Status of WMO global greenhouse gas initiative

Presented to CGMS-53 Plenary session, agenda item CGMS-53-WMO-WP-16

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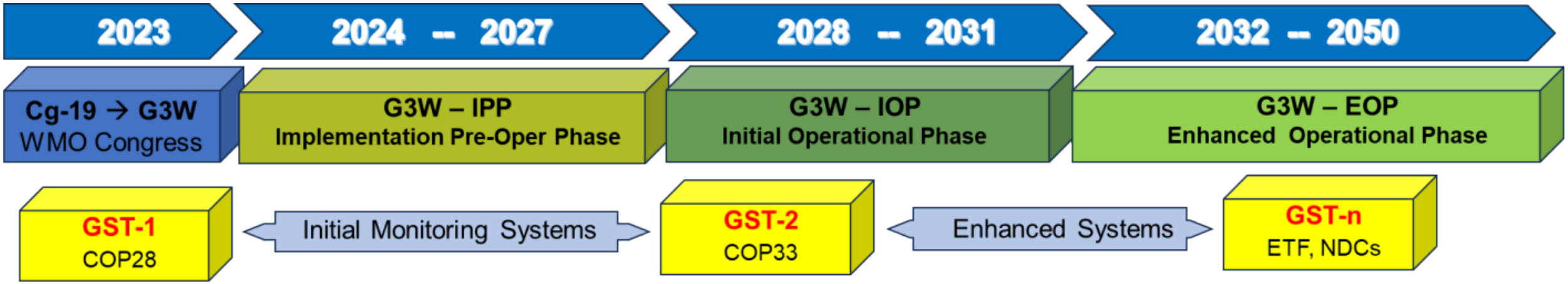
G3W timeline and recent updates



- G3W endorsed by WMO EC-78 in the week of the 10th of June 2024.
- G3W Implementation of pre-operational phase officially starts.
- G3W Advisory Group and Task Teams (Modelling, Networks, Data) formed in summer and autumn 2024.
- G3W presented at Earth Information Day: Progress noted by SBSTA SB61 in COP29 11-16th November 2024.
- *G3W presented to CEOS-CGMS WG Climate Harwell, UK, 11-13 February 2025, and*
- Technical "data providers" workshop was organized in Geneva on 5-7 March 2025.
- G3W presented at SIT-40 Fukuoka, Japan, 8-10 Apr 2025.

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G3W Implementation Plan – Prioritized Activities

- Create inventory of observations
- Carry out observational network design

- Create inventory of prior data products

- Develop the supporting R&D strategy
- Identify the highest priority research needs for the operational systems

Section 3 Observing System – O (12)

- O1 – Observation inventory
- O2 – Obs. standards & requirement
- O3 – Longer term Obs.
- O4 – Surface-based Obs. Design
- O5 – Reference Network Development
- O6 – Basic ("fit-for-purpose") network
- O7 – RS & vertically-resolved Obs.
- O8 – Ocean network design
- O9 – Gridded Air-Sea CO_2 flux
- O10 – Space-based Obs. with CEOS-CGMS, direct
- O11 – Space-based Obs. with CEOS-CGMS, indirect
- O12 – Space-based Obs. with CEOS-CGMS, future

Section 5 Prior Information – P (4)

- P1 – Identify needs – CO_2
- P2 – Identify needs – CH_4
- P3 – Identify needs – N_2O
- P4 – Fluxes characterization

Section 7 R&D Needs – R (3)

- R1 – G3W R2O Task Team establishment
- R2 – Advance Obs. & data exchange capabilities
- R3 – Advance modelling and flux inversion capabilities

Section 4 Modelling System– M (7)

- M1 – Modelling center & data
- M2 – Modelling center-documentation
- M3 – Continuous Operations (RRR)
- M4 – Obs. acquisition and pre-processing
- M5 – Prior Implementation
- M6 – Production centers common approaches
- M7 – Modelling products evaluation

Section 6 Data Management – D (7)

- D1 – Data from Raw to Exchange
- D2 – Data from providers to assimilation
- D3 – Data for model intercomparisons
- D4 – Data discovery and distribution
- D5 – Data repository for prior and fluxes
- D6 – Definition of prior data providers
- D7 – Data policy for the repository of prior fluxes

Section 8 User Engagement & Uptake – U (4)

- U1 – Support the GST
- U2 – Guidance on regional products
- U3 – Establish relationship & pathway
- U4 – Develop user interface guidelines

- Definition of the output products and system requirements

- Evaluate applicability of WIS2.0 for G3W required data exchange
- Connect existing observations to WIS

- Identify requirement for the products
- Provide recommendations on the use of G3W outputs

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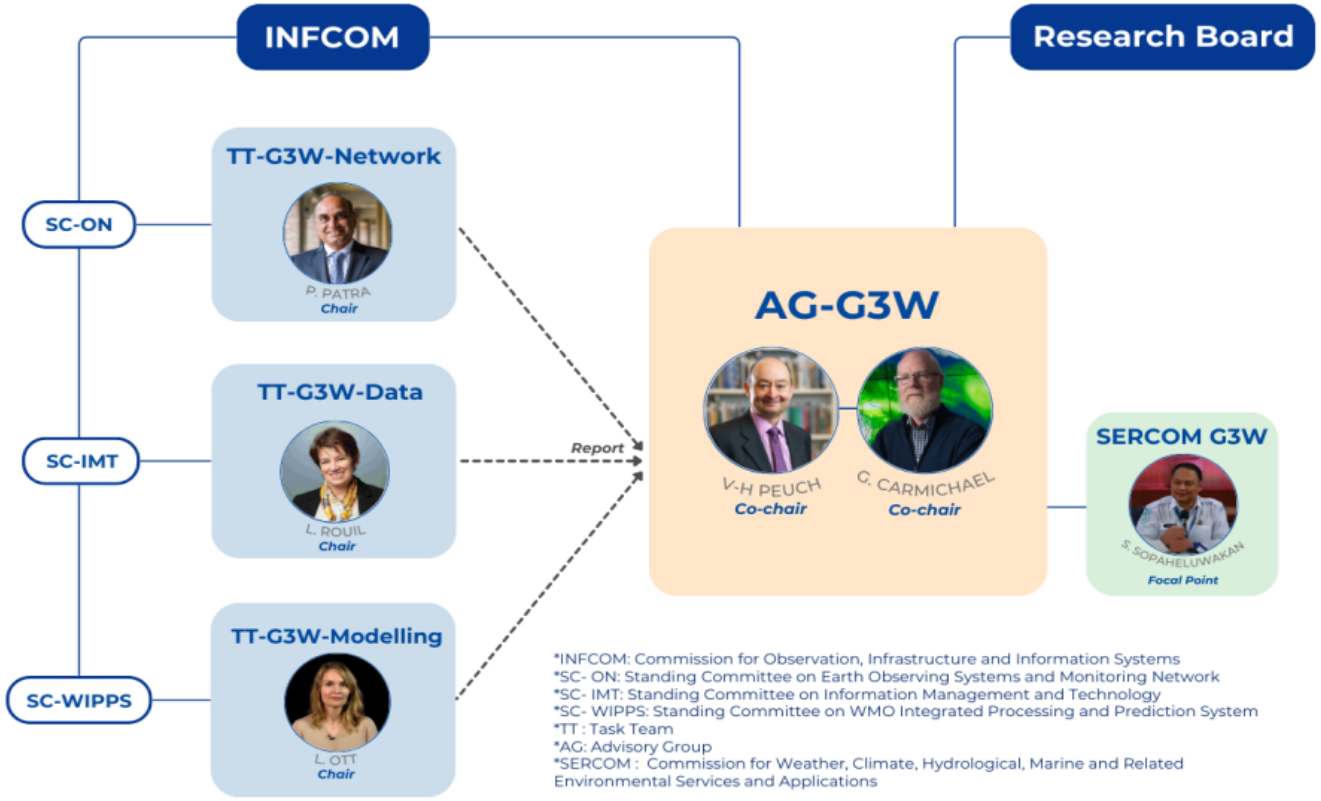
ver. September 2024

Global Greenhouse Gas Watch (G3W)



G3W delivery in 2025

AG-G3W: Oversight of implementation.

TT-G3W-Network: Comprehensive inventory of the GHG Observation, and a Network-design presented to the INFCOM.

TT-G3W-Modelling: WIPPS manual is updated to include G3W operations and recommendations on the methods and protocols for the quality control and verifications of infrastructure outputs are established and presented to the INFCOM.

TT-G3W-Data: Mapping of the current practices related to GHG data characterization, data exchange, data management and data policies.
Design of the architecture for global data sharing in support of G3W.

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Focus on modelling systems and data exchange (led by TT-G3W-modelling and TT-G3W-Data)

Modelling

Output products

- Target: <1 deg., weekly fluxes with 1 month latency, 3D concentration data with days latency.
- Threshold: <1 deg., monthly fluxes with quarterly update, 3D concentration data with days latency.
- Ancillary data products (to be provided alongside): analysis increments, prior fluxes, uncertainties.

Output verification

- Need to understand availability of in situ data within 1-month target window – guides implementation of evaluation protocols.
- Ideally metrics show system performance and help document improvement over time (e.g. similar to NWP skill score).

Data

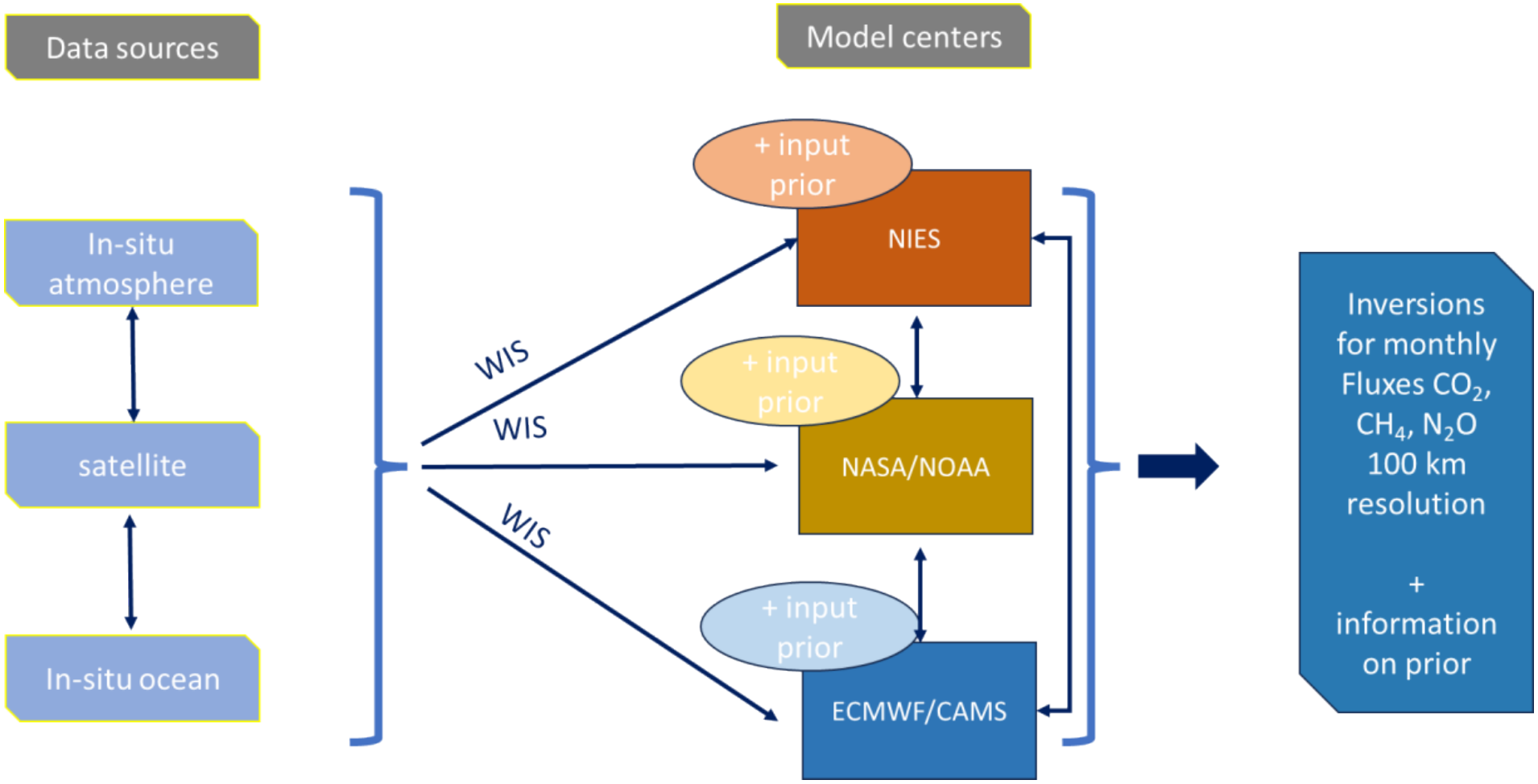
Input data considerations:

- Satellite observations – need to improve latency and spatial coverage, data processing capabilities at operational modeling centers is robust and can cope with low latency up to NRT.
- Ground-based remote sensing important for validation – can leverage existing efforts through GAW, CEOS/CGMS.

Input/verification data considerations:

- Observations - In situ: guidance on low latency products is needed; for surface ocean data priority for modelling is coverage over latency.
- Prior fluxes: all modeling centers have unique priors and advanced workflows for generating/processing them; exchanges between the centers may allow some degree of convergence (although this is not strictly required); recommendation to share priors used in operational systems as part of outputs (for transparency towards the users).

Initial thoughts on the data architecture



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Mapping of the input data

Satellite input data

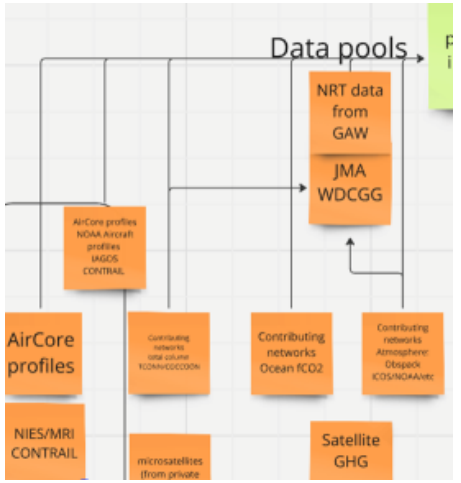
- Data exchange framework well defined under CEOS-CGMS Working Group Climate & GHG Task force.
- Various situations regarding operational data exchange but WIS2.0 already implemented in some satellite data centers.

In-situ ocean

- Exchange of existing datasets via WIS2.0 is possible
- NRT data access nice to have for the inversions but not at the detriment of spatial coverage.
- Clear “service-level” requirements (if there are) from the modelling community must be raised.

Atmospheric non-satellite data

- Granularity of the “data-centers” or data agregators to be precised.
- How to ensure redundancy?
- Governance issues when talking about a regulatory network.
- Questions about the capacity of regional/aggregator centers to perform QA/QC and how to harmonise.



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Key issues of relevance to CGMS:

- Implementation of G3W is progressing well. Excellent dovetailing with CEOS-CGMS activities, which effectively represent the Space component of G3W.
- Presentation at the WMO Executive Council (June 16th). Some degree of concern regarding the long-term funding of a critical mass of people within the G3W secretariate at WMO.
- Independently from budgetary issues within WMO the GHG operational needs will remain.

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To be considered by CGMS:

- Continue working on low latency products as this is decisive input for the overall system latency.
- Fill the spatial gaps identified (particularly stratospheric methane).
- Work towards observations sustainability for long-term operations.