG Task Team

- Guided by AC/VC white paper & *roadmap*
- Members from CGMS major WGs & In-situ community

- “Space element” in **GCOS**: Support implementation plan
- GCOS requirements**: Regular dialogue with and support to GCOS
- Advocating space observations in **GEO Climate Change Working Group**

Contacts

- Albrecht von Barga (DLR, Chair until end of 2022)
- Jeff Privette (NOAA, Incoming chair end of 2022)
- Wenying Su (NASA, nominated incoming vice-chair)