



World Meteorological Organization

Weather • Climate • Water

The Global Atmosphere Watch Programme: achievements and future plans

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For
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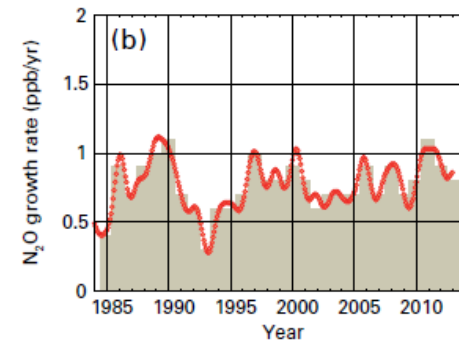
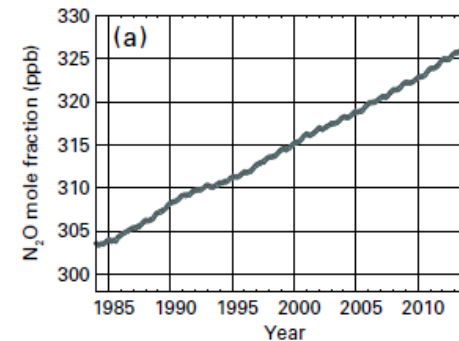
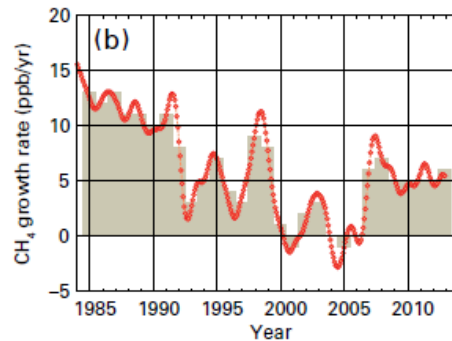
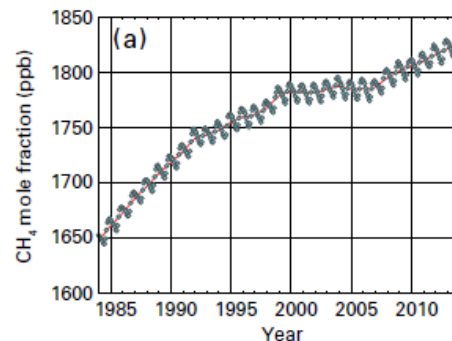
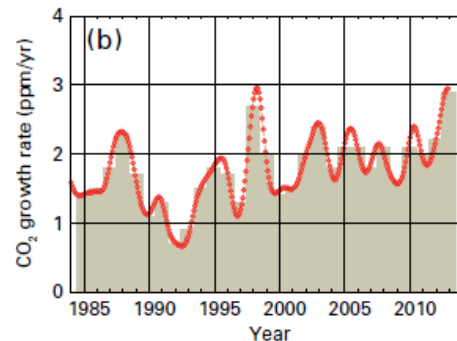
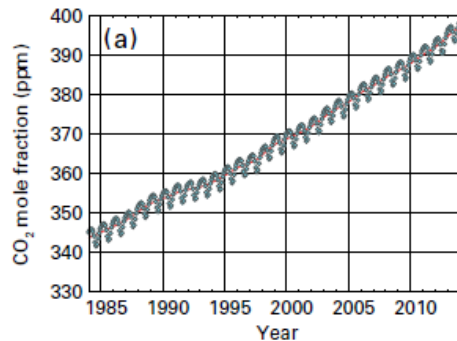
Major questions



What are the changes in the atmospheric composition and possible impacts?

What is the role of human activities in those changes?

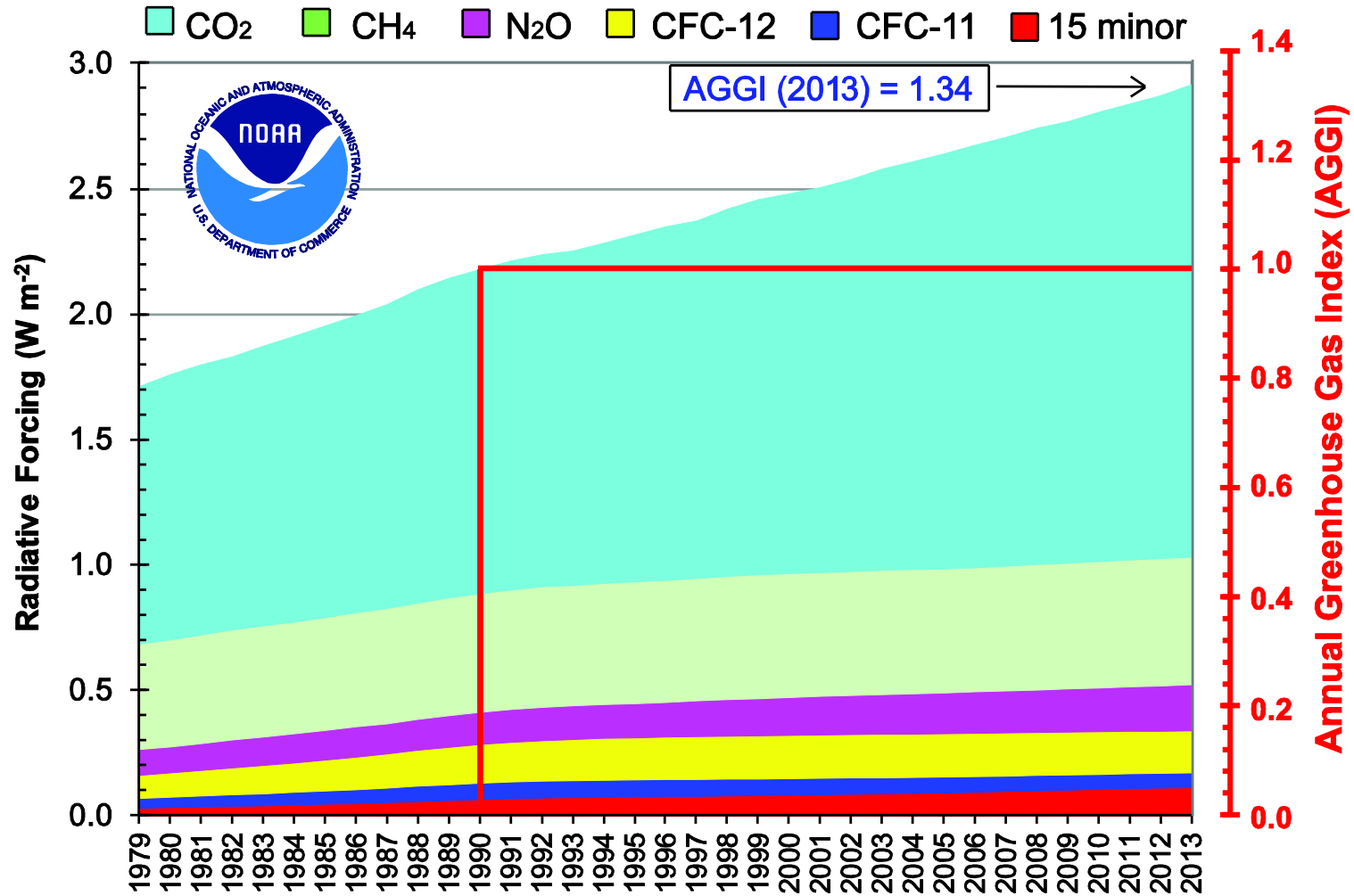
How can we identify and attribute those changes?



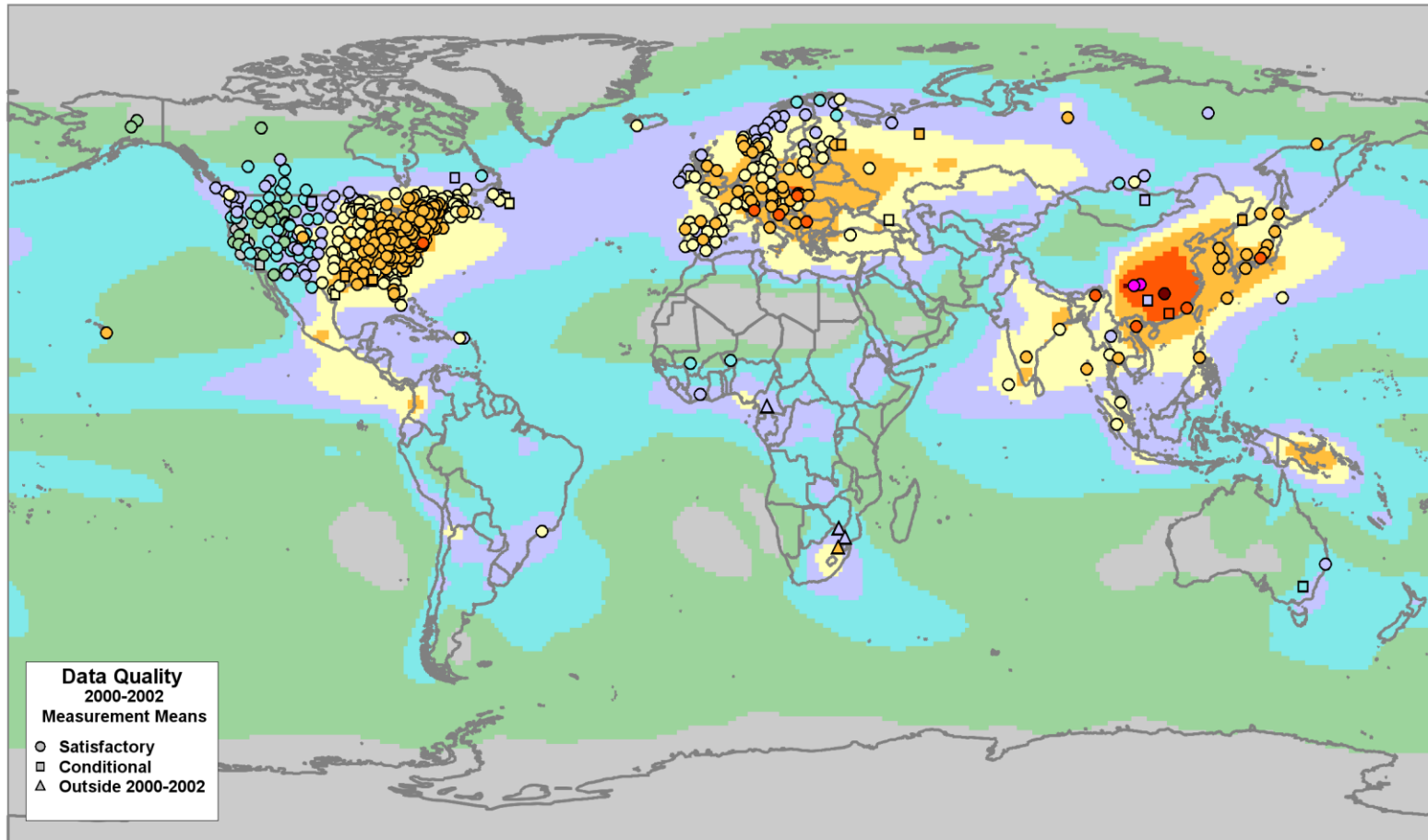
There are changes in e.g. level of greenhouse gases!



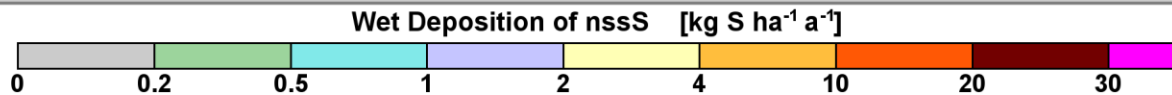
Consequences of the GHG level increase



Changes in deposition of different substances



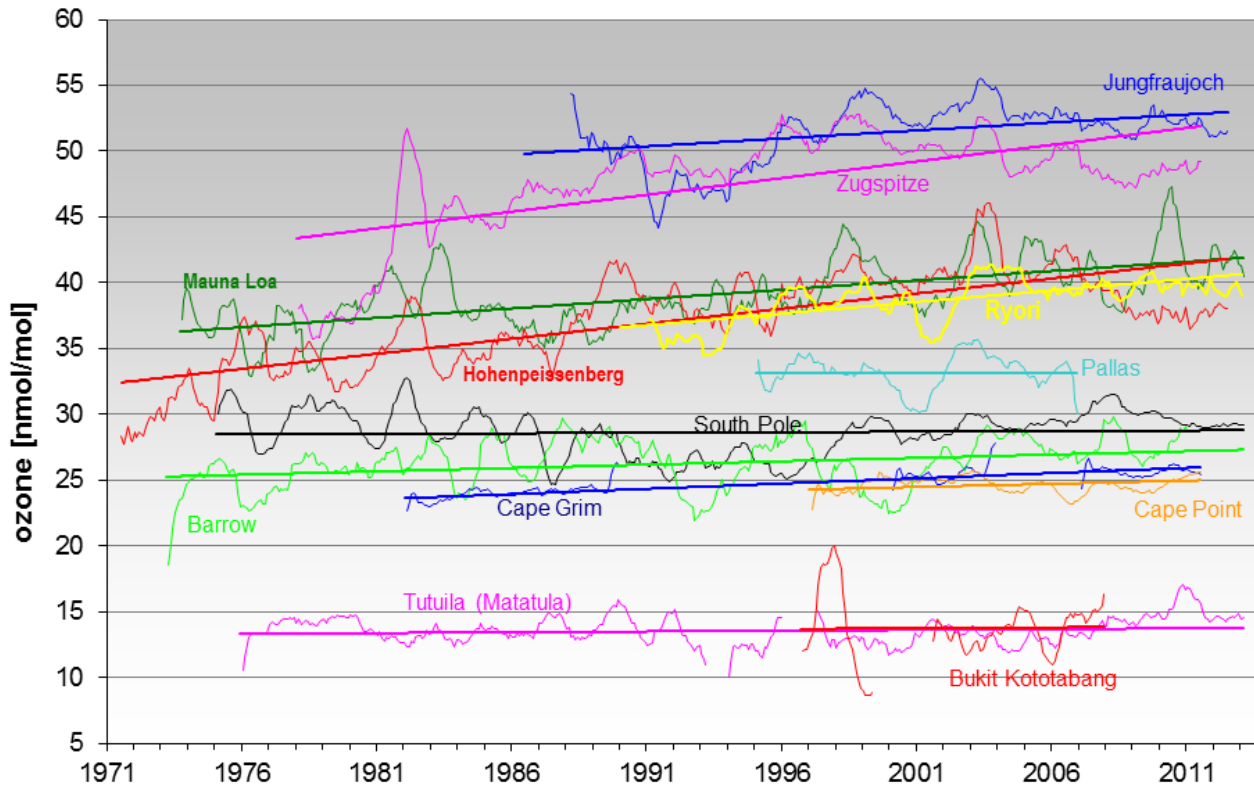
Data Quality
2000-2002
Measurement Means
○ Satisfactory
□ Conditional
△ Outside 2000-2002



Vet et. al, 2014

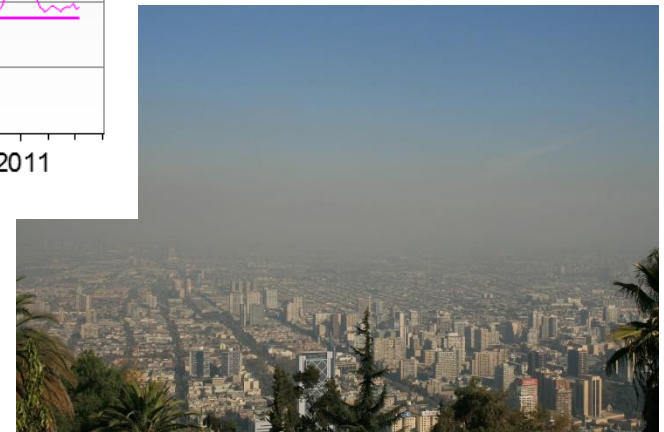


Changes in air quality



Quality assured observations and data analysis can help us detect these changes

(courtesy of S.Gilge)



Global Atmosphere Watch Programme



- **GAW made it possible to compare observations made by different Members, to develop global products and to improve understanding of the changes in the composition of the global atmosphere**
- GAW is a partnership involving contributors from 100 countries.
- GAW implements end-to-end approach (from observations through research to delivered products and services)
- Observations of atmospheric chemical composition and related physical parameters constitute important part of the programme
- GAW observations can be used for different applications, including climate studies, air quality forecasting, NWP etc.



GAW focal areas

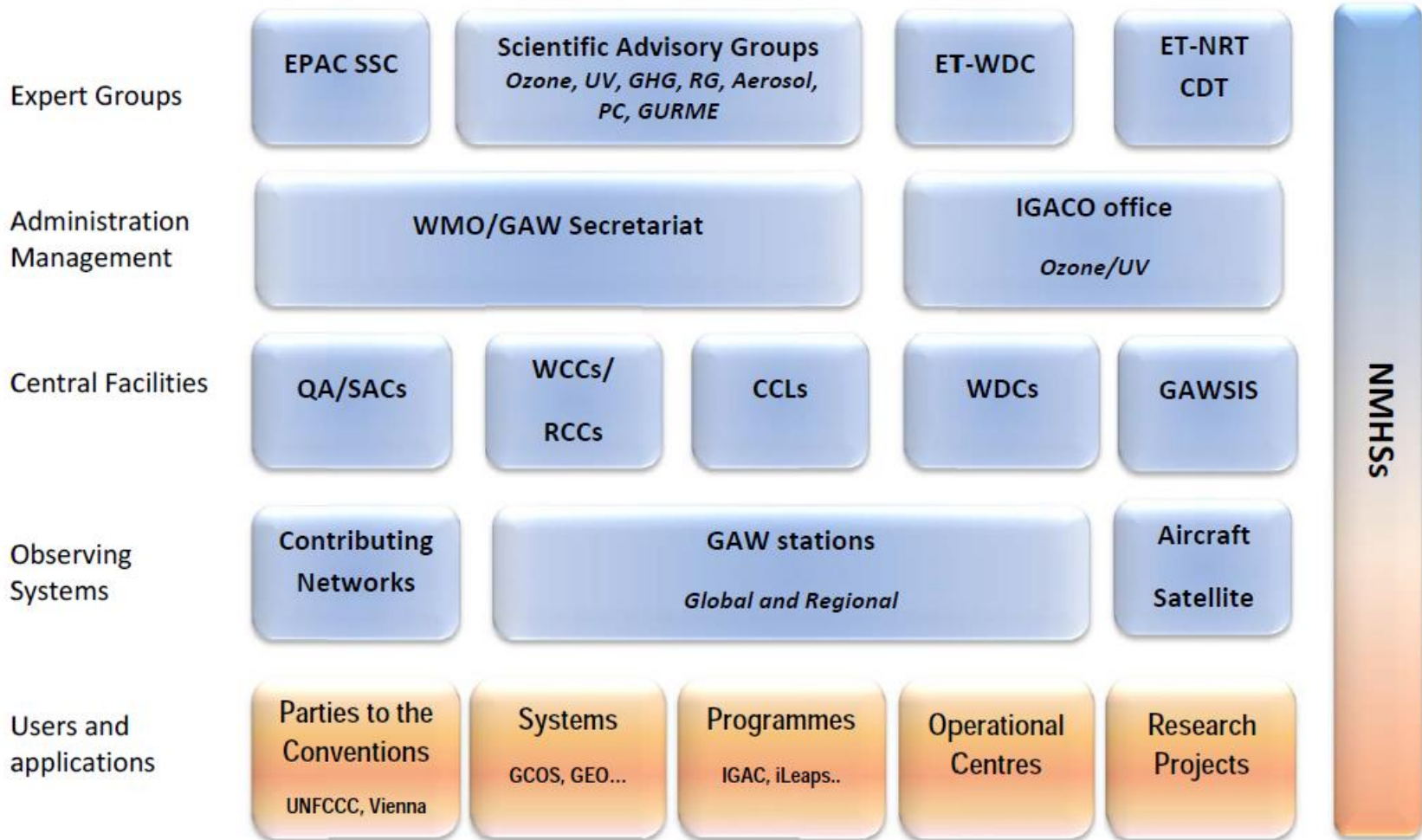


- Stratospheric Ozone and vertical ozone distribution
- Greenhouse Gases (*CO₂ and its isotopes* , *CH₄ and its isotopes*, *N₂/O₂ ratio*, *N₂O*, *SF₆*, *CFCs and substitutes*)
- Reactive Gases (*O₃*, *CO*, *VOCs*, *NO_x*, *SO₂*)
- Precipitation Chemistry
- Aerosols (*chemical and physical properties*, *AOD*)
- UV Radiation

Variables important for climate studies: **GHG, aerosols, ozone**



GAW structure



Observations in GAW



GAW **strives** to implement “integrated” observing system including ground-based observations and satellite remote sensing integrated through models

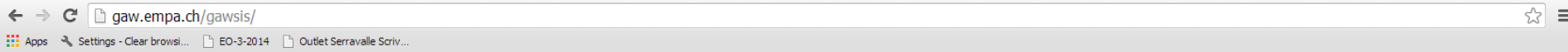
Surface-based *in situ* and remote sensing observations are the backbone of the GAW network.

There are **Global and Regional GAW stations and stations working within contributing** networks.

Currently GAW coordinates activities and data from **30** Global stations, about **400** Regional stations, and **100** Contributing stations (<http://gaw.empa.ch/gawsis/>)



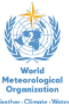
GAW Station Information System (GAWSIS)



GAWSIS STATION INFORMATION SYSTEM

by QA/SAC Switzerland

- Find Information
- Edit/Add Information
- Provide Feed-back



- Home
- Advanced Search
- Edit/Add Information
- Register a New Station
- Feed-back
- FAQs & Glossary
- About

Stations by country
Stations by network
Station by name (GAW only)
Station by GAWID (GAW only)
Contact information

[Advanced Search](#)

- ### GAW World Data Centres
- [WDCGG \(Gases\)](#) [WRDC \(Radiation\)](#)
 - [WOUDC \(Ozone/UV\)](#) [WDCA \(Aerosols/AOD\)](#)
 - [WDCPC \(Precip., Chem.\)](#) [WDC-RSAT \(Remote Sens.\)](#)

GoogleEarth Port
[gaw.km](#) for a different GAWSIS experience!

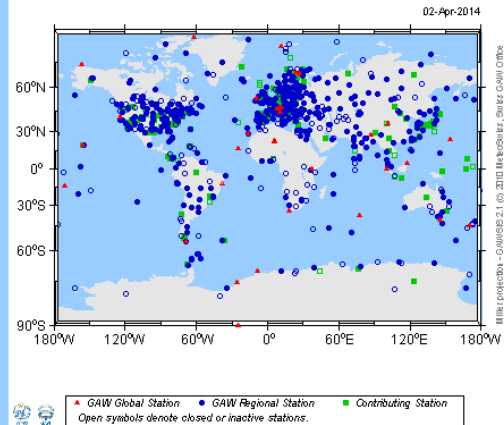
What's New

2013-12-11 Use 'Advanced Search' to **search and find Bibliographic References**. Not super-smart, but a start ...

2013-07-10 Metadata intake from **NDACC** has been improved and is now comprehensive.

Select by Station type
 Global Regional Contributing

Select by Parameter



Need for quality control



- Detect small trends
- Detect small spatial gradients
- Ensure long-term stability of observations
- Data comparability (on the same scale)



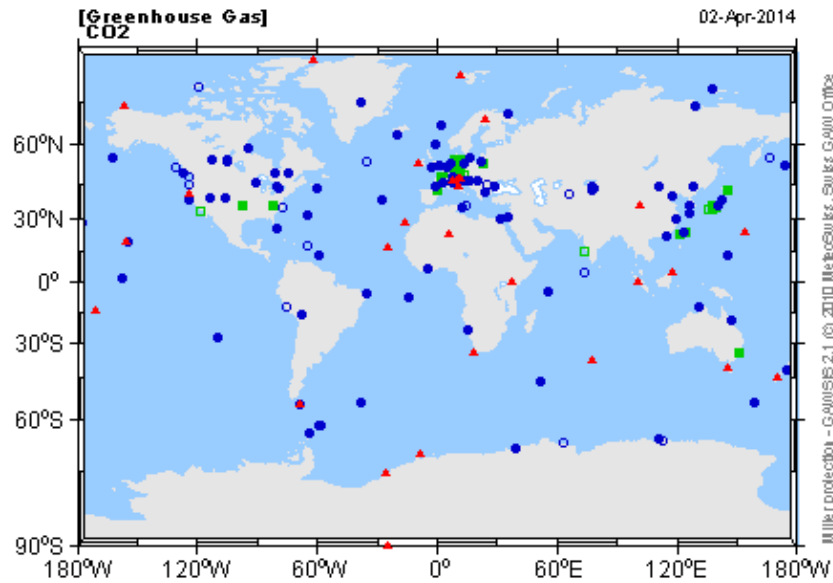
QMF principles






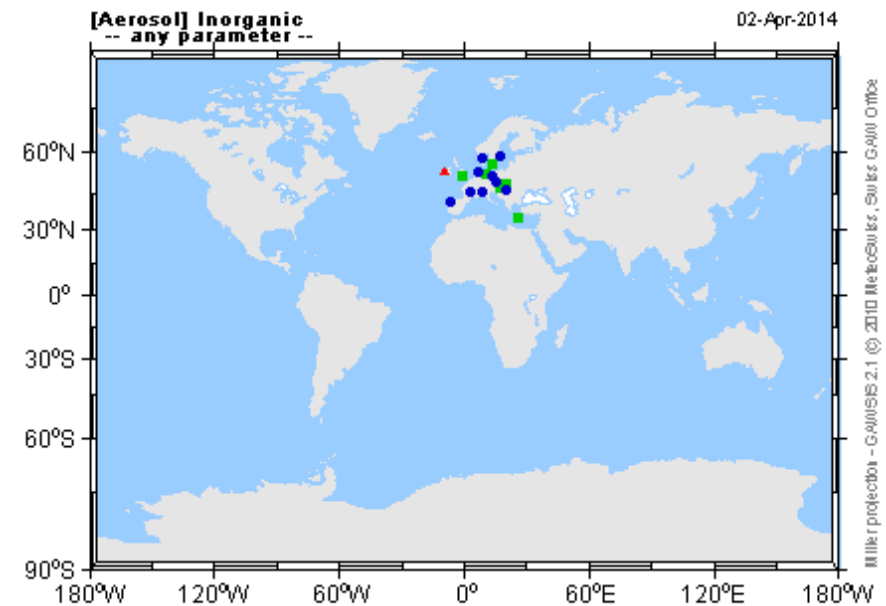
- ✓ Full support of the GCOS Climate Monitoring Principles
- ✓ Network-wide use of only **one reference standard or scale** (primary standard). In consequence, there is only one institution that is responsible for this standard.
- ✓ **Full traceability** to the primary standard of all measurements made by Global, Regional and Contributing GAW stations.
- ✓ The definition of data quality objectives (DQOs).
- ✓ Establishment of guidelines on how to meet these quality targets, i.e., **harmonized measurement techniques** based on Measurement Guidelines (MGs) and Standard Operating Procedures (SOPs).
- ✓ Establishment of MGs or SOPs for these measurements.
- ✓ Use of **detailed log books** for each parameter containing comprehensive meta information related to the measurements, maintenance, and 'internal' calibrations.
- ✓ Regular **independent assessments** (system and performance audits).
- ✓ Timely submission of data and associated metadata to the responsible World Data Centre as a means of permitting independent review of data by a wider community.






Heterogeneity of GAW observational network



   **▲ GAW Global Station** **● GAW Regional Station** **■ Contributing Station**
Open symbols denote closed or inactive stations.



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It is a challenge to establish the observational network with uniform “true” global coverage for all variables



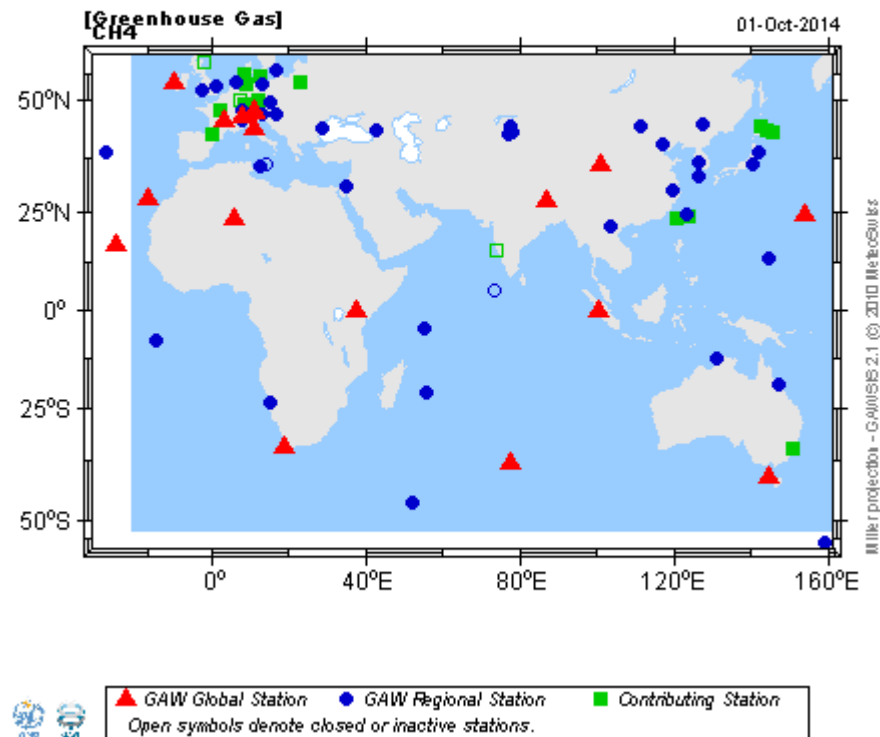
Issues around the Indian Ocean

- Increasing CO₂ emissions
- Deforestation
- Forest Fires
- Natural methane emissions
- Increasing urbanization

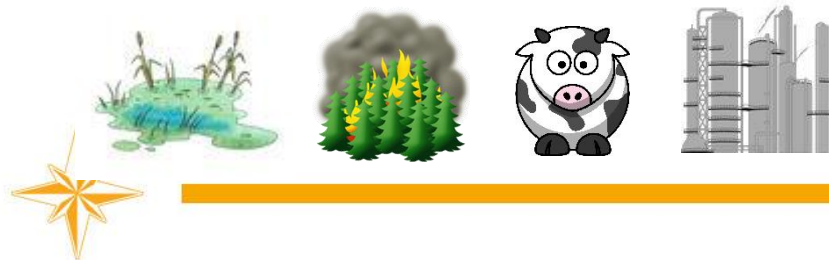
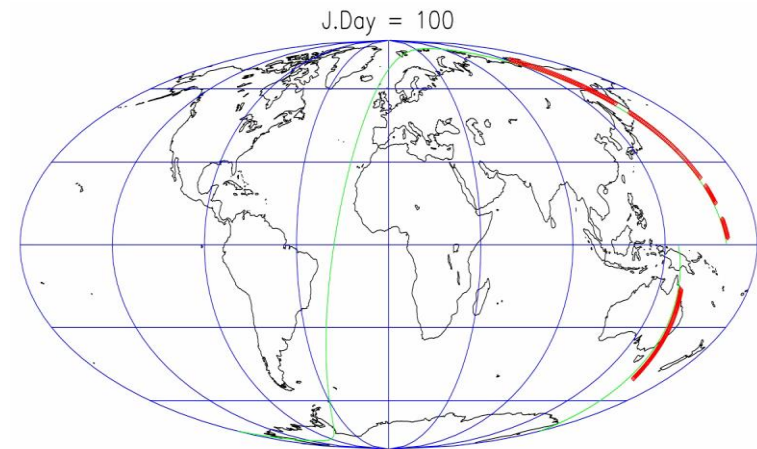
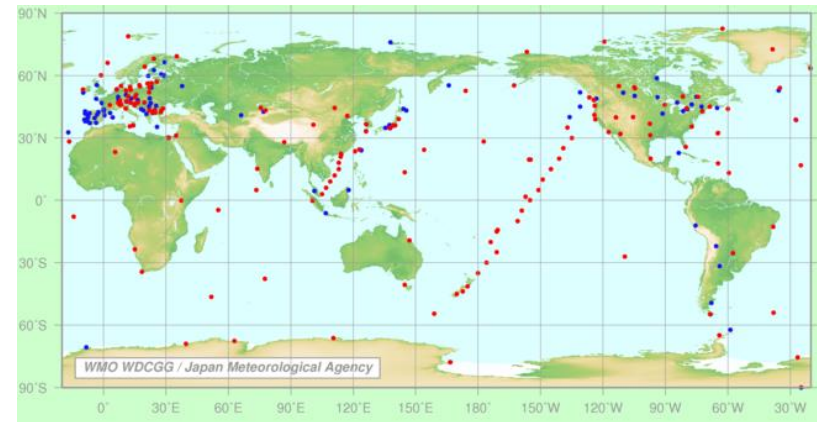
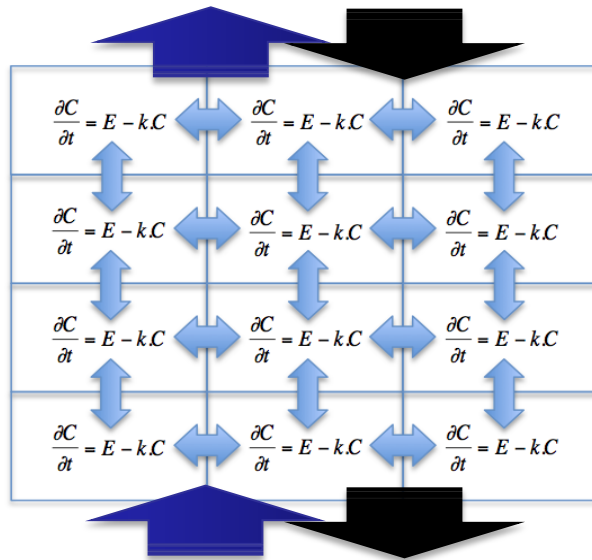
Observations of atmospheric composition are essential to understand these issues



In-situ observations of Methane around the Indian

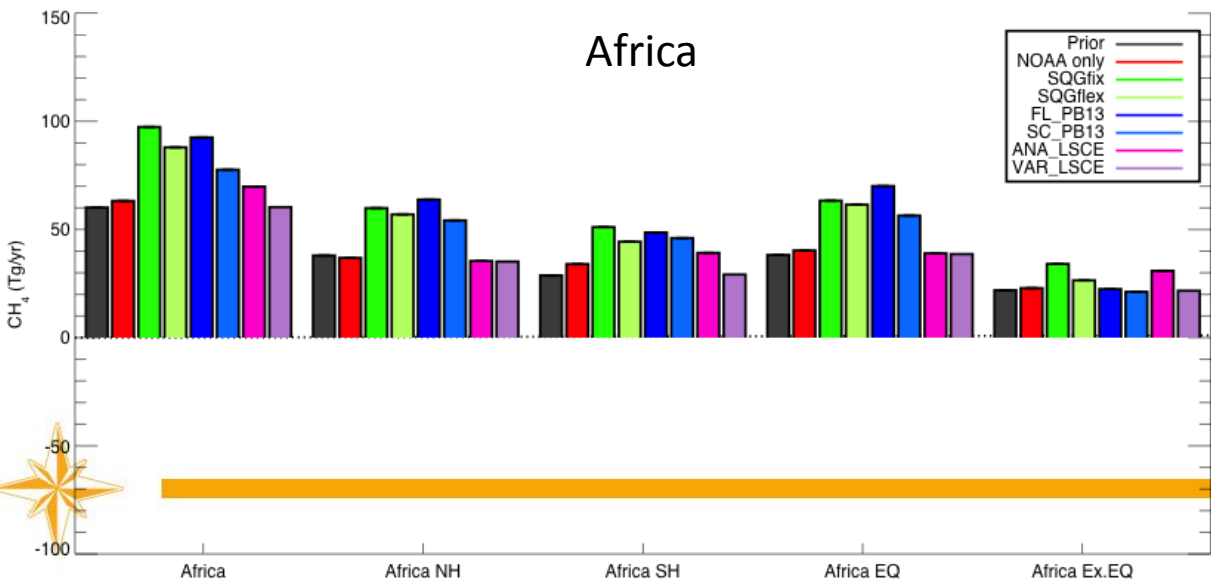
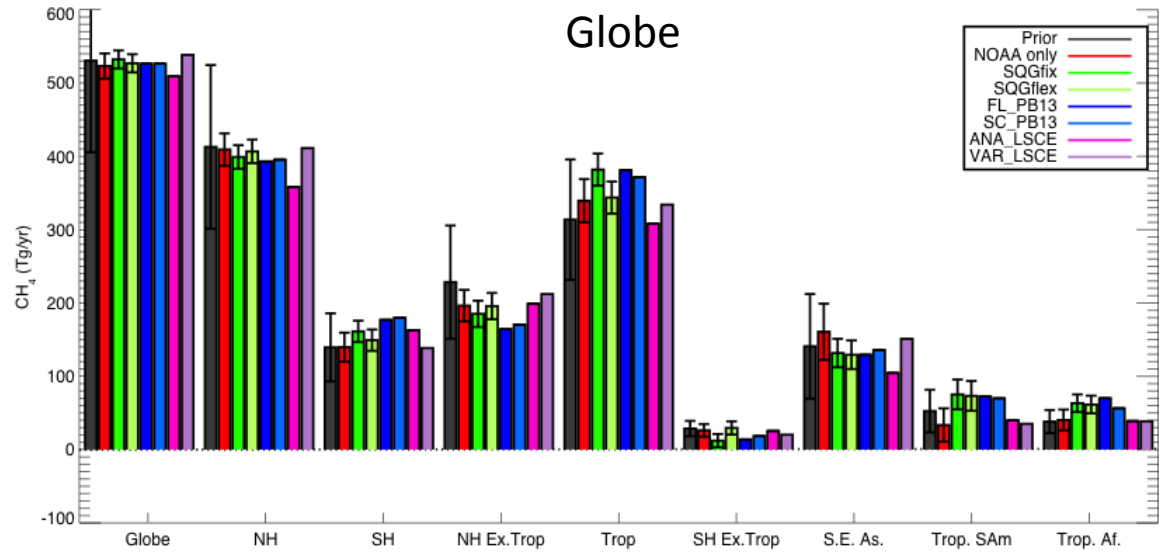


The use of atmospheric observations: Inverse modeling



Inverse modeling estimated CH₄ fluxes

Mean 2003 – 2010



Africa: ±15% of Global fluxes
 Uncertainty: 50%



Instead of conclusions

- Network around the Indian Ocean is not dense enough to address the environmental issues in the regions
- The experience in the region does exist and it should be utilized by the other countries
- Twinning and partnership with other regions can be considered as an opportunity for network development in the region





Thank you
for your
attention!

