The integrated global greenhouse gas observations and analysis system: WMO-GAW

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The rationale for Global Atmosphere Watch (GAW) is driven by the need:

- to understand the complex mechanisms with respect to natural and anthropogenic atmospheric change;
- improve the understanding of interactions between the atmosphere, ocean and biosphere;
- provide **reliable** scientific data and information for national and international policy makers.

**GAW Strategy in achieving the goals in presented in the GAW Strategic Plan: 2008-2015**
What is GAW?

• WMO/GAW was established 1989 by merging GO3OS and BAPMoN.
• GAW focuses on global networks for GHGs, ozone, UV, aerosols, selected reactive gases, and precipitation chemistry.
• GAW is a partnership involving contributors from 80 countries.
• GAW is coordinated by the Environment Division of WMO/AREP under the purview of WMO Commission for Atmospheric Science (CAS)
• Currently GAW coordinates activities and data from 26 Global stations, 410 Regional stations, and 81 Contributing stations (http://gaw.empa.ch/gawsis/)
How does GAW work?

GAW Secretariat

Quality Assurance & Science Activity Centres
World & Regional Calibration Centres

Central Calibration Laboratories
Host GAW World Reference Standards

Contributing networks
emep EANET BSRN
AERONET CARIBIC
NDACC AGAGE

GAW stations & GAWSIS

Satellites & Aircraft
CARIBIC

World Data Centres

WMO OMM

15th WMO/IAEA Meeting of Experts on Carbon Dioxide, Other Greenhouse Gases, and Related Tracer Measurement Techniques
Global GAW stations

15th WMO/IAEA Meeting of Experts on Carbon Dioxide, Other Greenhouse Gases, and Related Tracer Measurement Techniques
Greenhouse gases (GHGs) and their radiative forcing

NOAA Annual Greenhouse Gas Index

Radiative forcing, relative to 1750, of all the long-lived greenhouse gases.
http://www.esrl.noaa.gov/gmd/aggi/

- CO₂
- CH₄
- N₂O
- CFCs, HCFCs, HFCs
- Other minor gases

15th WMO/IAEA Meeting of Experts on Carbon Dioxide, Other Greenhouse Gases, and Related Tracer Measurement Techniques
Relative contribution of CO$_2$ to radiative forcing by long-lived GHGs

![Graph showing the relative contribution of CO$_2$ to radiative forcing over time. The graph includes markers for significant events such as strong El Niño, CFC turnover begins, Pinatubo & strong El Niño, and methane stabilization phase. The maximum contribution is approximately 93%, and the current contribution is approximately 84%.](image-url)
GAW Global CO₂ & CH₄ Monitoring Network Components

- Scientific Advisory Group (SAG)
- WMO/GAW Secretariat AREP
- CAS/JSSC OPAG/EPAC
- Central Calibration Laboratory
- World/Regional Calibration Centres
- GAW World Data Centre for Greenhouse Gases at JMA: (WDCGG)

15th WMO/IAEA Meeting of Experts on Carbon Dioxide, Other Greenhouse Gases, and Related Tracer Measurement Techniques
October 2005 GCOS-GAW Agreement established the:

WMO/GAW Global Atmospheric CO$_2$ & CH$_4$ Monitoring Network

as a Comprehensive Network of GCOS
Members of the Greenhouse Gases Scientific Advisory Group (SAG)

Ernst Brunke (Cape Point GAW Station, South Africa)
James H. Butler (NOAA ESRL, USA)
Edward Dlugokencky (NOAA ESRL, USA) - SAG Chair
Martin Heimann (Max Planck Institut für Biogeochemie, Germany)
Paul Krummel (CSIRO Marine and Atmospheric Research, Australia)
Hans-Eckhart Scheel (Forschungszentrum Karlsruhe (FZK), Germany)
Kazuto Suda (Japan Meteorological Agency, Japan)
Doug Worthy (Environment Canada, Canada)

WMO Secretariat Oksana Tarasova

P1: Ed Dlugokencky and GHG SAG Members, Current Activities of the GHG SAG
Primary Standards

Central Calibration Laboratories
Hosts of WMO World Reference Standards for long-lived GHG

- CO$_2$, CH$_4$, N$_2$O - NOAA ESRL USA
- CO$_2$&CH$_4$ isotopes - not assigned
- CFCs, HCFCs, HFCs - not assigned
Quality Assurance I

World or Regional Calibration Centres

Linking Observations to World Reference Standards and Ensuring Network Comparability through intercomparison campaigns and regular audit

- **CO$_2$** - NOAA ESRL USA
  - EMPA, Switzerland

- **CH$_4$** - EMPA, Switzerland (Am, E/A)
  - JMA, Japan (A/O)

- **N$_2$O** - IMK-IFU Garmisch, Germany

- **CFCs, HCFCs, HFCs** - WCC is not assigned
Quality Assurance II

Standard measurements procedures and measurements guidelines

- CH$_4$ and N$_2$O - updated GAW report 185
- CO$_2$ - GAW report 134 (evolving through semi-annual meetings)
- CFCs, HCFCs, HFCs - MG are not established

The Guide for Data submission and dissemination (by WDCGG) is updated (GAW report 188 to be published this month)
Quality Assurance III

Stations twinning/ Training/Expert workshops

**Twinning**
- Empa - Assekrem (Algeria), Bukit Koto Tabang (Indonesia) and Mt. Kenya (Kenya)
- The Institute for Meteorology and Climate Research, (IMK-IFU) - Cape Point (South Africa).
- NOAA (ESRL) - Ushuaia (HATS group), Tiksi (Russia) and a number of others

**Training**
- The GAW Training and Education Centre (GAWTEC)
- EMPA conducts training for operators of stations Mt. Kenya (Kenya), Bukit Koto Tabang (Indonesia), Assekrem (Algeria), Shangdian’zi (China)
- NCAR (Boulder) has provided training for Mt. Kenya operators specifically for their \( \text{CO}_2 \) analyzer installed in 2008.

**Expert meetings**
- Biennial WMO/IAEA Meeting of Experts on Carbon Dioxide, Other Greenhouse Gases, and Related Tracer Measurement Techniques (since 1975)
An Observational Network with Global Coverage

Recent Number of submissions to WDCGG: \( \text{CO}_2 - 193, \text{CH}_4 - 177 \)
World Data Centre for Greenhouse Gases

Searchable Station Directory & Metadata

Online data Plot and download

Downloadable Publications

Welcome to the WDCGG Web Site

The World Data Centre for Greenhouse Gases (WDCGG) is one of the WDCs under the GAW programme. It serves to gather, archive and provide data on greenhouse gases, 

http://gaw.kishou.go.jp/wdcgg/
World Data Centre for Greenhouse Gases

World Data Centre for Greenhouse Gases

Gallery

Images from the latest issue of the WDCGG DATA SUMMARY (latest issue: WDCGG No.33 March 2009)

- CO2
- CH4
- N2O
- HCN
- NOx
- SO2

This site is maintained by the Japan Meteorological Agency in cooperation with the World Meteorological Organization.
(Created: 2001/07/02 Modified: 2005/08/02)

WMO World Data Centre for Greenhouse Gases
C/O Japan Meteorological Agency
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Tokyo 100-8122, Japan
Tel: +81-3-3501-7171

15th WMO/IAEA Meeting of Experts on Carbon Dioxide, Other Greenhouse Gases, and Related Tracer Measurement Techniques
Annual Greenhouse Gas Bulletins

Bulletin 1 (March 2006) CO₂ global distribution
Bulletin 2 (November 2006) CH₄ global distribution
Bulletin 3 (November 2007) NOAA’s CarbonTracker model
Bulletin 5 - in preparation
Carbon Tracker by NOAA ESRL

What is CarbonTracker?
A system to keep track of carbon dioxide uptake and release at the Earth's surface over time.

Who needs CarbonTracker?
Policy makers, industry, scientists, and the public need CarbonTracker information to make informed decisions to limit greenhouse gas levels in the atmosphere.

http://www.esrl.noaa.gov/gmd/ccgg/carbontracker/
GLOBALVIEW data products are designed to enhance the spatial and temporal distribution of atmospheric observations of CO₂, CH₄ and other related atmospheric measurements. GLOBALVIEW products are specifically intended as tools for use in carbon cycle modeling studies. A GLOBALVIEW data product is derived from measurements but contains no actual data. GLOBALVIEW products are updated annually.

Now Available
GLOBALVIEW-CO₂, 2008
GLOBALVIEW-CH₄, 2008
GLOBALVIEW-CO, 2008
GLOBALVIEW-CO₂C₁₃, 2008

http://www.esrl.noaa.gov/gmd/ccgg/globalview/
THANK YOU