The WMO Global Atmosphere Watch (GAW) programme

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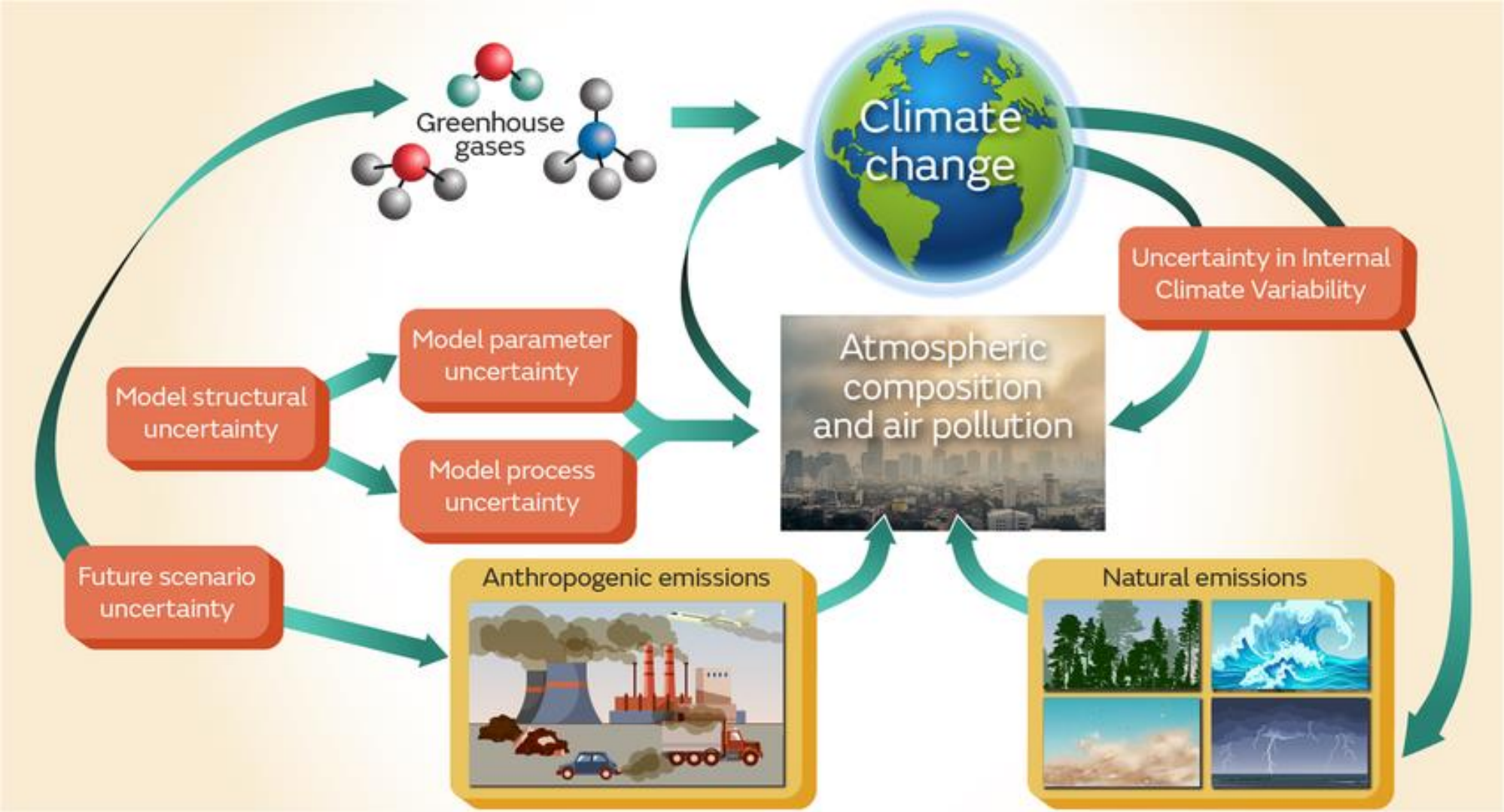
Scientific Scope | Atmospheric Composition

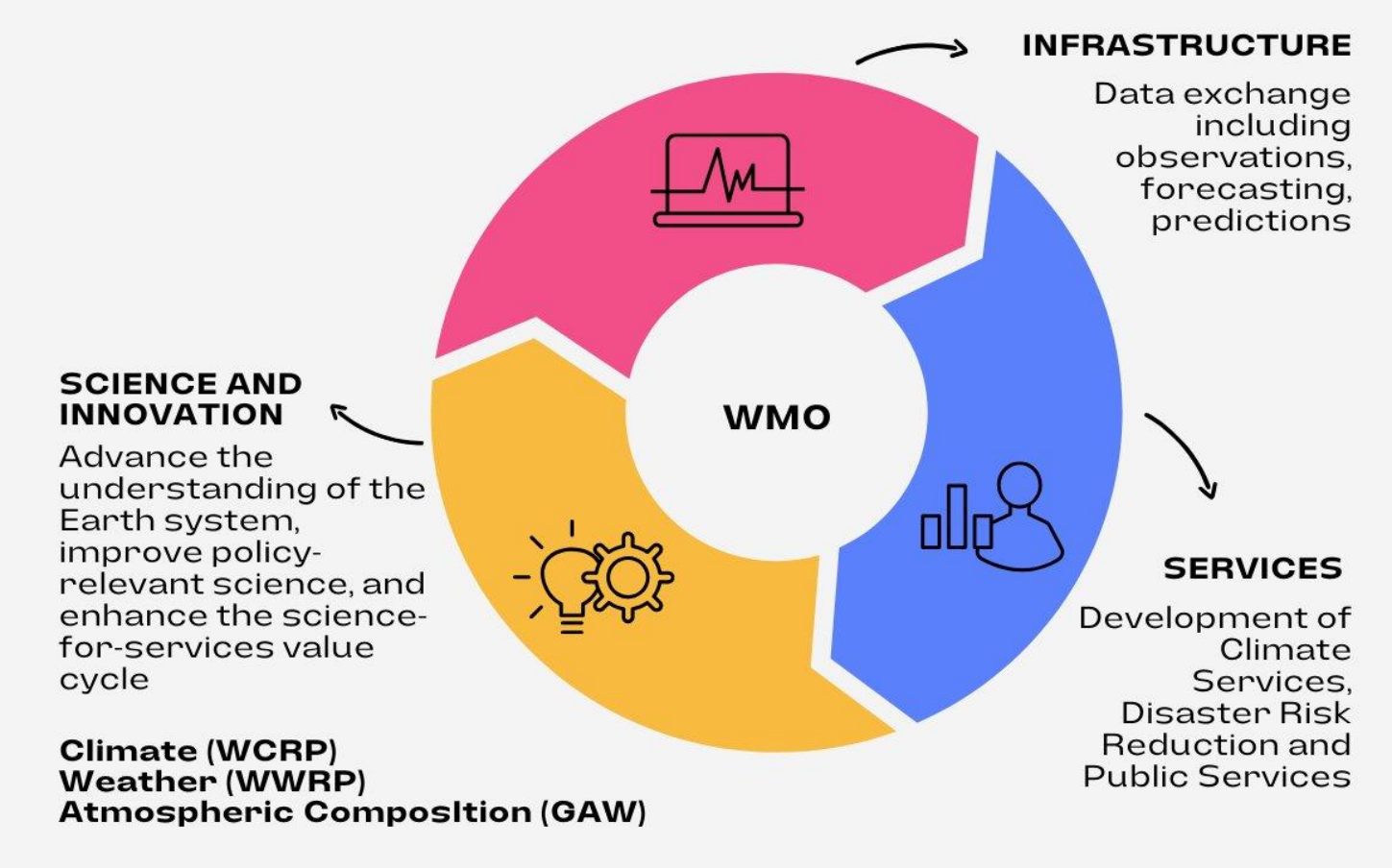
Which source of uncertainty is more important for projections of **future atmospheric composition and air quality**?



Source: Doherty et al., JGR, 2022

World Meteorological Organization (WMO)

- UN specialized agency on weather, climate and water.
- It's supported by 193 Members and the headquarters is in Geneva (Switzerland).
- Coordinates work of > 300,000 national experts from meteorological and hydrological services, academia and private sector.
- Co-Founder and host agency of IPCC.



WMO Reseach-Operations Departments

WMO Research - Global Atmosphere Watch (GAW)

Research Enabling Atmospheric Composition Services

Advance and enhance ***science, infrastructure and services*** *related to atmospheric composition, and support policies for society through applied research aimed at improving the understanding of the roles of* ***aerosols, reactive gases, stratospheric ozone, greenhouse gases and deposition*** *and their interactions in the Earth System.*

Drivers: Global societal needs

Support to international conventions and SDGs

- The Convention on Long-range transboundary Air pollution (LRTAP)
- The Montreal Protocol and Vienna Convention (*ozone*)
- The UN Framework Convention on Climate Change (UNFCCC)
- Climate and Clean Air Coalition (CCAC)
- The Convention on Biodiversity
- The Group of Experts on the Scientific Aspects of Marine Environmental Protection (GESAMP)
- UN Coalition for Combating Sand and Dust Storms

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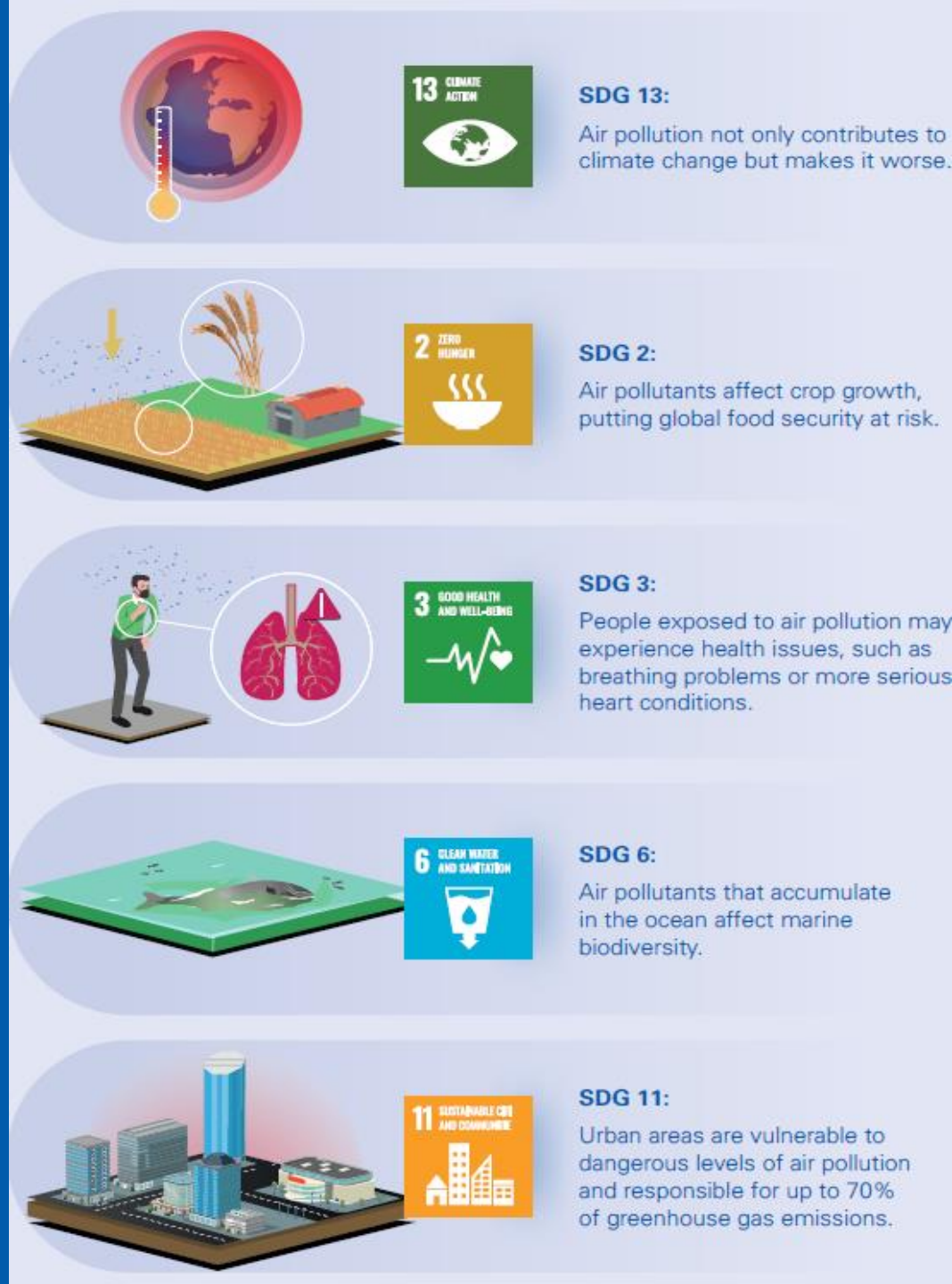


The GAW Programme: 4 pillars

Monitoring Infrastructure: provision of atmospheric composition data from GAW stations,

Scientific assessments: advancing scientific understanding through analysis of global data sets,

Science-for-Services Initiatives: engage with user communities for supporting services and policies,

Capacity Building and education: provide training opportunities for all GAW users from all regions

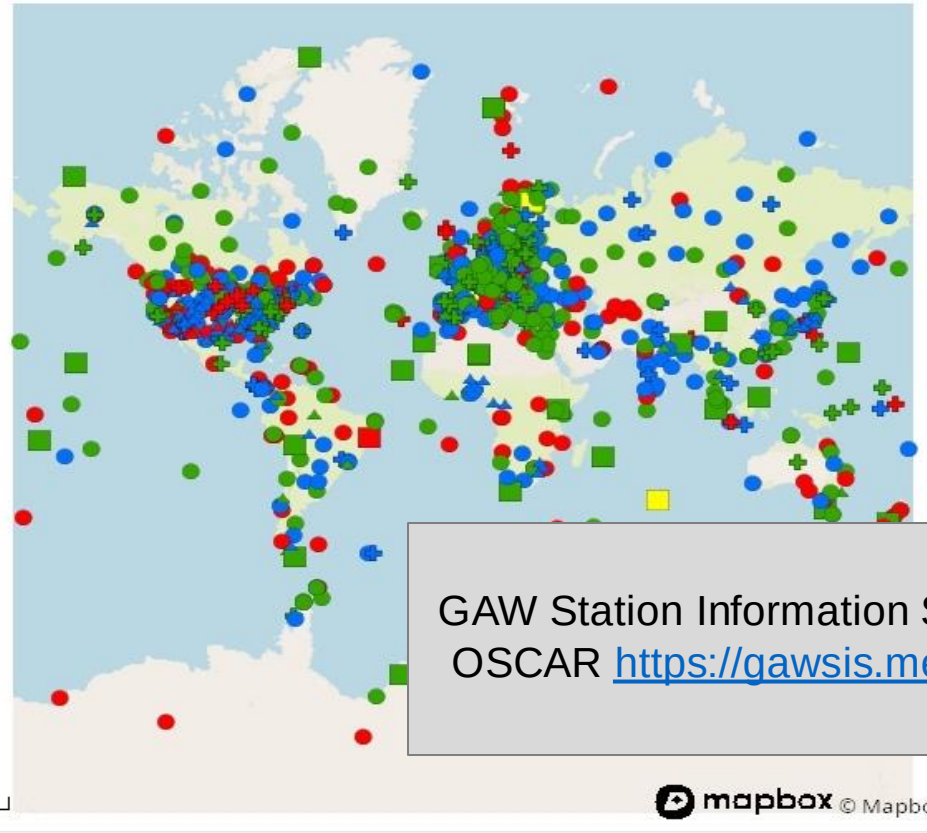
GAW: Research Infrastructure

Strengthen the atmospheric composition measurement and data infrastructure and contribute to ***understanding trends and variability and extremes.***

- More than 200 parameters
- Intercomparisons
- Measurement guidelines
- World Data Centers

Open access with emphasis in QA and QC

Filling gaps:
LCS and satellites, but also National AQ networks
Integration!



GAW Station Information System (**GAWSIS**) part of OSCAR https://gawsis.meteoswiss.ch/GAWSIS/#/

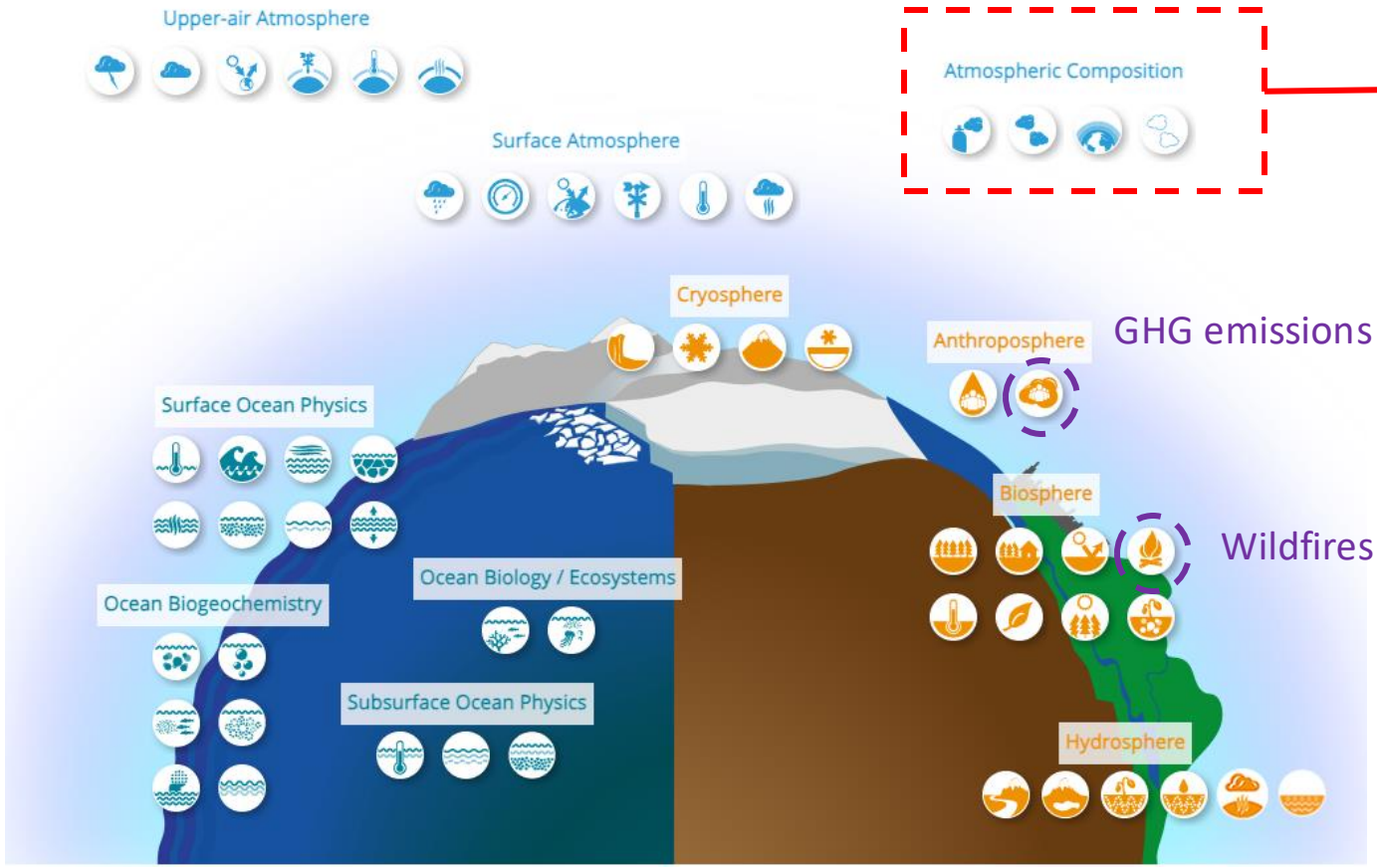
World Meteorological Organization
Weather - Climate - Water

Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Swiss Confederation

Federal Department of Home Affairs FDHA
Federal Office of Meteorology and Climatology MeteoSwiss

Global Climate Observing system: GCOS Essential Climate Variables



GAW Focal Areas

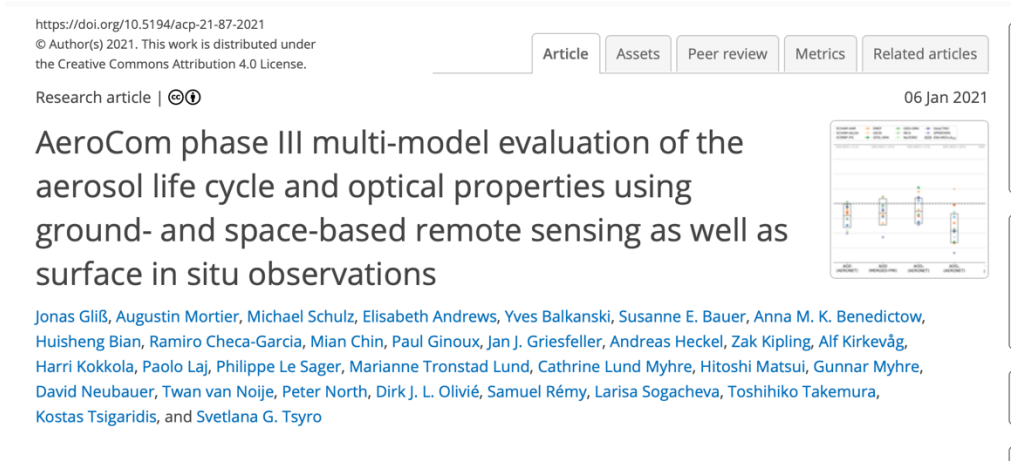
- Aerosols (*chemical and physical properties, AOD*)
- Greenhouse Gases (CO_2 *and its isotopes,* CH_4 *and its isotopes,* N_2O, SF_6, *CFCs*)
- Stratospheric Ozone and vertical ozone distribution
- Reactive Gases (O_3, *CO, VOC,* NO_x, SO_2)
- Precipitation Chemistry
- UV Radiation

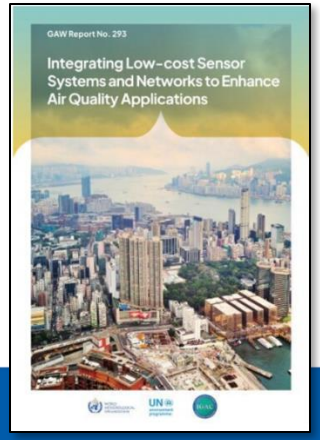
Note that GAW stations are required to meet GCOS monitoring principles

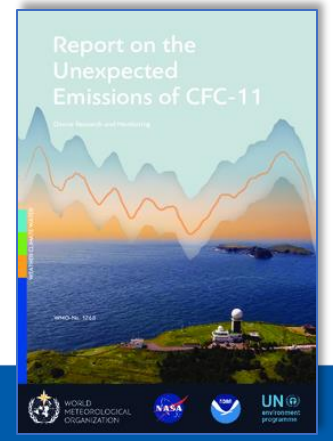
https://gcos.wmo.int/en/essential-climate-variables

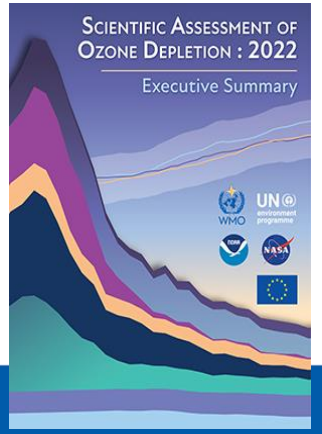
GAW Scientific assessments

- Publish community assessment reports and high-level scientific papers on the state of the atmosphere and its evolution,
- Provide technical recommendation for monitoring atmospheric composition
- Contribute to international reports









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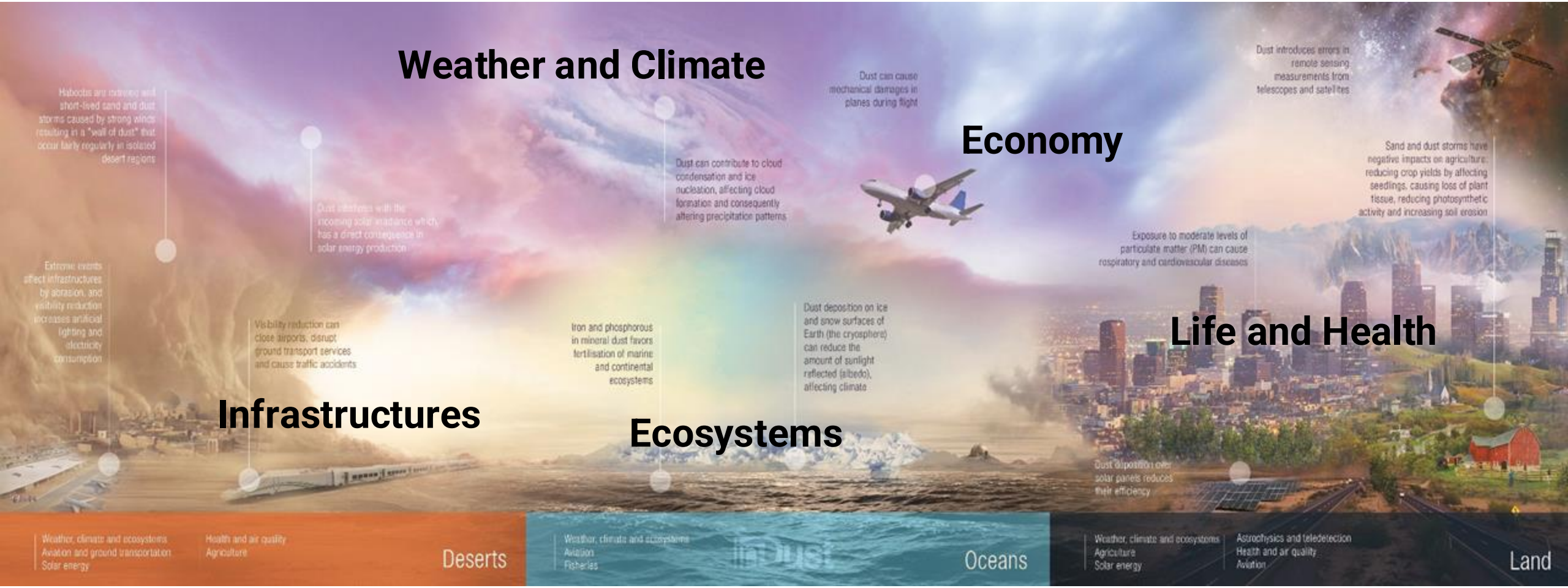
Science for Services

Sand and Dust Storms and its impacts

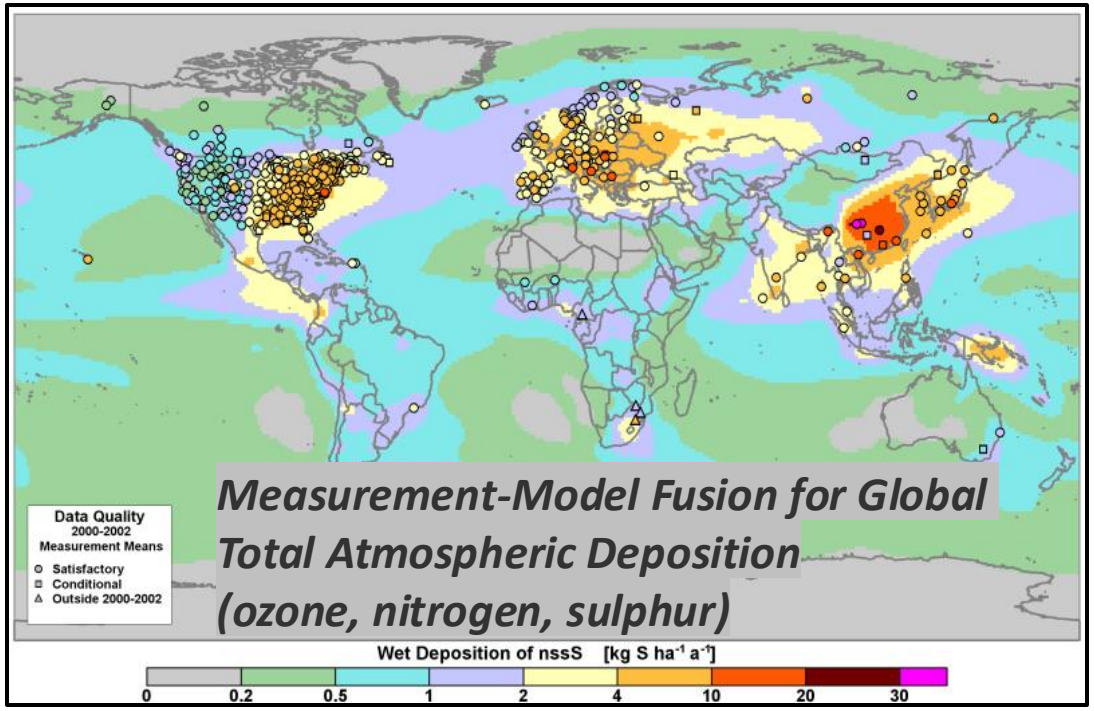


inDust Leaflet available in www.cost-indust.eu/media-room

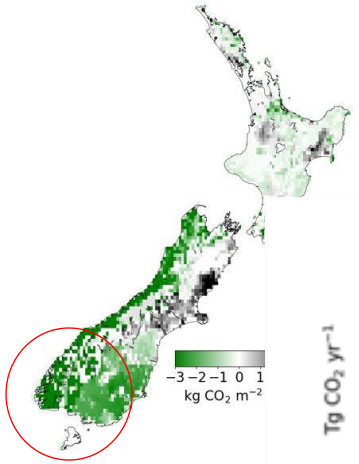
Science for Services

*Advance the application of atmospheric composition information in support of policies and conventions, and expand **societal services** related to air quality, human and ecosystem health, **climate change** and food production.*

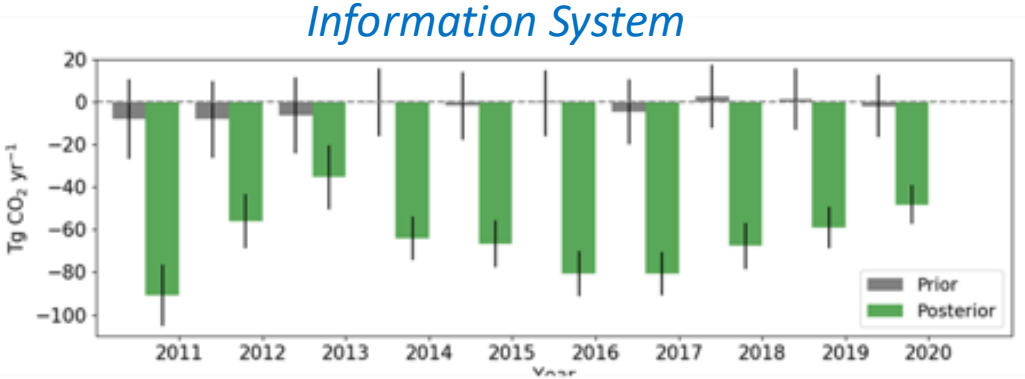
Deposition to ecosystems and crops + climate action



Measurement-Model Fusion for Global Total Atmospheric Deposition (ozone, nitrogen, sulphur)



Integrated Global Greenhouse Gas Information System

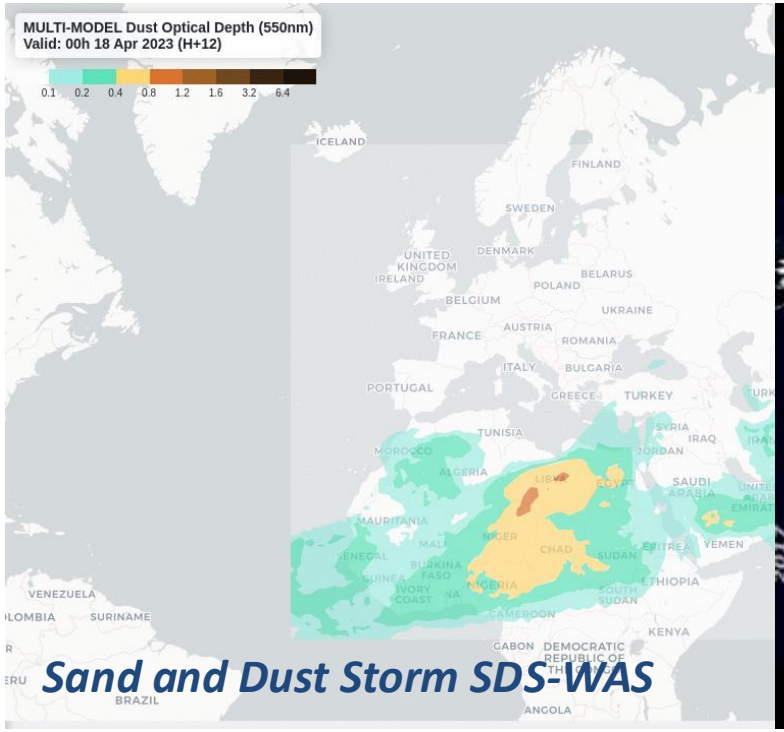


Aotearoa New Zealand's terrestrial carbon uptake

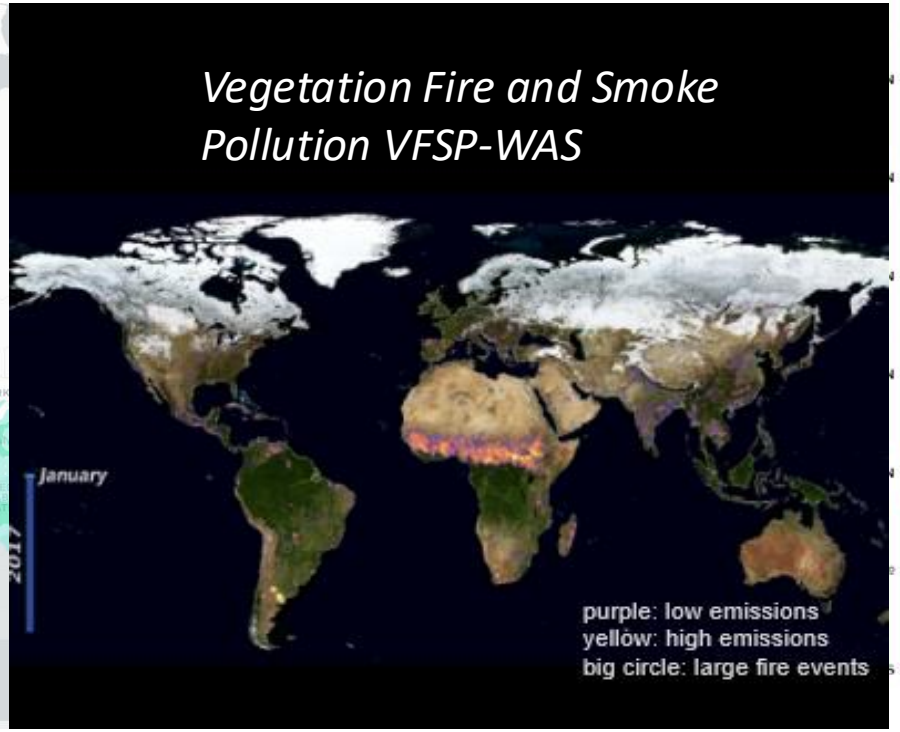
Science for Services

*Advance the application of atmospheric composition information in support of policies and conventions, and expand **societal services** related to air quality, human and ecosystem health, climate change and food production.*

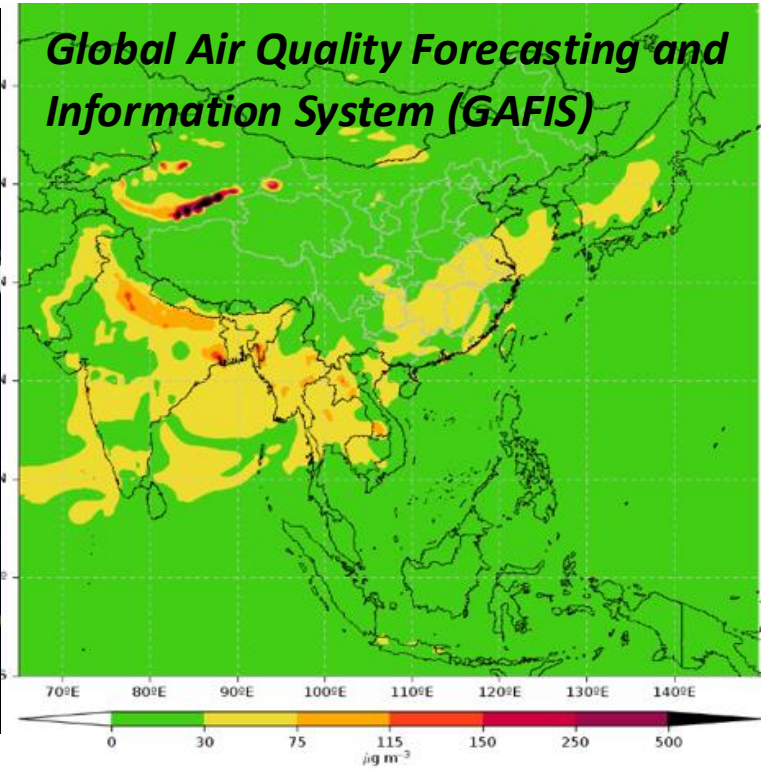
Warnings and Forecasting Services
Model intercomparisons



Sand and Dust Storm SDS-WAS

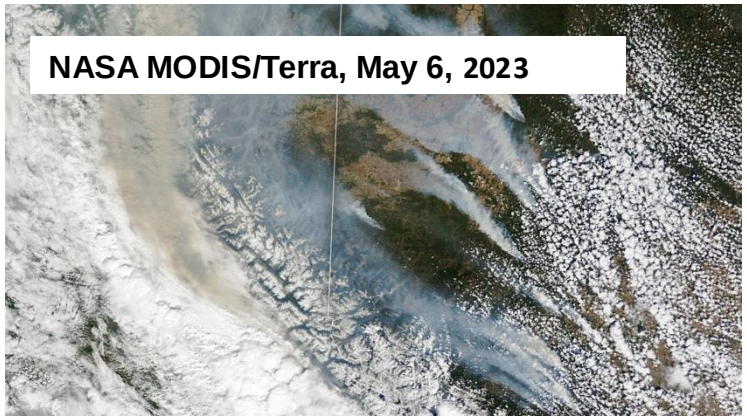


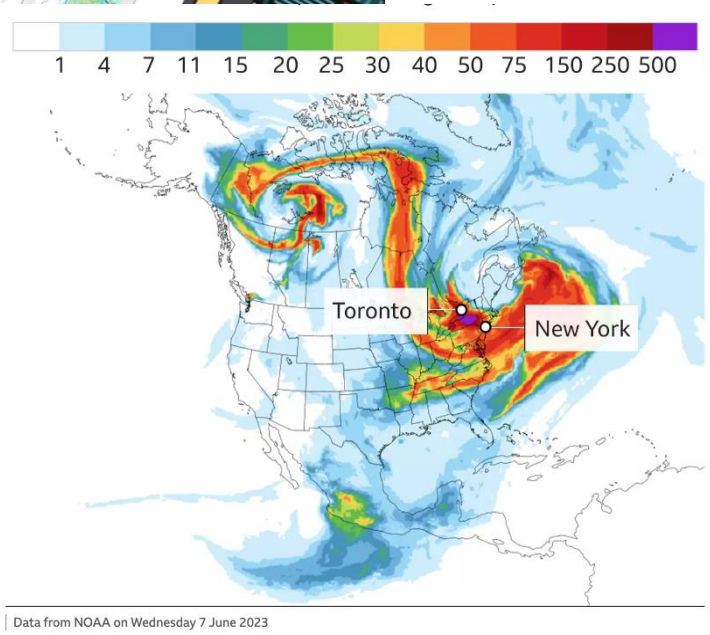
Vegetation Fire and Smoke Pollution VFSP-WAS



Global Air Quality Forecasting and Information System (GAFIS)

WMO-GAW Warning Advisory and Assessment Systems (SDS-WAS and VFSP-WAS)





International coordination of research for weather and climate

Identification and assessment of SDS and VFSP impacts

Promoting the use of current available products (observations and monitoring)

Building capacity and facilitate access to the available services

Dissemination and awareness

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

Infrasctructure for the provision of Services

Monitoring

746 active global/regional/urban/ stations in 112 countries

Central Facilities

13 countries are hosting GAW central facilities

Forecasting

21 countries providing daily forecasts

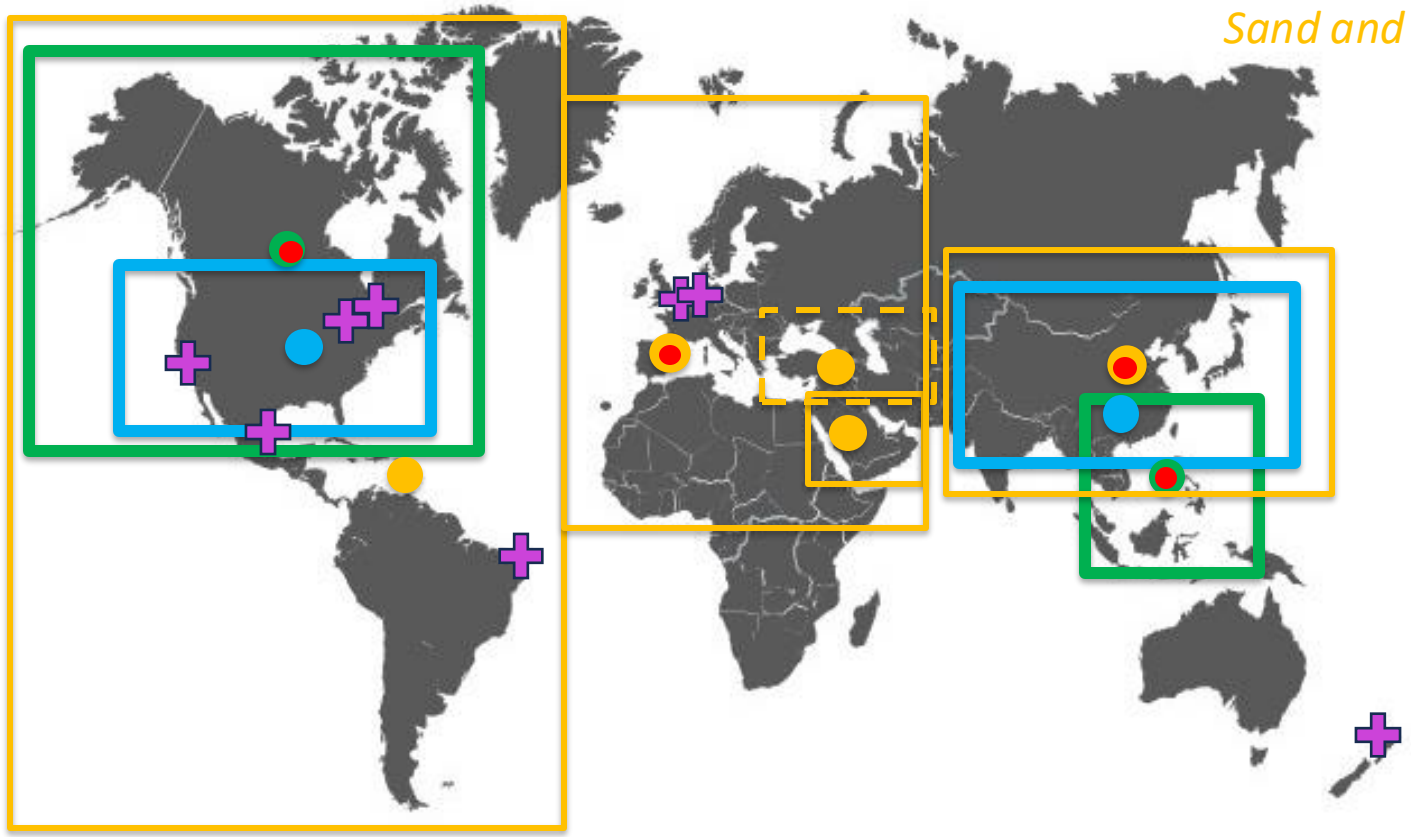
GHG emission information systems – IG3S city projects

Forecasting - Model Intercomparisons:

Sand and Dust Storms

Wildfires

Air Quality



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WMO INFRASTRUCTURE - WIPPS

Regional Specialized Meteorological Center with activity specialization

Capacity Development

- Provision of training to GAW station operators through the Global Atmosphere Watch Training & Education Centre (GAWTEC)
- GAW stations instrument intercomparison and calibration campaigns
- Training on data quality control, data use, modelling tools and quality assurance procedures

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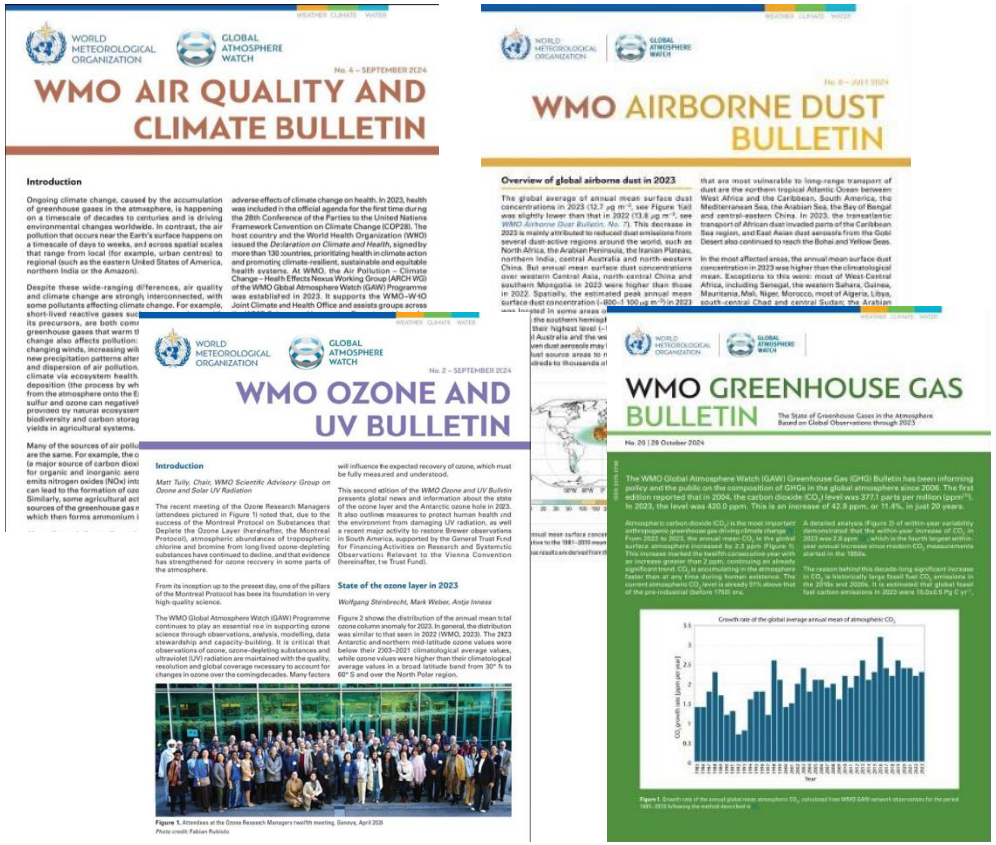
Promoting latest Science achievements

WMO Bulletins in 2024



Available at: https://library.wmo.int/

WMO-GAW Newsletter

GLOBAL ATMOSPHERE WATCH

Stay up to date on our core and related activities through our Newsletter

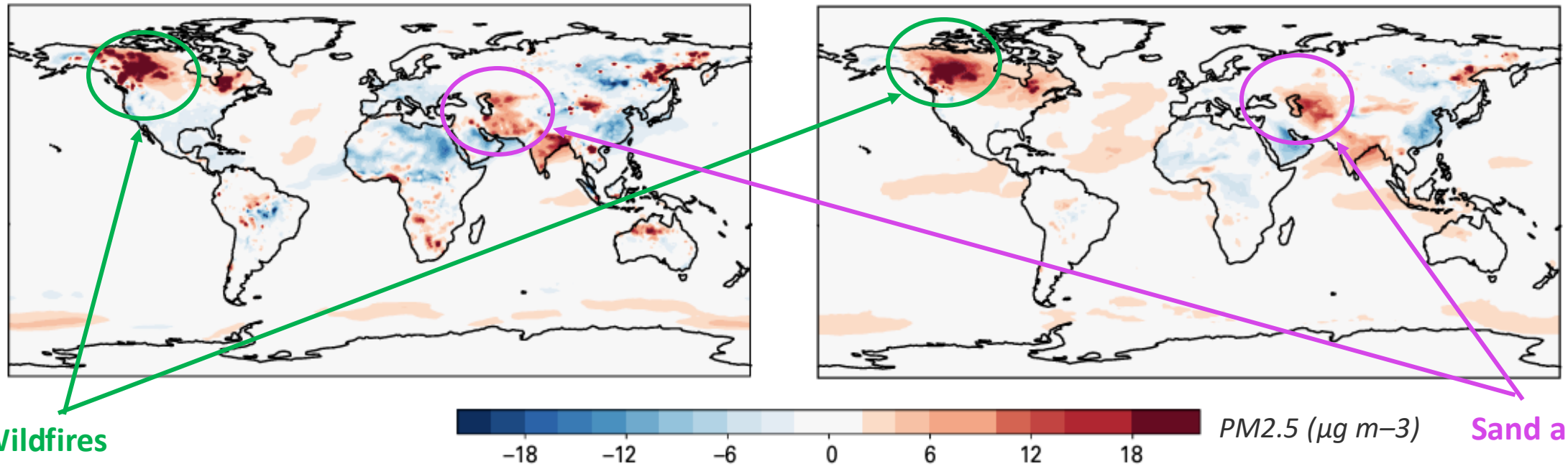
Click here to Subscribe to the GAW Newsletter

What did it happen in 2023?

PM2.5 anomaly for 2023 with respect 2003-2023

Source: MERRA-II Reanalysis

Source: CAMS Reanalysis

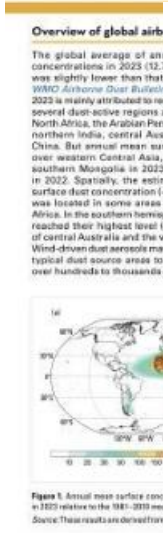


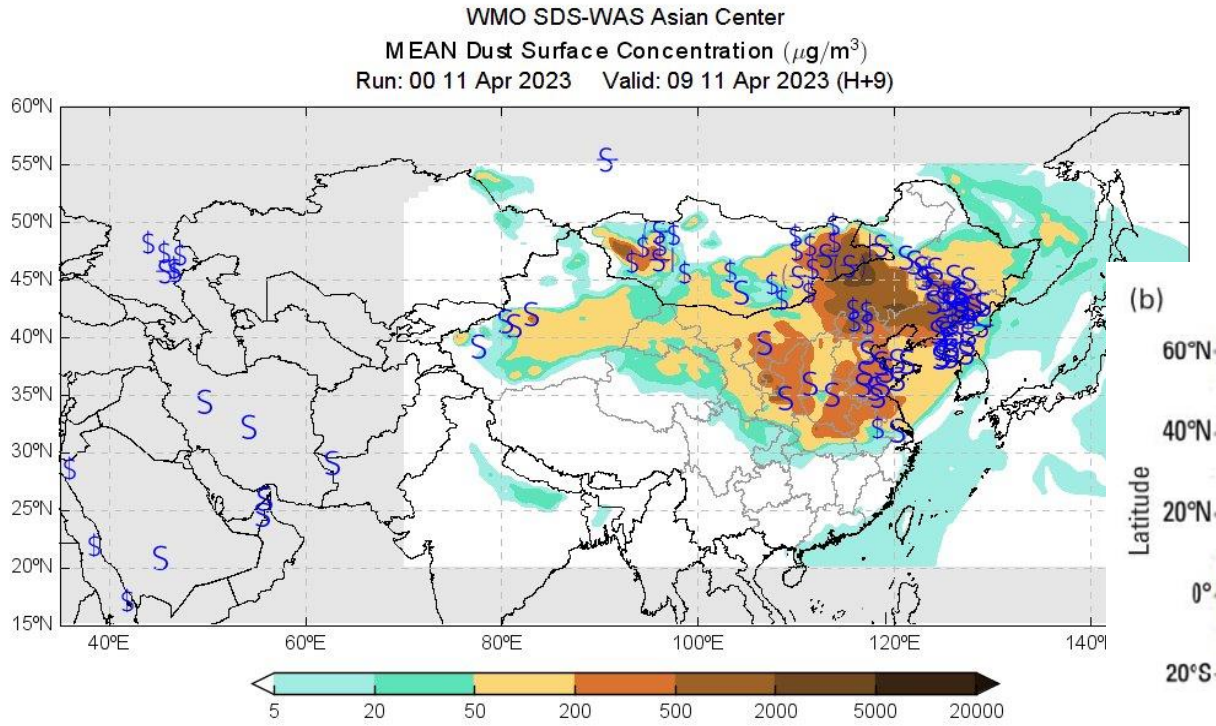
WMO Air Quality and Climate Bulletin 2024 Edition – Released on 6th Sep 2024
https://library.wmo.int/records/item/69006-no-4-september-2024

Atmosphere Monitoring Service
atmosphere.copernicus.eu

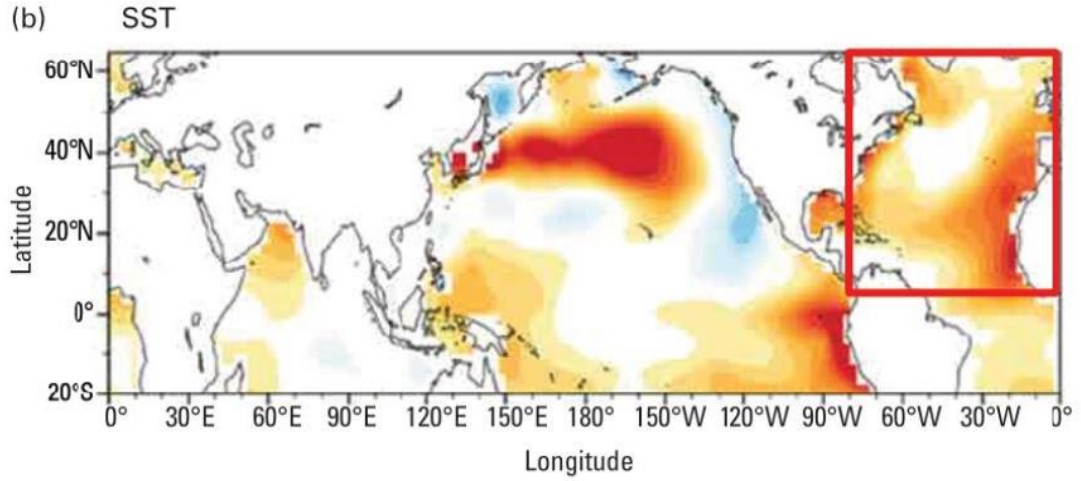
What did it happen in 2023?

Asia suffered several extraordinary events in Spring 2023.



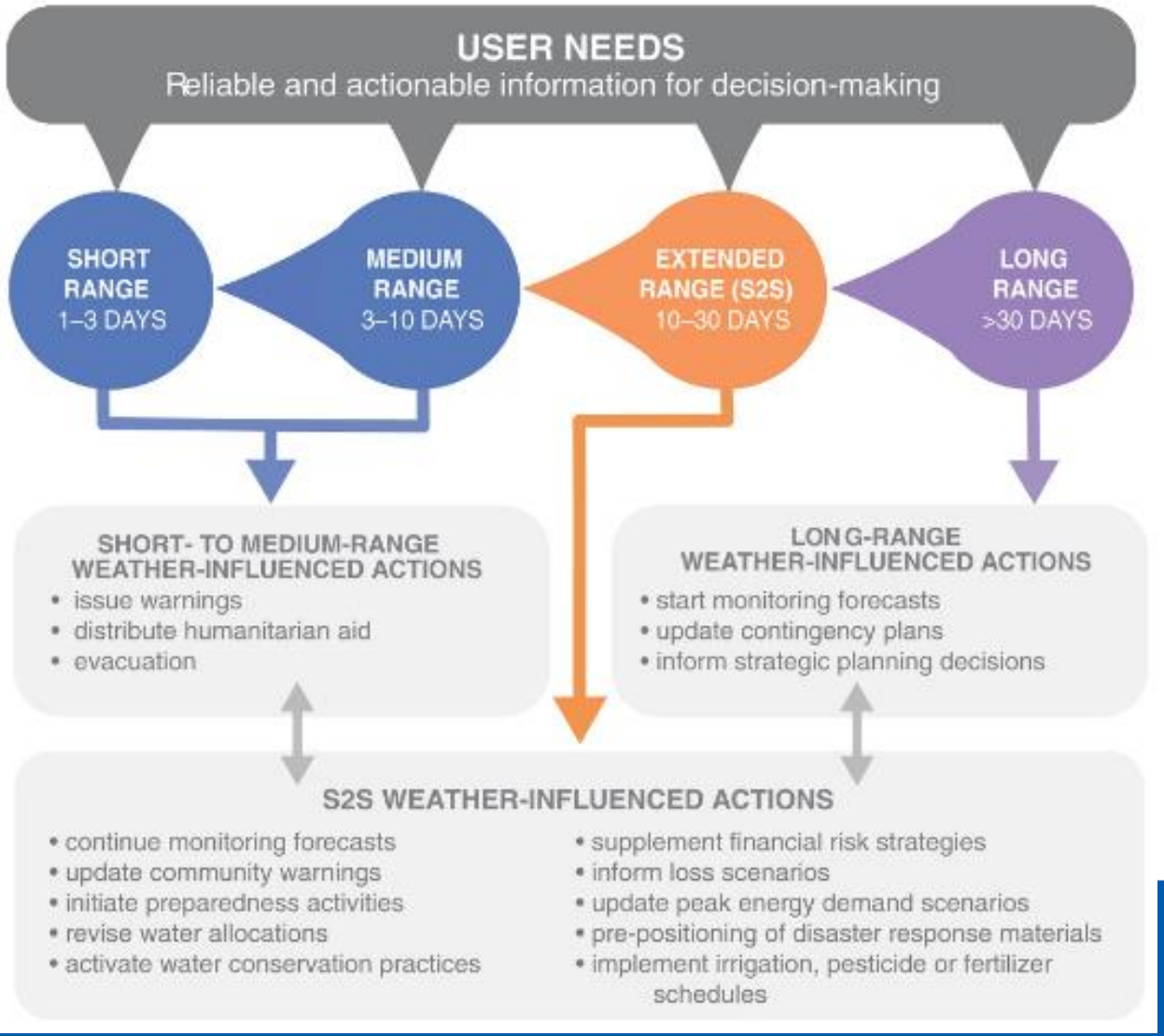


SDS are driven by soil and atmospheric drivers!



WMO Airborne dust Bulletin 2024 Edition – Released on 12th July 2024
https://wmo.int/publication-series/wmo-airborne-dust-bulletin-no-8-july-2024

Seasonal products for Services

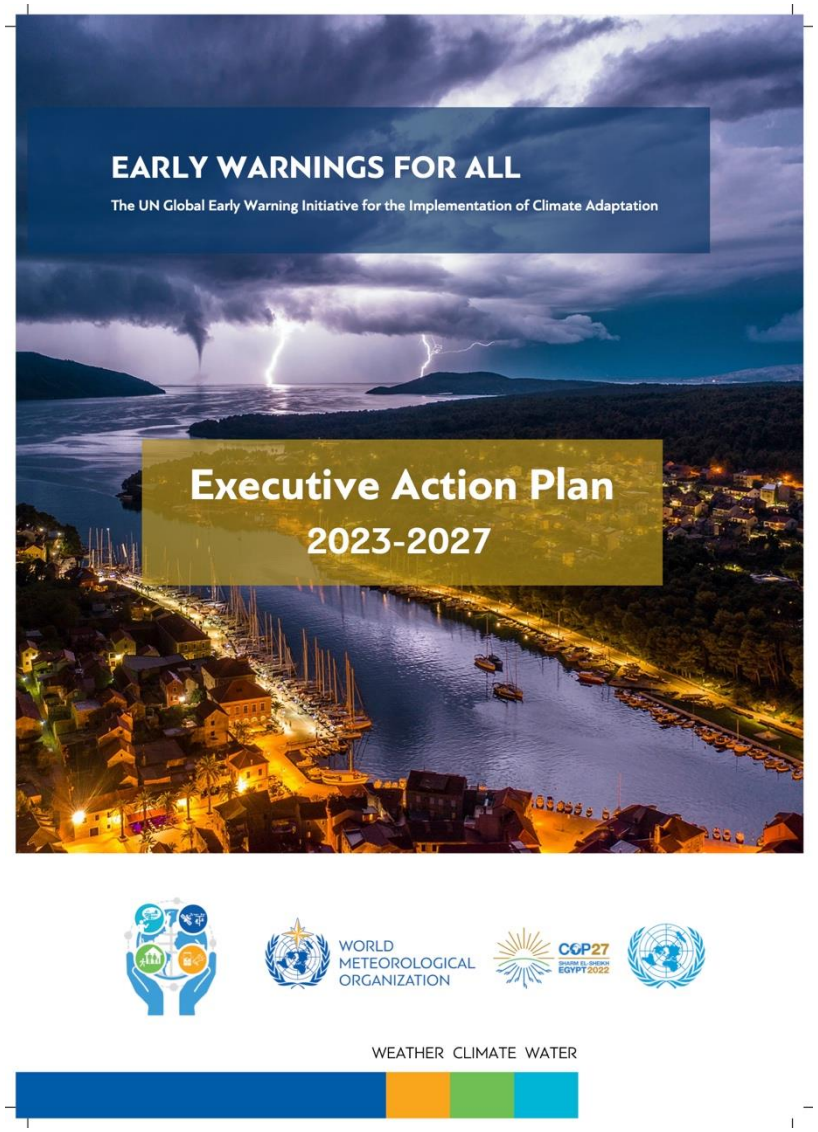


Research on

adding interactive aerosols – WGNE

http://www.s2sprediction.net/
(White et al., RMETS, 2017)

UN Early Warning for All | EW4All



https://library.wmo.int/

"The facts are clear. Early warnings save lives and deliver vast financial benefits. I urge all governments, financial institutions and civil society to support this effort." – *UN Secretary-General António Guterres*

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Strategy build in 4 pillars:

1. Disaster risk knowledge and management (UNDRR)
2. Detection, observation, monitoring, analysis, and forecasting (WMO)
3. Warning dissemination and communication (ITU)
4. Preparedness and response capabilities (IFRC)

50% of countries not protected by Early Warnings
In the list of potential hazards are SDS, wildfires and air pollution

GAW – WCRP/ESMO secretariat priorities

- Not to encourage raising entropie
- Streamline initiatives
- Ensure high-level cooperation amongst international actors

Enhancing coordination, exchange and collaboration

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

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Stay up to date on our core and related activities through our Newsletter

Thank you.

Sara Basart (sbasart@wmo.int)

Special thanks to the GAW community including staff and our experts

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