



Benefits of Engagement with External Strategic Partnerships

Paolo Laj

**Head, Atmospheric Environment Research
Science and Innovation department**



WORLD
METEOROLOGICAL
ORGANIZATION

2024 AMSG strategic Planning Workshop, July 9-10, 2024, Salt Lake City, Utah

2009 Emmeten GAW WS

Despite the crucial importance of aerosols as short-lived climate forcers and their importance for air quality, the networks are lacking in global, coordinated coverage. The Global Atmosphere Watch (GAW) Programme of the World Meteorological Organization (WMO) has an important role in the coordination of aerosol measurements globally.

Recommendations for a Composite
Surface-Based Aerosol Network

(Emmetten, Switzerland, 28-29 April 2009)



World
Meteorological
Organization
Weather · Climate · Water



GLOBAL
ATMOSPHERE
WATCH

Advance in Monitoring Global Aerosol Properties

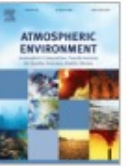
- AERONET as the central Global network
- In-situ aerosol networks have coordinated efforts for more integrated assessment papers
- Aerosol profile network of networks (GALION) are still mostly working as independent regional networks
- Other networks remain regional in scope

Emmeten, 15 years later




Atmospheric Environment

Volume 225, 15 March 2020, 117216

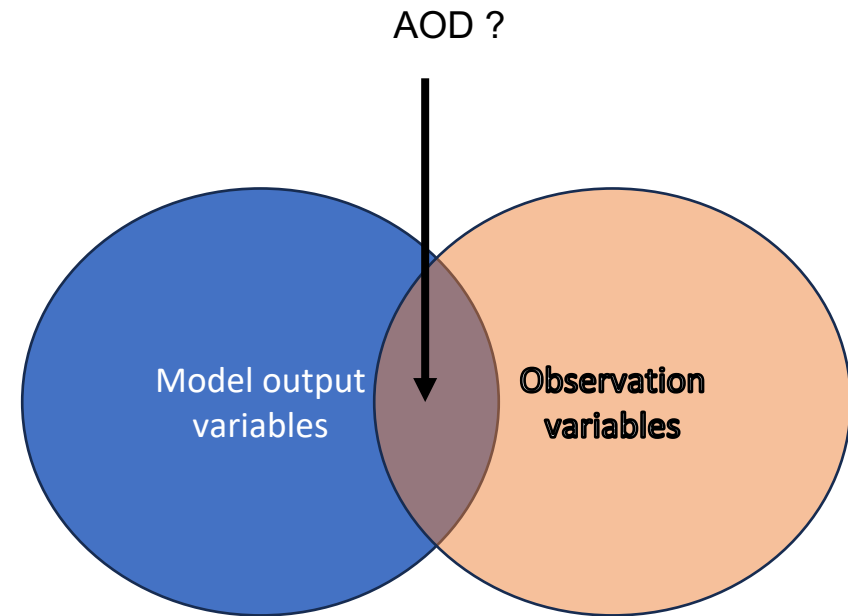


Worldwide validation of CAMS and MERRA-2 reanalysis aerosol optical depth products using 15 years of AERONET observations

[Christian A. Gueymard](#)^a, [Dazhi Yang](#)^b  

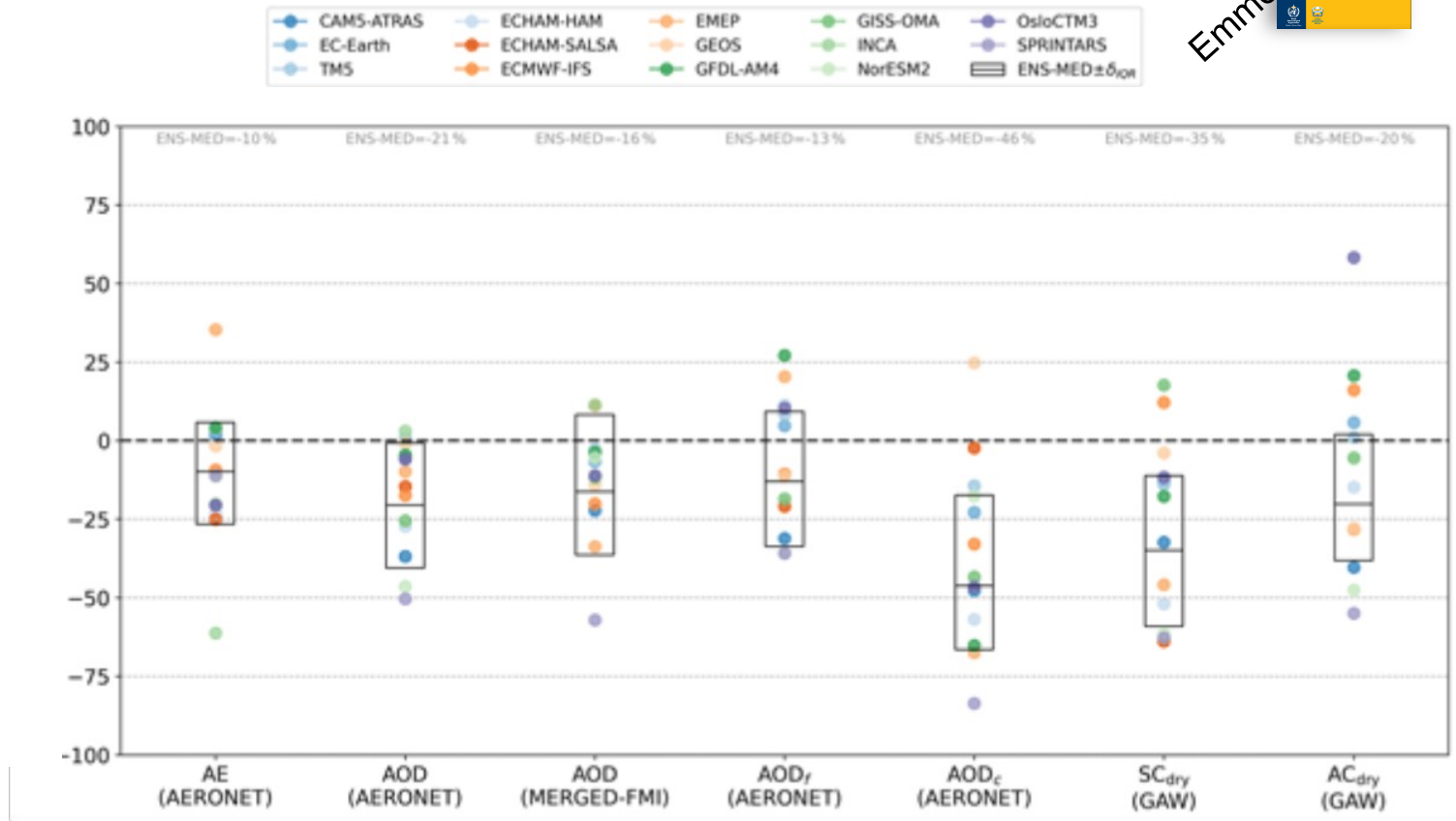
Connecting with modelling: Model and Observation Overlap

- Efforts to integrate models with observations (i.e. AEROCOM)
- Few aerosol quantities can be used for direct comparisons
- For Aerosol Essential Climate Variable Quantities, it is mostly AOD
- Next in line is Black Carbon
- How can we expand the overlap to other variables (the Aerosol ECV quantities) ?



AEROCOM great efforts

- Correlation coefficients between model and observation AOD are high ($R > 0.75$) but model ensemble underestimates all aerosol optical properties
- Comparison against GAW in situ data results in high mean bias and inter-model variations



$$NMB = \frac{Model - Observation}{Model}$$

Connecting with modelling: providing fit-for-purpose products ?

- 12 data sets used for the study : Regional research campaigns 2008 to 2017
- No use of eBC, ABS_{coef} , SSA produced by long-term observation networks
- Does aerosol networks provide the expected fit-for-purpose products ?

Emmetten, 15 years later






ARTICLE



<https://doi.org/10.1038/s41467-020-20482-9>

OPEN

Biomass burning aerosols in most climate models are too absorbing

Hunter Brown ¹, Xiaohong Liu^{1,2✉}, Rudra Pokhrel ^{1,3}, Shane Murphy ¹, Zheng Lu^{1,2}, Rawad Saleh⁴, Tero Mielonen⁵, Harri Kokkola ⁵, Tommi Bergman ⁶, Gunnar Myhre ⁷, Ragnhild B. Skeie ⁷, Duncan Watson-Paris ⁸, Philip Stier ⁸, Ben Johnson⁹, Nicolas Bellouin ¹⁰, Michael Schulz ¹¹, Ville Vakkari^{12,13}, Johan Paul Beukes¹³, Pieter Gideon van Zyl¹³, Shang Liu¹⁴ & Duli Chand¹⁵

Aerosol Essential Climate Variables Quantities

- Aerosol ECV quantities increased from 4 to 7 (Chem. Comp, Size distribution, CCN)
- Networks are better connecting requirements for Climate and for atmospheric composition monitoring

Carbon dioxide, Methane and other greenhouse gases	N2O mole fraction CO2 Total Column CO2 mole fraction CH4 Total Column CH4 mole fraction
Ozone	Ozone Mixing Ratios in the Troposphere Ozone Mixing Ratios in the Upper Troposphere/ Lower Stratosphere (UTLS) Ozone Mixing Ratios in the Middle and Upper Stratosphere Ozone Stratospheric Column Ozone Tropospheric Column Ozone Total Column
Precursors (supporting the aerosol and ozone ECVs)	CO Total Column CO Tropospheric Column HCHO Total Column SO2 Total Column NO2 Total Column (suggested to change to tropospheric) CO Mole fraction NO2 mole fraction
Aerosols properties	Aerosol light extinction vertical profile (troposphere, stratosphere) Multiwavelength aerosol optical length Chemical composition Number of cloud condensation nuclei Aerosol single scattering albedo Aerosol number size distribution

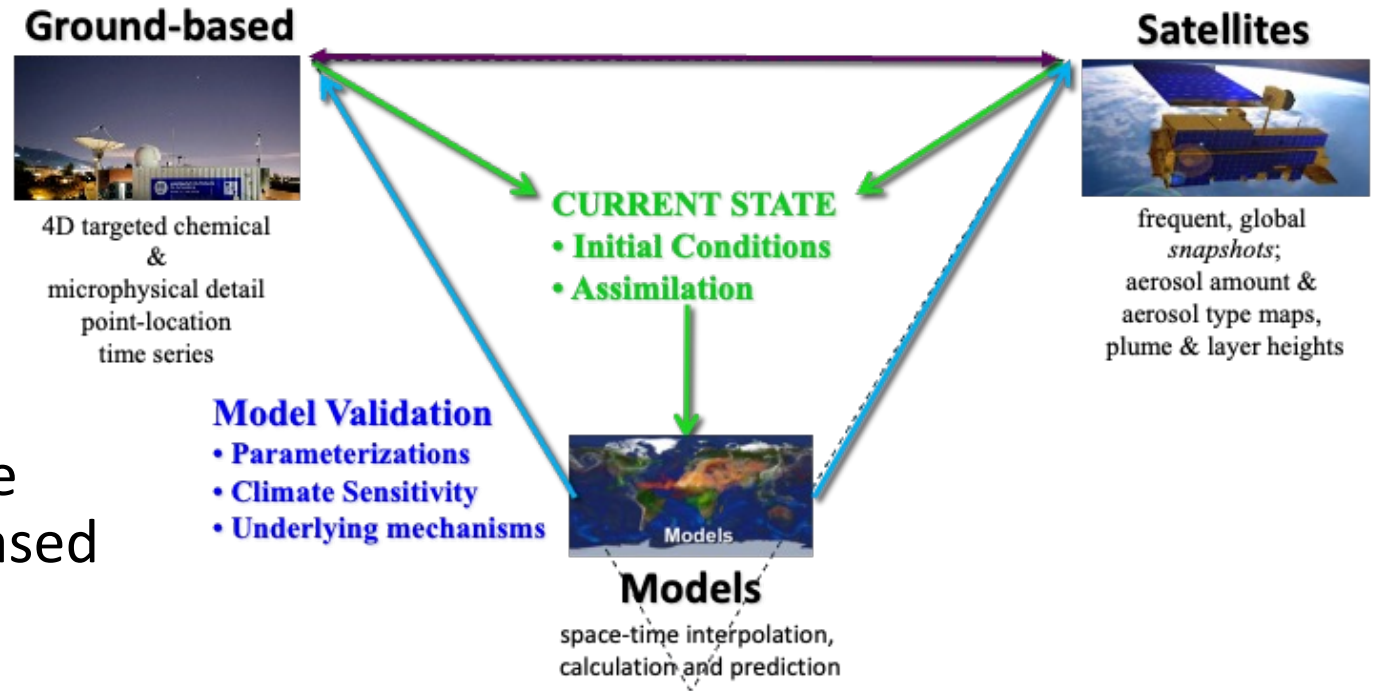
} EU Air Quality Directive



Emmeten, 15 years later



- Substantial Progress has been made connecting ground-based, space-based and models
- Contribution to IPCC AR6
- Exploitation of Aerosol Observations is not yet fully optimized
- From a user perspective, cross-network is not plug-and-play
- Go onto the next phase of global cooperation



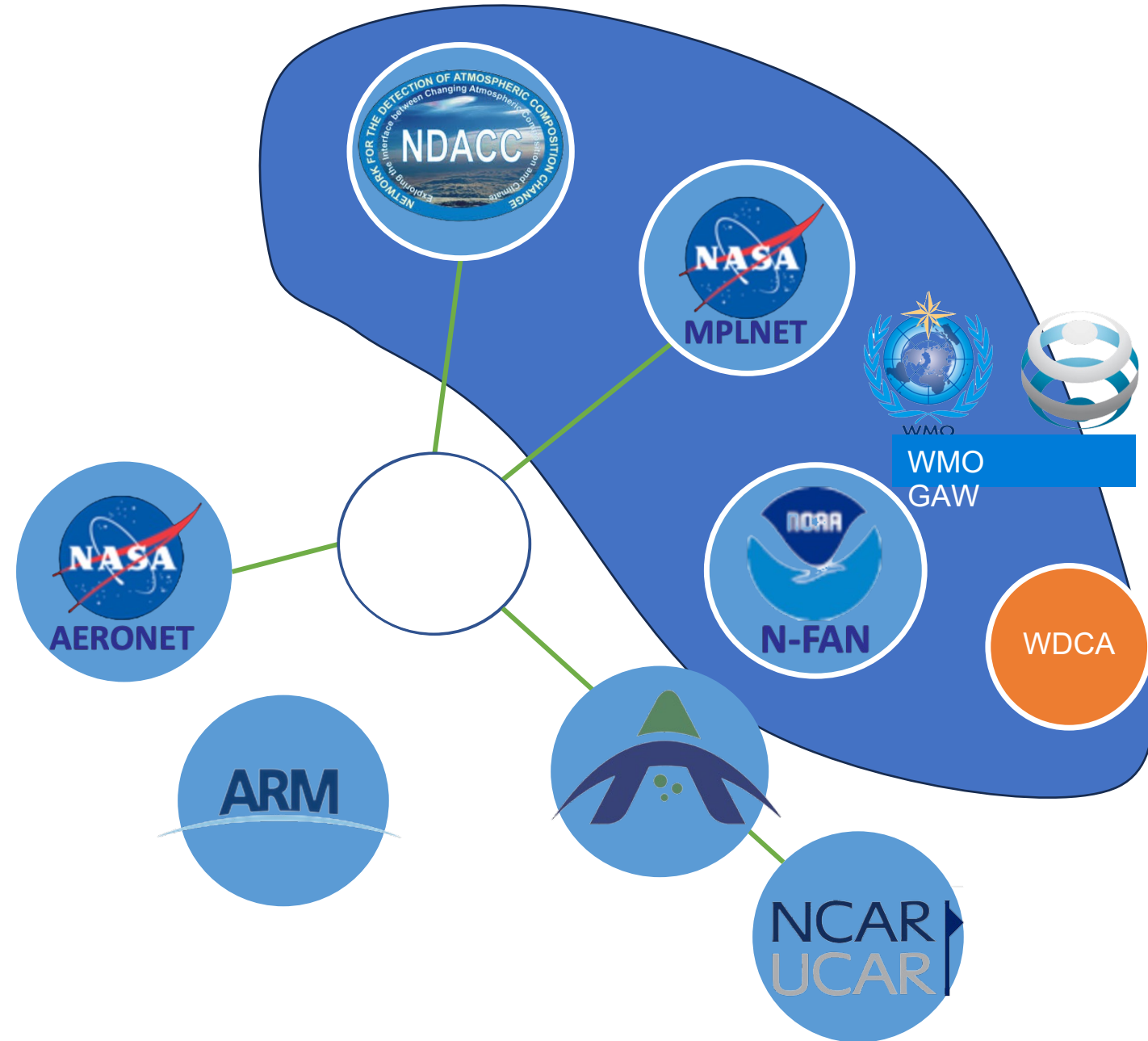
The next phase: strategic network partnership

- In Europe, ACTRIS as a single voice for long-term aerosol observations
- SOPs (WMO-GAW)
- Colocation of observations
- Data policies
- Licensing
- Funding policies for Central Facilities
- Access



The next phase: strategic network partnership

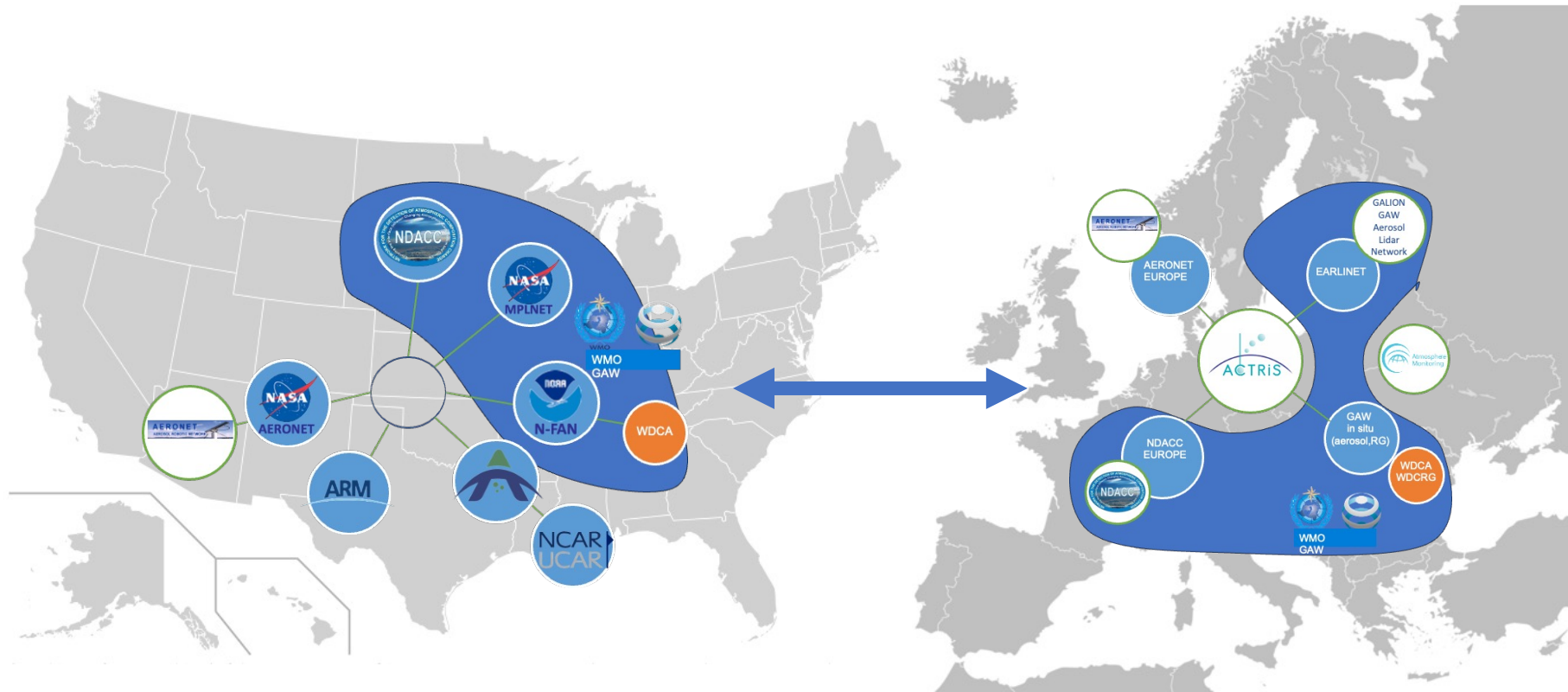
- In the US...work in progress
- Not shown: IMPROVE, SPARTAN...



The next phase: strategic network partnership

CARGO-ACT (2024-2027)

- sustainable cooperation between US-EU ground-based networks for SLCS,
- demonstrate the benefits of interoperability and common standards,
- establish the mechanisms for providing international access



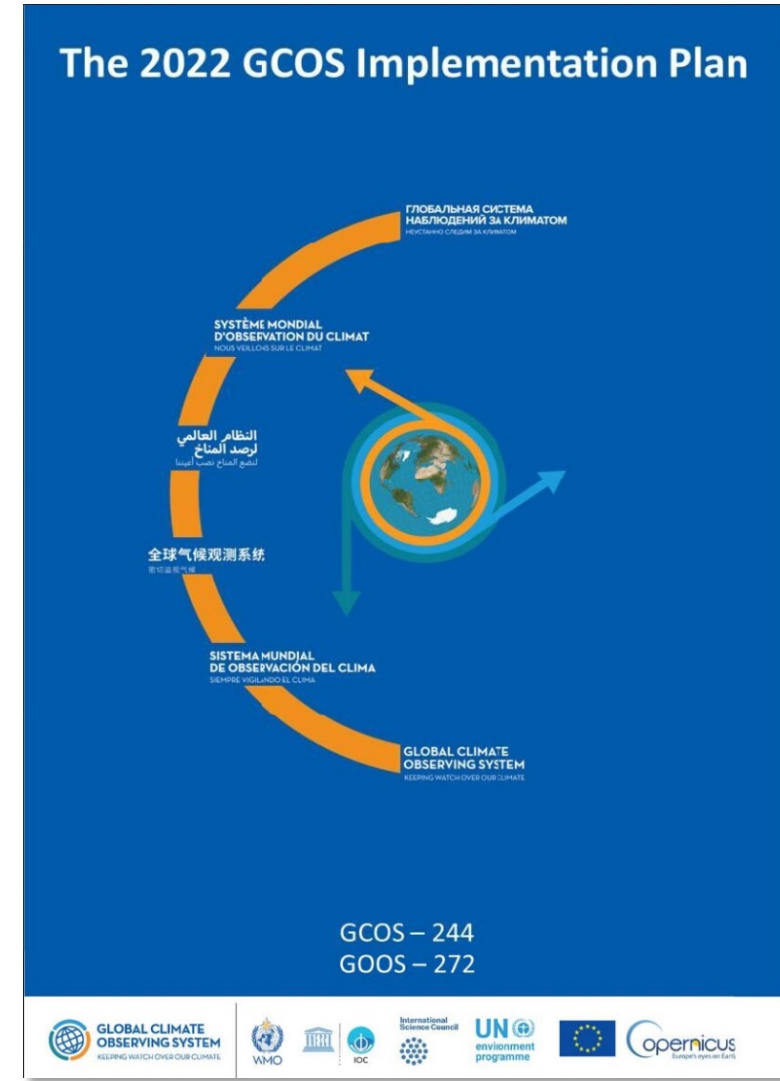
The next phase: strategic network partnership

- Extending CARGO-ACT to Global Regional cooperation
- WMO/GAW can act as glue for regional cooperation



The Key Performing Indicators for successful regional cooperation

- Ensuring Sustainability
- Filling Data Gaps, establish partnership
- Improving data quality, availability and utility, including reprocessing
- Managing Data, establishing regional data centers
- Engaging with Countries



Agenda for WMO/GAW : improving global partnership

5 Pillars of the GAW program

- **GAW Monitoring atmospheric composition**
- **GAW Science assessments**
- **GAW Science-to-Services-to-Policies**
- **GAW Support to Conventions and Treaties**
- **GAW Education, outreach, Training and capacity building**



GAW implementation actions 2024-2025

- Discuss with the Regions (Mt Waliguan anniversary in September)
- Better monitor the network performances (network manager)
- Further develop the concept of Tiered (Contributing networks)
- Meeting of implementers for fostering data exploitation
- Developing the GAW academy for education and training
- Resource mobilization for secretariat and members

Hopefully, GAW Symposium in 2025



WORLD
METEOROLOGICAL
ORGANIZATION

<https://community.wmo.int/en/activity-areas/gaw>