GAW, NDACC, GCOS, GRUAN

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WMO’s Research Department
WMO-GAW was established 1989 by merging two established WMO networks: 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 Atm. Env. Research Division of WMO’s Research Dept.

Currently GAW coordinates activities, data delivery and analysis products from 24 Global stations, 200 Regional stations, and many Contributing stations.
The GAW Mission

- Systematic Global Monitoring of the Chemical Composition of the Atmosphere
- Analysis and Assessment in Support of International Conventions
- Development of Air Pollution and Climate Predictive Capability
Dobson, Brewer & Sondes are now part of GCOS

- Dobson & Brewer Networks constitute:
  WMO/GAW GCOS Global Baseline Total Ozone Network

- Ozonesonde Network constitutes:
  WMO/GAW GCOS Global Baseline Profile Ozone Network

- Endorsed by GCOS AOPC-XIII 23 April 2007

- Adopted at the 15th session of the GCOS Steering Committee in Paris 16-19 Oct 2007
Global Atmosphere Watch
Dobson & Brewer stations

132 stations
GAW/SHADOZ/NDACC
Ozonesonde stations

63 stations
What is NDACC?

Network for the Detection of Atmospheric Composition Change

Priorities

Studying the temporal and spatial variability of atmospheric composition and structure,

Detecting trends in overall atmospheric composition and understanding their impacts on the stratosphere and troposphere,

Establishing links between climate change and atmospheric composition,

Calibrating and validating space-based measurements of the atmosphere,

Supporting process-focused scientific field campaigns, and

Testing and improving theoretical models of the atmosphere.
NDACC Site Selection

Primary and complementary sites
Primary sites have a comprehensive suite of measurements
Complementary sites have a more limited set of measurements
The quality criteria are the same

Stations in different regions
Polar regions (N and S)
Mid-latitude in both hemispheres
Tropical and equatorial sites

A station can consist of several sites
Arctic site: Eureka, Thule, Søndre Strømfjord, Ny-Ålesund
Alpine site: Jungfraujoch, OHP, Payerne, Bern, Zimmerwald, Arosa, Garmisch Partenkirchen, Zugspitze, Hohenpeissenberg
Antarctic site: South Pole, Dumont d’Urville, Arrival Heights, McMurdo and Scott Base.
NDACC: Focus on data quality

Strict criteria for being and staying affiliated

Network governed by a number of protocols
Data protocol: Compromise between data availability & IPR
Validation protocol
Instrument intercomparison protocol

Regular intercomparison campaigns
Mobile systems (Lidar, FT-IR)
Gathering of many instruments at the same location

Organisation of NDACC

Working groups
UV-Vis, Spectral UV, Ozone&aerosol sondes, FT-IR, MW, Lidars, Dobson&Brewer
Working groups for Satellites, Theory&Analysis, H$_2$O, O$_3$
Steering Committee with Working Group representatives + peer and ex-officio members (~40 in all)
NDACC Station Map

- **NDACC Primary Sites**
- **NDACC Complementary Sites**

Key Sites:
- GrunInitiation Meeting, Lindenberg 26-28 February 2008
- NDACC Sites
  - Rothera, Syowa Base, Tarawa
  - Kiruna, South Pole Station & Scott Base
  - Dumont d'Urville, Mauna Kea, Hilo, & Mauna Loa
  - Eureka, Thule, Ny Ålesund
  - Bern & Jungfraujoch, Arosa & Payerne
  - Bordeaux, Haute Provence & Plateau de Bure
  - Scoresbysund, Garmisch & Zugspitze
  - Zvenigorod, Sodankylä
  - Ciater/Bandung, Zhygansk
  - Wollongong, Campbell Island (Inactive)
  - Table Mountain & Pasadena, Mt. Barcroft
  - Toronto (Inactive), Greenbelt, Wallops Island
  - Kitt Peak, Kitt Peak
  - Alert, Thule
  - Reunion Island, Kerguelen Island
  - Faraday (Inactive), Macquarie Island (Inactive)

Other Sites:
- Neumayer Station, South Pole Station
- Sondre Stromfjord
- Neumayer Station
- Arran Heights, McMurdo Station
- Alert, Thule
- Salekhard, Salekhard
- Zhygansk, Zhygansk
- Rikubetsu, Rikubetsu
- Tsukuba, Tsukuba
- ATsukuba, ATsukuba
- Kiso & Toyokawa, Kiso & Toyokawa
- Faraday (Inactive), Faraday (Inactive)

Map Legend:
- ▲ NDACC Primary Sites
- ■ NDACC Complementary Sites
NDACC microwave sites

Ozone Characteristics
Altitude range: 20-70 km
Vertical resolution: 8-12 km

Water vapour Characteristics
Altitude range: 20-70 km
Vertical resolution: 8-12 km

Zimmerwald, CH
Ozone Characteristics

- Altitude range: 10 - 50 km
- Vertical resolution: 0.5 - 5 km
- Network homogeneous within ± 2% in the 20-35 km range

Temperature Characteristics

- Altitude range: 10-80 km
- Vertical resolution: 1-6 km
- Network homogeneous within ± 1 K in the 35 - 60 km range
NDACC lidar sites

Water vapour (Raman and DIAL)

Characteristics

Altitude range: ground to 8-17 km
Vertical resolution: 0.1 km
Detection limit: 15 ppb
Accuracy: Depends on calibration source (5-20%)
Precision: 0.001 to 50%
### Essential climate variables (ECVs)

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<th>Priority</th>
<th>Lidar</th>
<th>FT-IR</th>
<th>μwave</th>
<th>Dobson Brewer</th>
<th>UV-Vis</th>
<th>Sondes</th>
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</table>

### Initial station candidates

ARM Sites, Lindenberg, Camborne, Payerne, Cabauw, Boulder, Sodankylä, Heredia, Lauder, Beltsville
Proliferation of data bases

Current situation

data providers
(e.g. ESA, NASA, NASDA, ECMWF, NCEP, station networks, individual stations, field campaign data centers, ...)

data users
(individual research groups)

bureaucratic procedure, i.e., submission of proposal, annual reports, final report, etc.

simple registration or free access

Figure courtesy of Markus Rex, AWI
Ideal situation

Data providers

Data protocol

GTS/WIS

Data centres

Data users
WMO Information System (WIS)

World Radiation Centre
Regional Instrument Centres

Climate research institutes
Universities
Regional Climate Centres

International organizations

Commercial service providers

WMO World Data Centres

5 GAW World Data Centres
GCOS Data Centres
Global Runoff Data Centre

GISC: Global Information System Centre
NMC: National Meteorological Centre
DCPC: Data Collection or Product Centre

Real-time “push”

On-demand “pull”

GAW: Global Atmosphere Watch
GCOS: Global Climate Observing System

WMO Information System (WIS)