



WMO



WMO DATA CONFERENCE

EXCHANGE OF EARTH SYSTEM DATA
IN THE 21ST CENTURY

#WMOData

16 - 19 NOVEMBER 2020
VIRTUAL CONFERENCE

Theme #3 Preparatory Workshop: Filling the gaps in global data coverage

What are the atmospheric observation data gaps and what should WMO do to close them?

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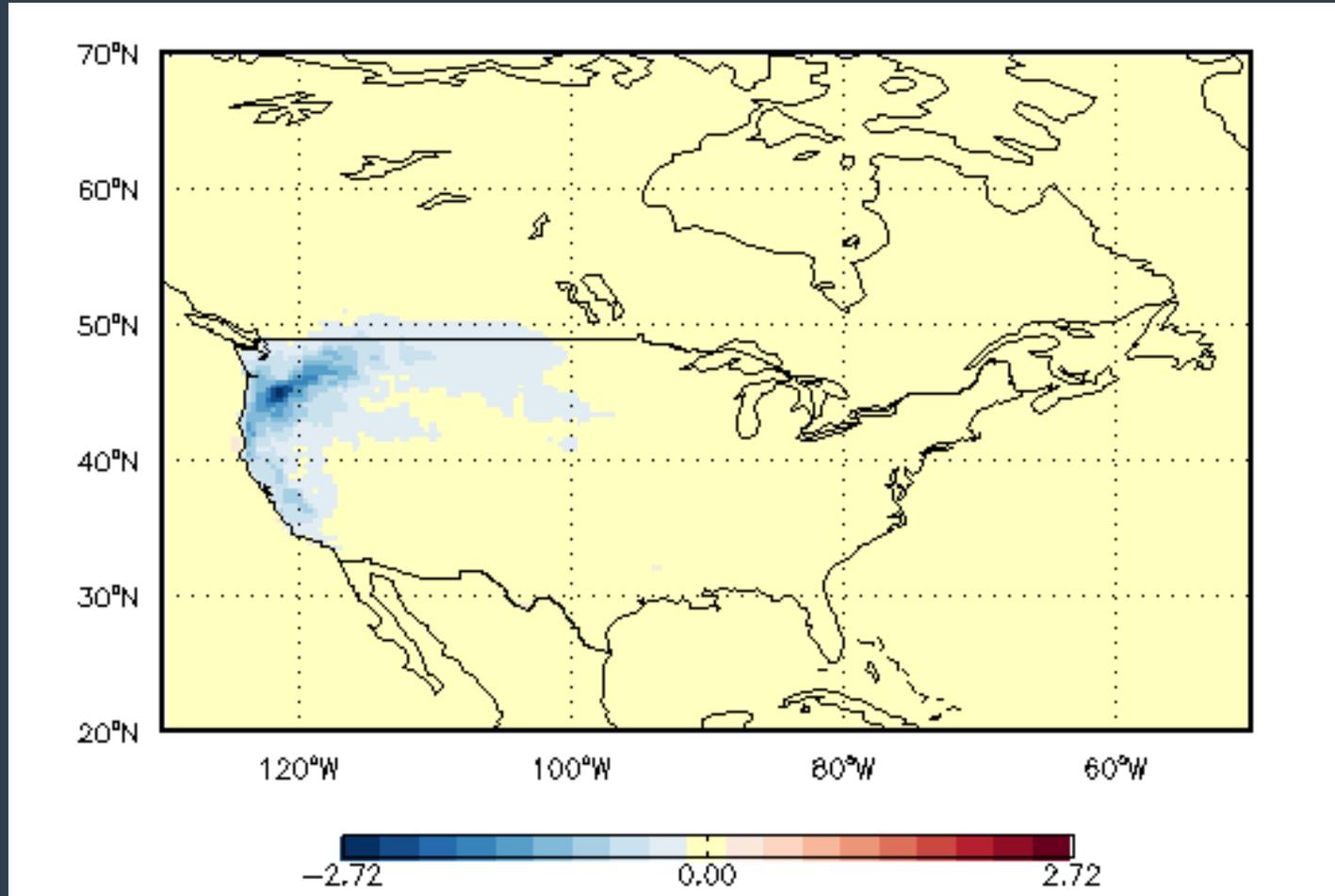


Why atmospheric composition matters?



- Most direct link between human activities and the environment: climate change, air pollution, ecosystems...
- Health impacts alone total 7 million premature deaths (WHO) and cost societies \$5 trillions every year (World Bank).

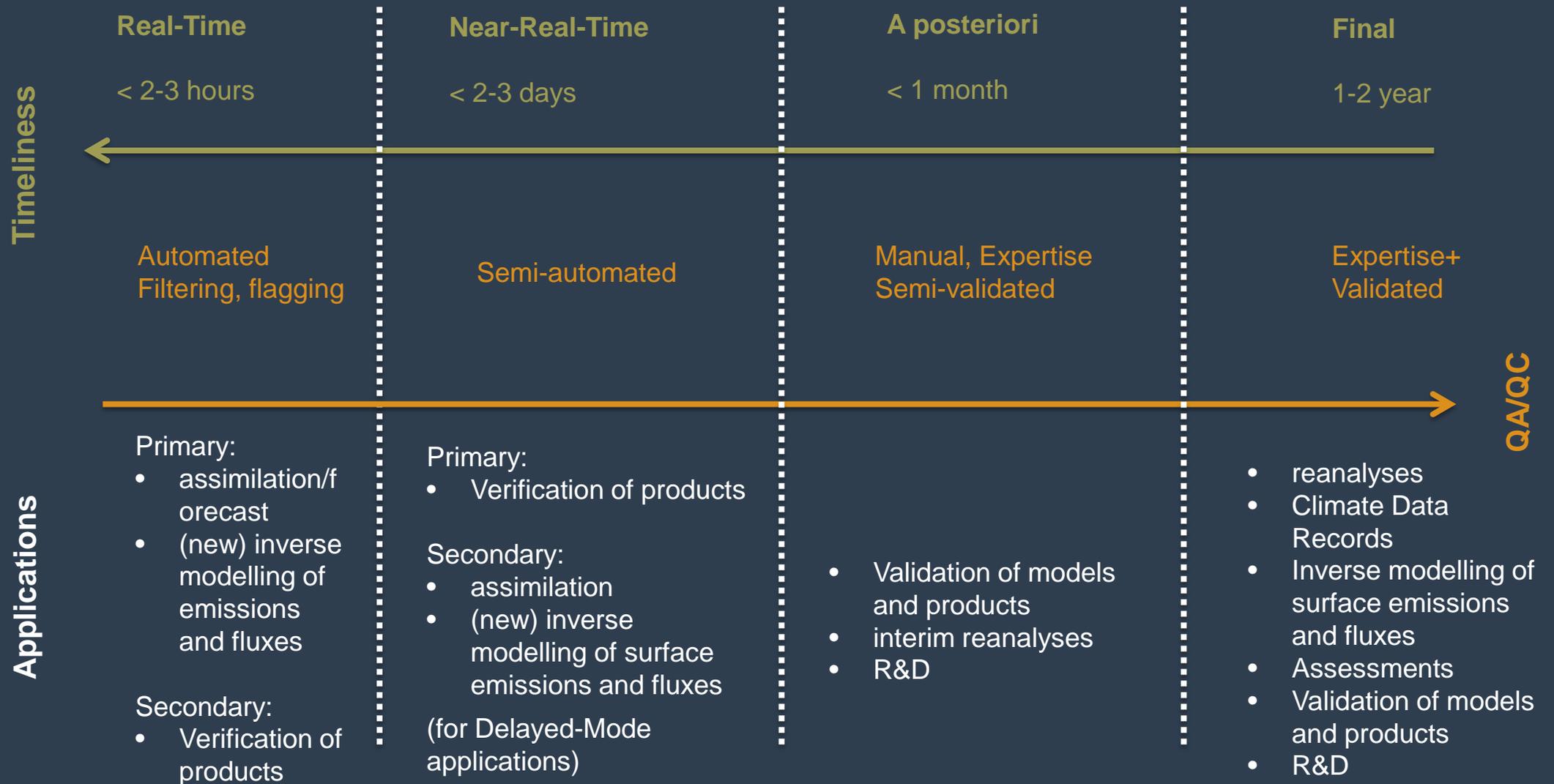
Why atmospheric composition matters? Impact on NWP.



To take one example:

- Surface temperature difference between aerosol climatology and dynamic/interactive aerosol in the ECMWF/IFS system, average for 9-17 September 2020.
- Recent megafires in Western US resulted in up to 2 to 3 K regional impact.

How observations are used for atmospheric composition applications?



But we have patchy view of the world (example: real-time air quality).

- Standardisation of operational procedures and instrumentation?
- Quality control (esp. real-time / near-real-time)?
- IoT sensors, model-sensor “fusion”/AI products?
- Funding drivers: research / regulatory / business?
- ...

IF THERE WAS NO GAW, IT SHOULD BE INVENTED!

HOW TO REINFORCE GAW's ROLE?

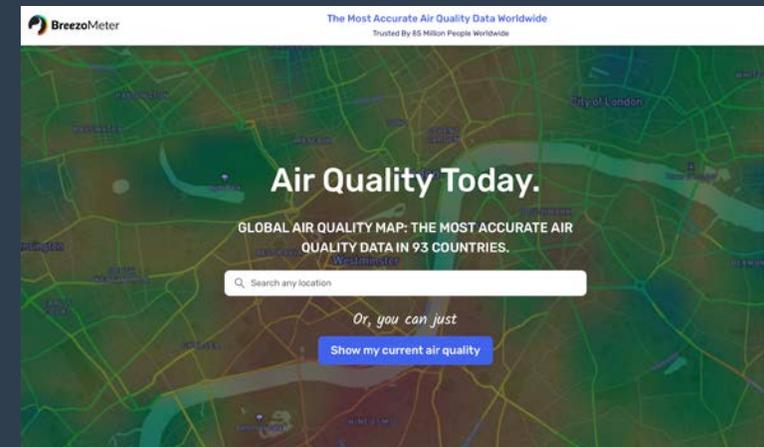
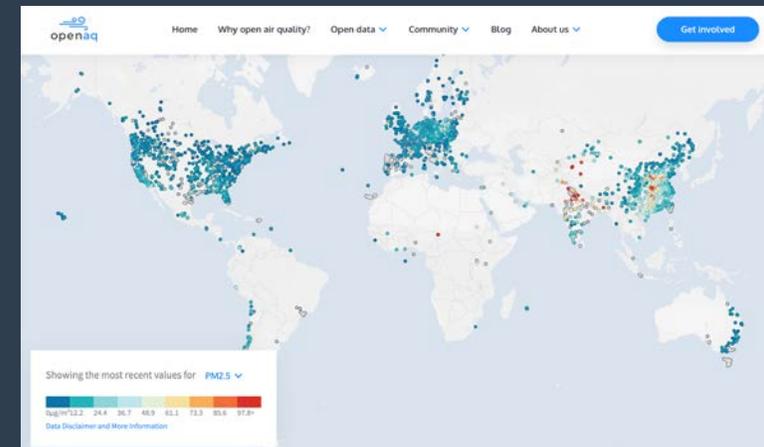
HOW TO ACHIEVE SUSTAINABLE FUNDING?



GAW



EUROPEAN CENTRE FOR MEDIUM-RANGE WEATHER FORECASTS



Key gaps and issues and how WMO assists and can assist further

COVERAGE

- Geographical coverage (needed: funding and expertise)
- Vertical coverage (needed: funding and expertise)
- Parameters coverage (needed: funding and expertise)

OPERATIONS

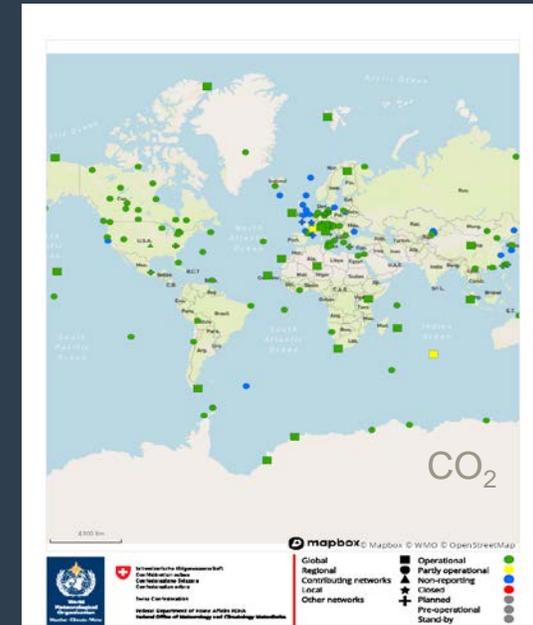
- Standardisation (needed: governance and coordination)
- Quality Assurance & Quality Control (needed: expertise and knowledge/tool sharing)
- Timeliness (needed: operational capabilities; feeds into impact)

POLICIES

- Availability and sharing (needed: data exchange mechanisms and data policy)
- Impact and recognition of observational functions (needed: feeds into funding)
- From research mode to research / operations / regulatory-policy mode (needed: feeds into funding)

Gaps in coverage

- Structural issue with sustainable funding (often soft money)
- Exceptions: large networks that can receive stronger national or international commitment (generally report to GAW) and countries where air quality is regulatory (about a third of all countries)
- GAWSIS: key resource for GAW (talk by J. Klausen in Theme 2 WS, 21/10)
- Regulatory air pollution networks have at best regional coordination (US Air Now, Europe EEA...), often only national or city-level (principle of subsidiarity).
- To some extent, a Global Observing System of opportunity because its parts have been established for different purposes (e.g. research, exposure monitoring...)
- Geographical gaps: large parts of Africa, S America and SE Asia
- Species gap: aerosol composition and ultrafine fraction, high-precision greenhouse gas, high-precision Nitrogen Oxides, Volatile Organic Compounds and stable isotopes...
- Vertical profile gap: very few sondes/balloons, commercial aircraft (IAGOS-CARIBIC, CONTRAIL...) promising but major hurdles for scaling up
- Satellite observations for troposphere and near-surface only emerging outside of academic domain



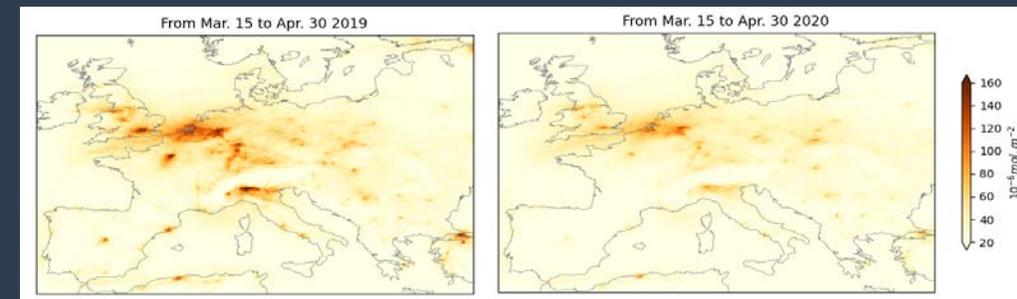
Gaps in operational procedures

- Key role of research networks (NDACC, EMEP...) and large infrastructures (NOAA, ICOS, ACTRIS...) and GAW... To a large extent, everything needed is there!

But...

- Atmospheric composition observation is generally not coordinated at national level and involves academic, meteorological and/or environment agencies (sometimes air pollution and greenhouse gases separated); these have various degrees of experience with operational aspects
- Cost of operations of the regulatory equipment is high and cannot be afforded by many countries, causing bloom of the low-cost sensors which are over advertised and not QA/QCed
- Standards in particular for site selection, air sampling, operations are effectively not universal; this is very problematic as representativeness issues are very acute
- Maintenance and early detection of issues are sometimes lacking (QA/QC)
- Different sensitiveness to the importance of timeliness of data collection, QA/QC and dissemination, missed opportunities to raise the profile of in situ observation in particular

Copernicus Sentinel-5P
Effect of COVID-19
lockdown (April 2020)



Gaps in policies

- Data policies are often eventually open but reserved period for publication (academic), near-real-time data not necessarily made public (for good and wrong reasons)...
- A number of valuable “aggregator” efforts are on-going (such as openaq), as limitations are sometimes simply about language issues or about finding out and contacting the right institutions or even persons; but transparency & traceability & full metadata generally lacking, as there is some competition between these
- Observations (especially in situ) blended into aggregated products such as analyses or observation-based emissions/fluxes lose distinct visibility (not too different from NWP or climate reanalysis), which can be an issue to justify funding
- Important aspects such as CO₂ or CH₄ monitoring are not regulatory, while there are commitments to reduce anthropogenic emissions and there are limited possibilities to monitor progress

What should WMO do to close them?

- In short, engage with the Countries to elevate the role and mandate of GAW: atmospheric composition observations are not simply "nice-to-have"
- GAW needs to continue research & innovation in measurement techniques, modelling and process understanding
- GAW needs to continue training and capacity building
- But it would be a benefit to also strengthen operational aspects:
"All countries should share their air-quality information. Some do already; many do not. There is no international authority that organizes this. The WMO facilitates such sharing for weather data, and it should coordinate an international agreement and devise quality controls and operating guidelines for air quality, too. Metadata should be included (such as the height of a detector above ground, or its distance from the nearest building, tree, road or industrial stack) as well as measurement errors."
- Advocate for sustainable funding, especially targeting data sparse region
- Encourage all WMO modeling centres to support integrated products & emerging environmental services IG3IS, MMF-TAD & GAFIS (example of ECMWF/Copernicus)

