Наблюдения и анализ состава атмосферы в рамках Глобальной Службы Атмосферы ВМО

Оксана Тарасова, Лииза Ялканен

ВМО, Отдел Атмосферных Исследований и Окружающей Среды

OTarasova@wmo.int

www.wmo.int/gaw

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 GO_3OS 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 Research Department of WMO under the purview of WMO Commission for Atmospheric Science (CAS)

GAW focal areas

- Stratospheric Ozone
- Tropospheric Ozone
- Greenhouse Gases (CO_2, CH_4, N_2O, SF_6, CFCs)
- Reactive Gases (CO, VOC, NO_y, SO_2)
- Precipitation Chemistry
- Aerosols (chemical, physical, AOD)
- UV Radiation
- (Natural Radionuclides, Rn^{222}, Be^{7}, ^{14}CO)

How does GAW work?

SAGs

- Ozone
- UV
- IGACO-Ozone
- Greenhouse Gases
- Precipitation chemistry
- Reactive gases
- GURME
- Aerosols

GAW Secretariat

WMO

CAS Open Programme Area Group

EPAC

Environmental Pollution & Atmospheric Chemistry

Joint Steering Committee

Quality Assurance & Science Activity Centres

World & Regional Calibration Centres

GHG	N_2O VOC	CH_4	Precip. chem.	Physical aerosol properties	In situ O_3, CO, CH_4	Optical depth	Total O_3	O_3 Sondes
NOAA ESRL/GMD (USA)	IMK-IFU (DE)	JMA (JP)	SUNY Albany (USA)	IFT (DE)	EMPA (CH)	WORCC (CH)	3 WCC (US, CA, RU) 6 Dobson RCC (JP, AU, ZA, AR, DE, CZ) 1 Brewer RCC (ES)	FZJülich (DE)

Central Calibration Laboratories

Host GAW World Reference Standards

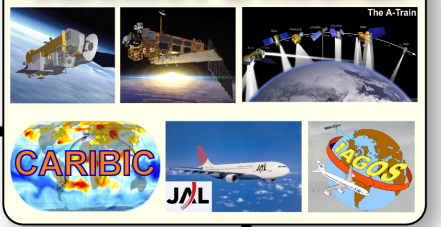
CO_2, CH_4, N_2O CO, Dobson O_3	Brewer total O_3	Ozone-sondes	In situ O_3
NOAA ESRL/GMD (USA)	Environment Canada	FZJülich (DE)	NIST (USA)

Contributing networks

emep · EANET · BSRN · AERONET AEROSOL ROBOTIC NETWORK · EARLINET · CAPMoN · NDACC · SHADOZ · AGAGE

GAW stations & GAWSIS

Satellites & Aircraft



IGACO products

GHG Bulletins

O_3 Bulletins

Assessments

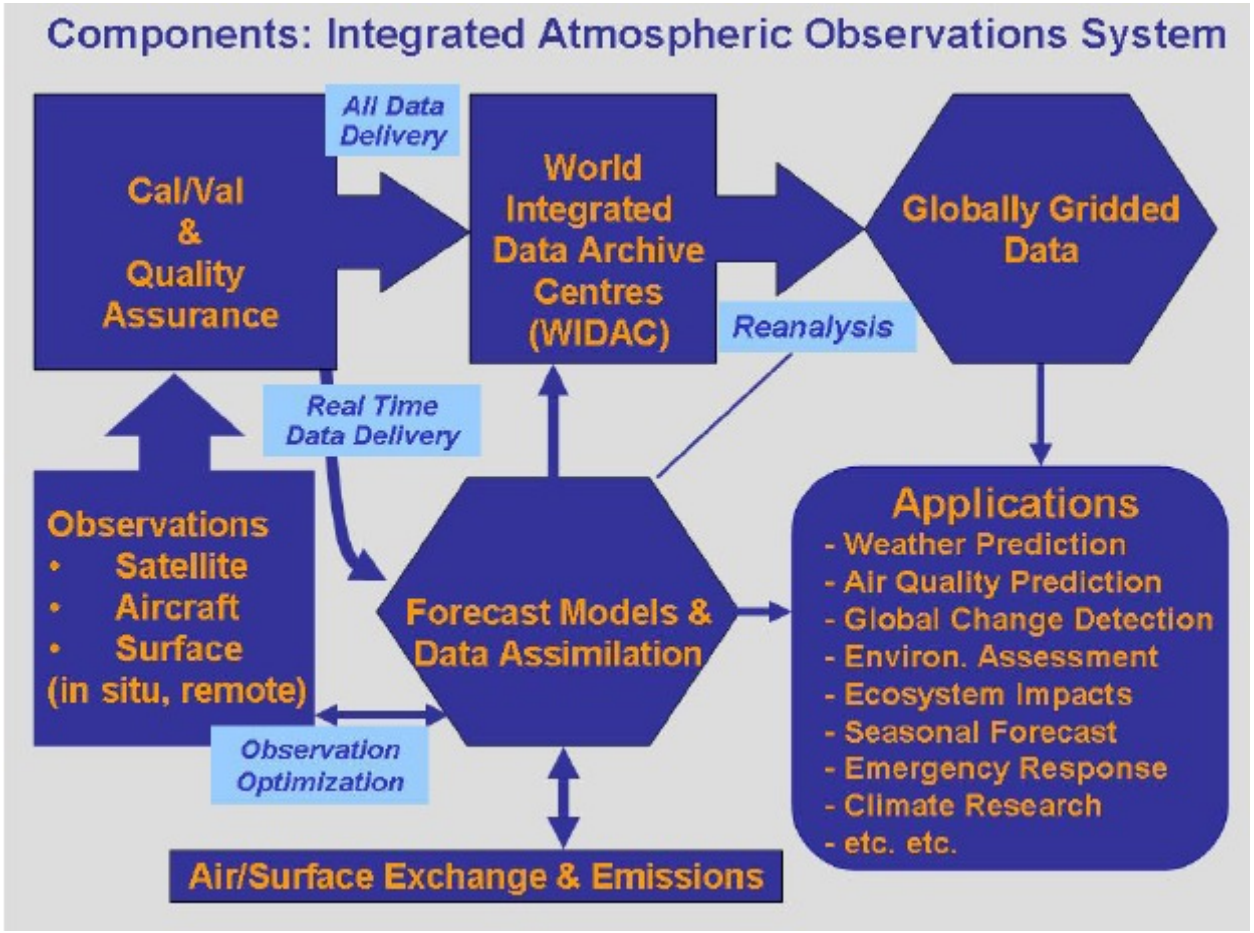
Global fields

World Data Centres

WOUDC Ozone & UV	WDCGG Greenhouse gases	WDCA Aerosols	WRDC Radiation	WDCPC Precip. chem.	WDC-RSAT Satellite data
Environment Canada (CA)	JMA (JP)	JRC (EU)	MGO (RU)	SUNY Albany (USA)	DLR (DE)

GAW approaches

- Global
- End-to-end (from observations to products)
- Integrated 3D observations



Observations

Surface-based *in situ* and remote sensing observations are the backbone of the GAW network, which consists of Global, Regional and Contributing stations.

- Currently GAW coordinates activities and data from 28 Global stations, 400 Regional stations, and 100 Contributing stations (http://gaw.empa.ch/gawsis/)

GAW affiliated networks (in GAWSIS)

- AERONET, AGAGE/SOGE/NIES, BSRN, CAPMoN, EANET, EMEP, GALION, NADP, NDACC, NOAA-ESRL, RAMCES, SHADOZ, TCCON

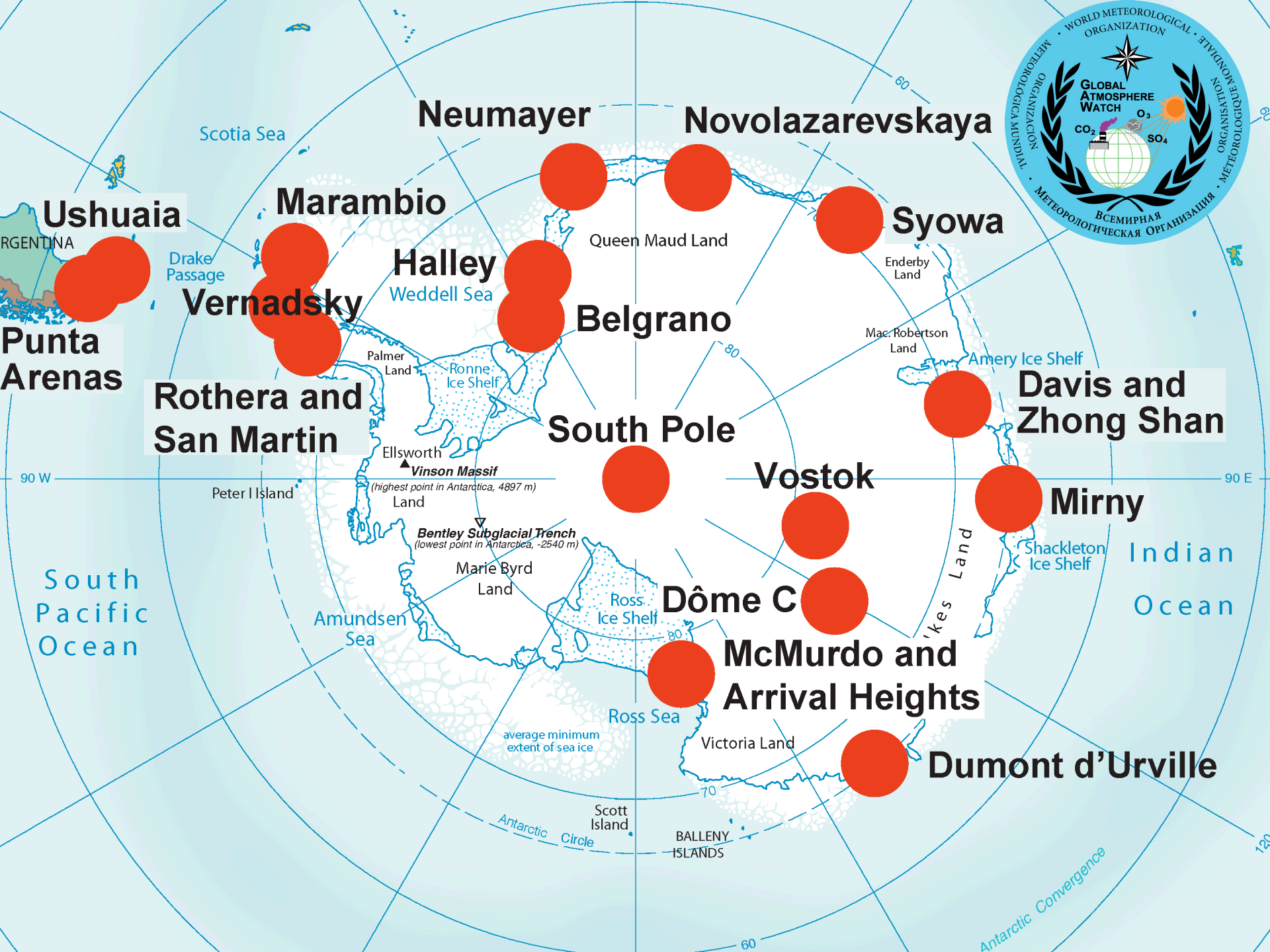
GAW Station Information System

GAWSIS Online - comprehensive information on all GAW stations

- ***Database***
- ***Search / Update***
- ***Inventory / Audit***

(Supported by Switzerland)

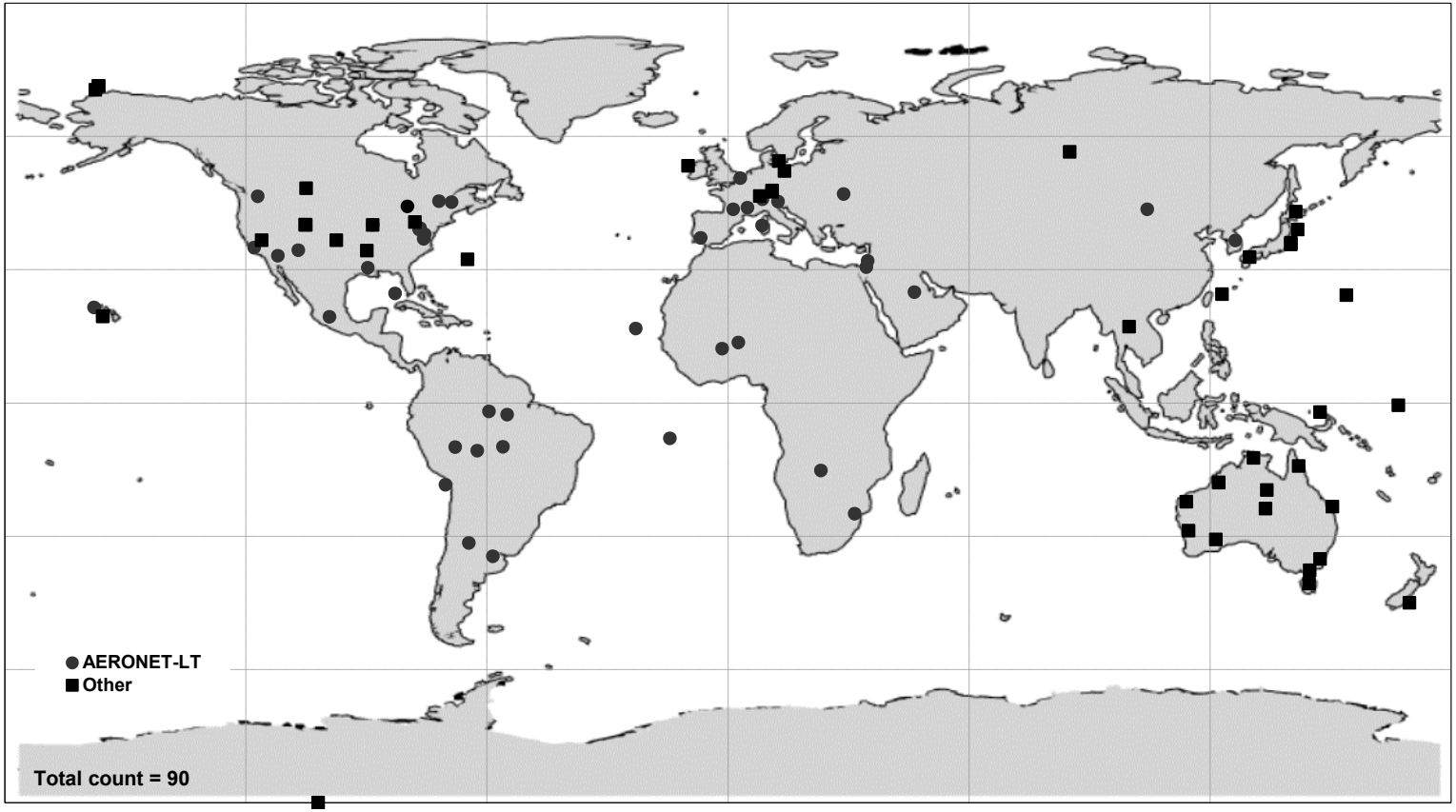
GAW Global stations


Neumayer
Novolazarevskaya
Syowa
Marambio
Halley
Weddell Sea
Vernadsky
Belgrano
Ushuaia
Punta Arenas
Rothera and San Martin
Davis and Zhong Shan
South Pole
Vostok
Mirny
Dôme C
McMurdo and Arrival Heights
Dumont d'Urville
Scotia Sea
Drake Passage
Queen Maud Land
Enderby Land
Mac. Robertson Land
Amery Ice Shelf
Palmer Land
Ronne Ice Shelf
Ellsworth
Vinson Massif
(highest point in Antarctica, 4897 m)
Land
Peter I Island
Bentley Subglacial Trench
(lowest point in Antarctica, -2540 m)
Marie Byrd Land
Amundsen Sea
Ross Ice Shelf
Shackleton Ice Shelf
Ross Sea
Victoria Land
average minimum extent of sea ice
Scott Island
BALLENY ISLANDS
Antarctic Circle
Antarctic Convergence
South Pacific Ocean
Indian Ocean
90 W
90 E
60
70
80
120
RGENTINA
Global Atmosphere Watch
World Meteorological Organization
Organización Meteorológica Mundial
Organisation Météorologique Mondiale
Всемирная Метеорологическая Организация

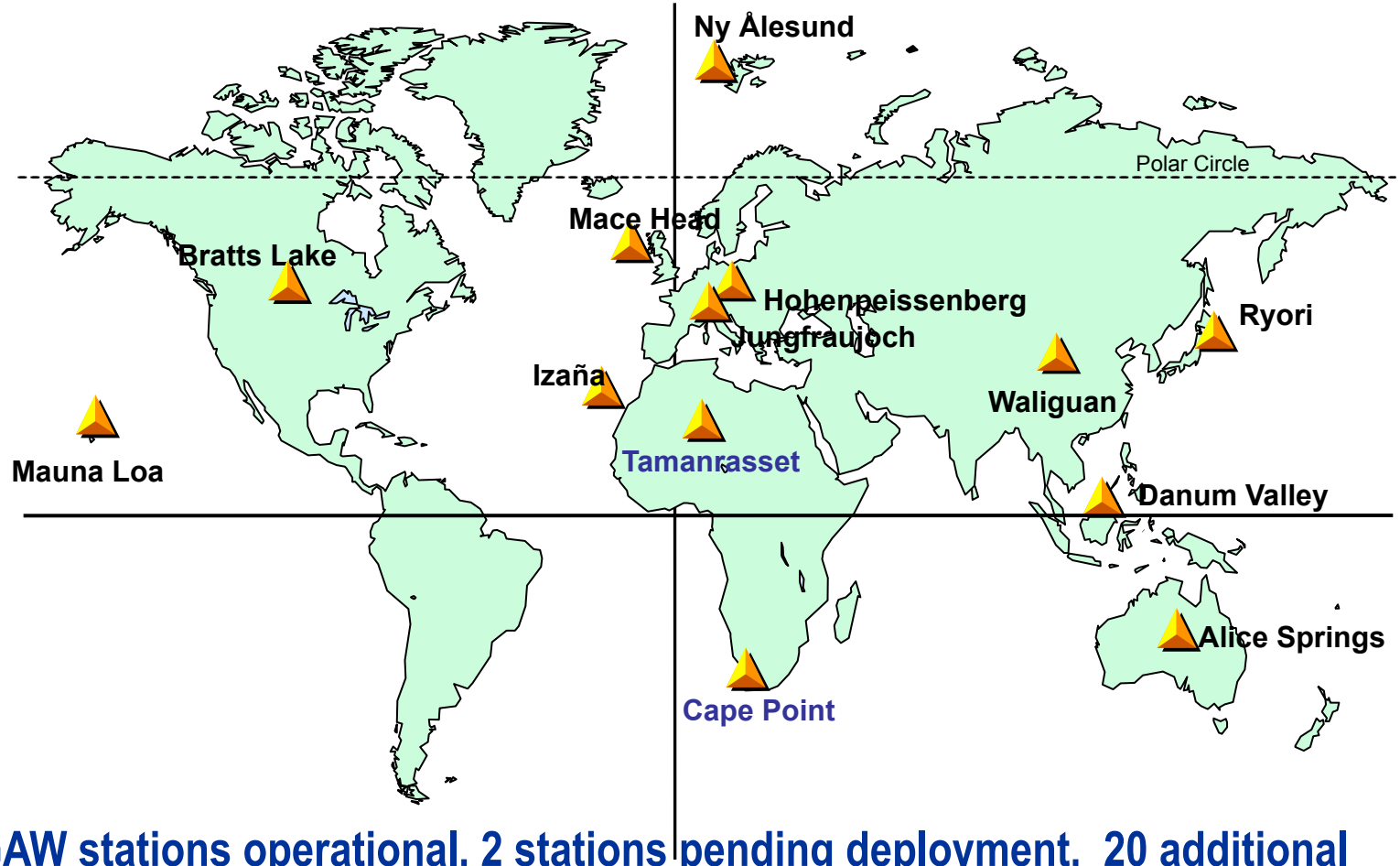
Global AOD observations

Global AOD Network Long-term Sites

4+ years in operation, >50% coverage, as of March 2004

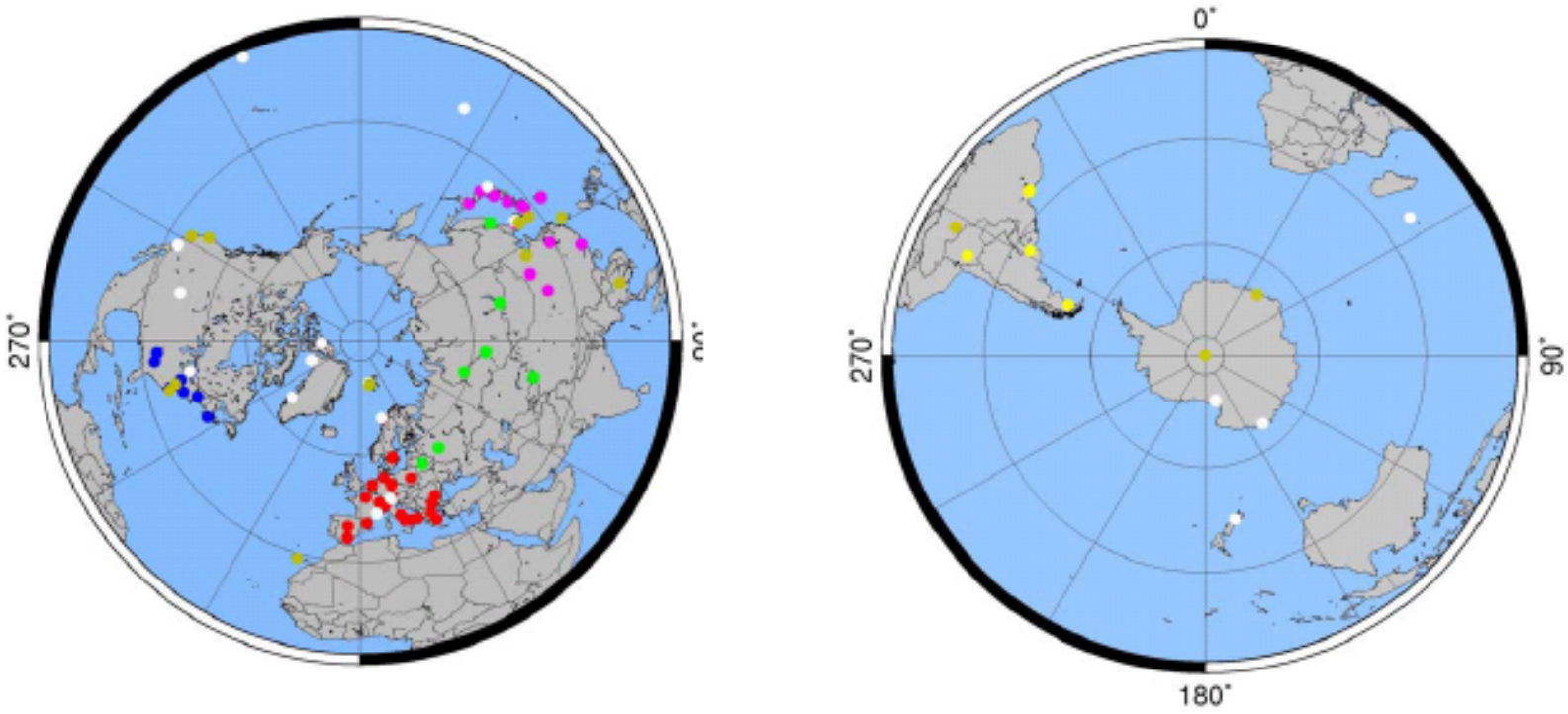


Global AOD Reference Network
GAWPFR DAVOS WORCC



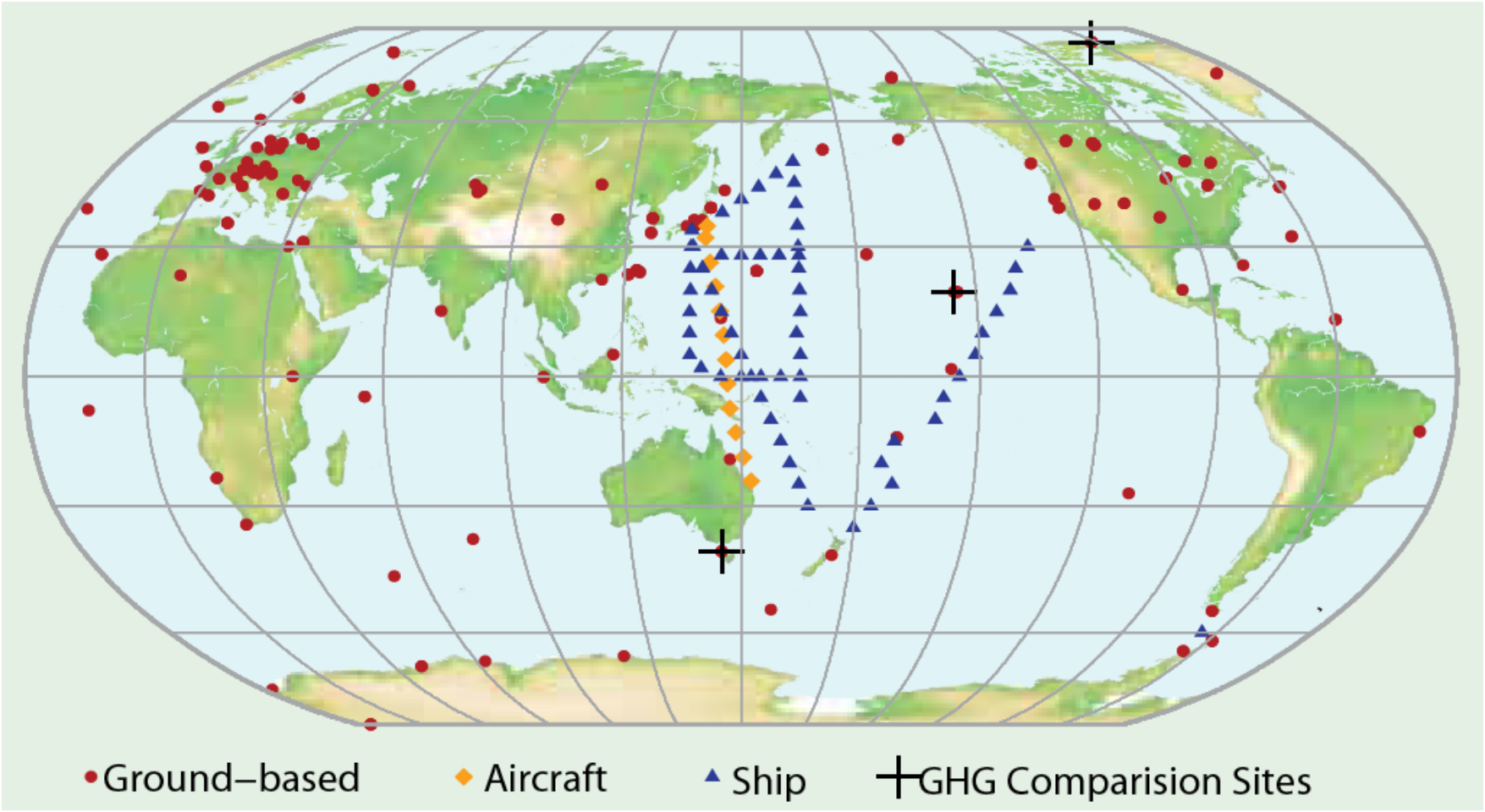
11 GAW stations operational, 2 stations pending deployment, 20 additional PFR operated worldwide by National Meteorological Institutes

GAW Aerosol LIDAR Observing Network GALION

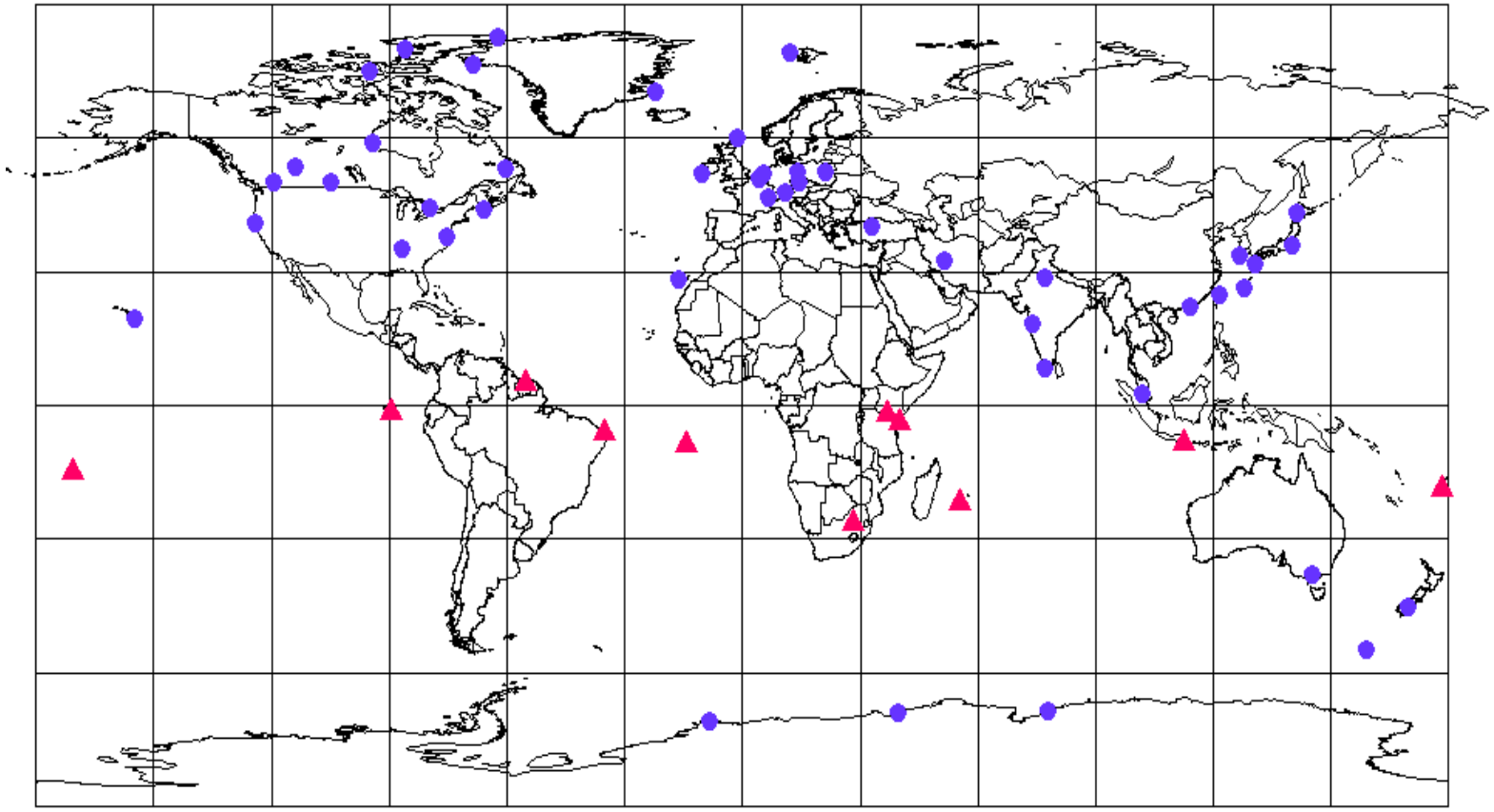


Parameters measured lidar instruments are: backscattering and extinction
2nd GALION workshop (20-23 September 2010 in Geneva) addressed QA/AC and SOPs for all type of instruments operated in the networks

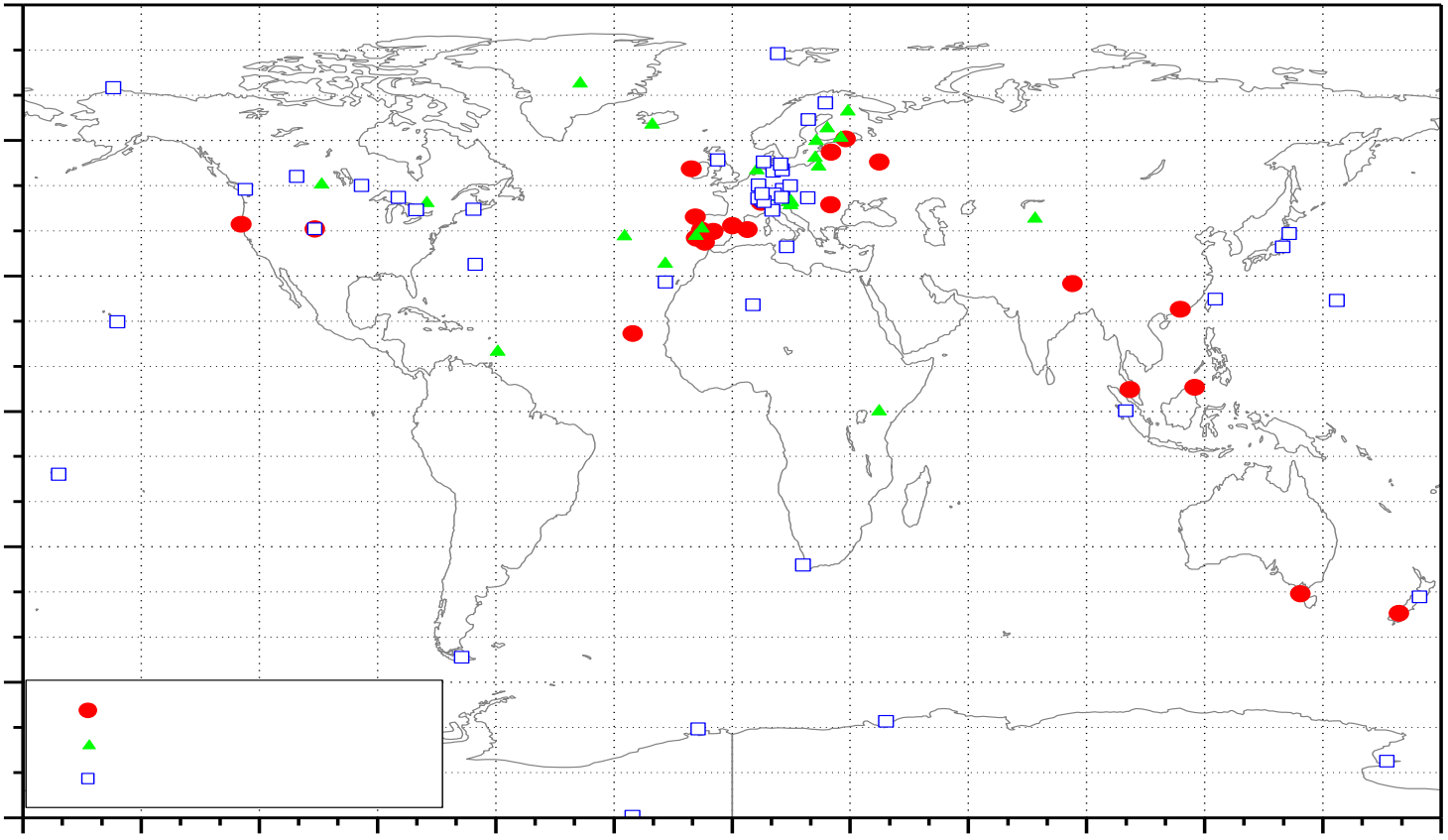
Greenhouse gas observational network (CO_2 and CH_4)



Ozone vertical profiles observations in GAW



Surface ozone observations in GAW



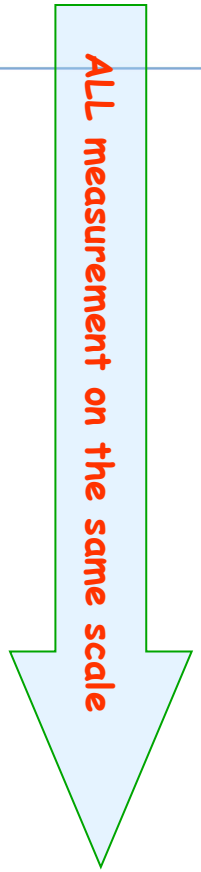
Quality Assurance

An Observational Network with Global Coverage

GAW Surface-Based In Situ (continuous and/or flask) and Routine Commercial Aircraft Observations

Contributing surface based networks and remote sensing

Contributing Aircraft and Satellite measurements



Integrated observations by means of models
Data products and assessments

The *principles* of the GAW QA system

- ✓ 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.

Central Facilities

- Quality Assurance/Science Activity Centres (QA/SACs) perform network-wide data quality and science-related functions.
- Central Calibration Laboratories (CCLs) maintain calibration standards and scales
- World and Regional Calibration Centres (WCCs, RCCs) link observations to World Reference Standards, ensure network comparability through intercomparison campaigns and regular audit, provide training to the stations.
- World Data Centres archive the observational data and metadata, which are referenced in the GAW Station Information System (GAWSIS).

GAW World Central Facilities

Variable	QA/SAC	Central Calibration Laboratory (CCL) (Host of Primary Standard)	World Calibration Centre (WCC)	Regional Calibration Centre (RCC)	World Data Centre (WDC)
CO_2	JMA (A/O)	ESRL	ESRL (round robin) Empa (audits)		JMA
carbon isotopes		MPI-BGC			JMA
CH_4	Empa (Am, E/A) JMA (A/O)	ESRL	Empa (Am, E/A) JMA (A/O)		JMA
N_2O	UBA	ESRL	IMK-IFU		JMA
CFCs, HCFCs, HFCs					JMA
SF_6		ESRL			JMA
H_2		MPI-BGC			JMA
Total Ozone	JMA (A/O)	ESRL[1], EC[2]	ESRL[1], EC[2]	BoM[1], ESRL[1], IZO[2] JMA[1], MOHp[1], MGO[3], OCBA[1], SAWS[1], SOO-HK[1]	EC[5], DLR[8]
Ozone Sondes	IEK-8	IEK-8	IEK-8		EC
Surface Ozone	Empa	NIST	Empa	OCBA	JMA
Precipitation Chemistry	NOAA-ARL	ISWS	ISWS		NOAA-ARL
CO	Empa	ESRL	Empa		JMA
VOC	UBA	NPL	IMK-IFU		JMA
SO_2					JMA
NO_x	UBA		IEK-8 (NO)		JMA
Aerosol	UBA (physical properties)		IfT (physical properties)		NILU[5], DLR[8]
Optical Depth		PMOD/WRC[4]	PMOD/WRC		NILU
UV Radiation				ESRL (Am), EUVC/PMOD (E)	EC
Solar Radiation		PMOD/WRC	PMOD/WRC		MGO

Products and Services

WMO Global Atmosphere Watch

World Data Centre for Greenhouse Gases

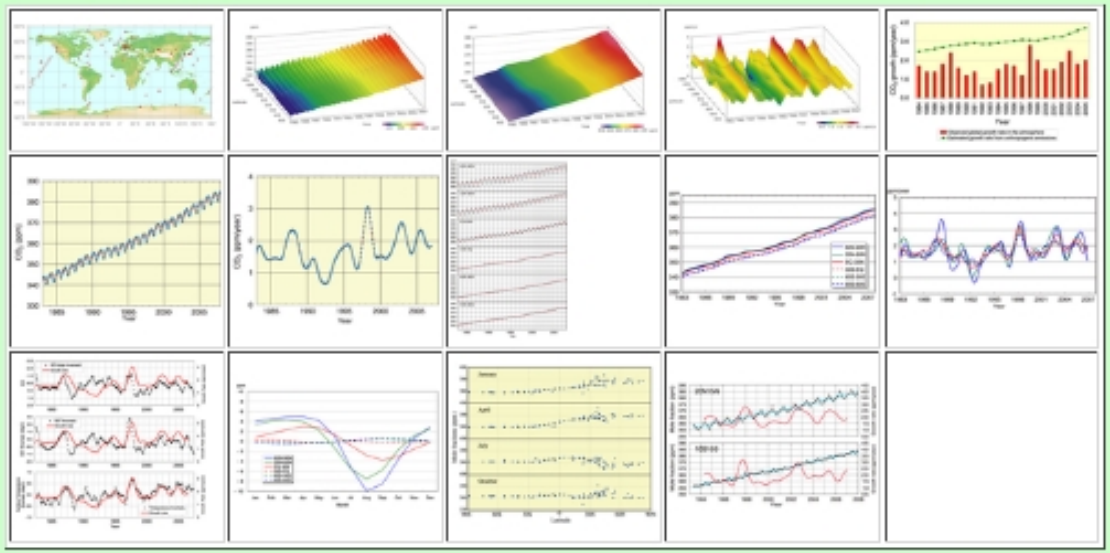
WDCGG

Introduction
Contributors
Data/ Quick Plot
Publications
Summary and CD-ROM
WMO Bulletin
Gallery
Related Links
Update Note
Home
Site Map
日本語版

Gallery

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

CO2 | CH4 | N2O | Halocarbons | O3 | CO | NOx | SO2



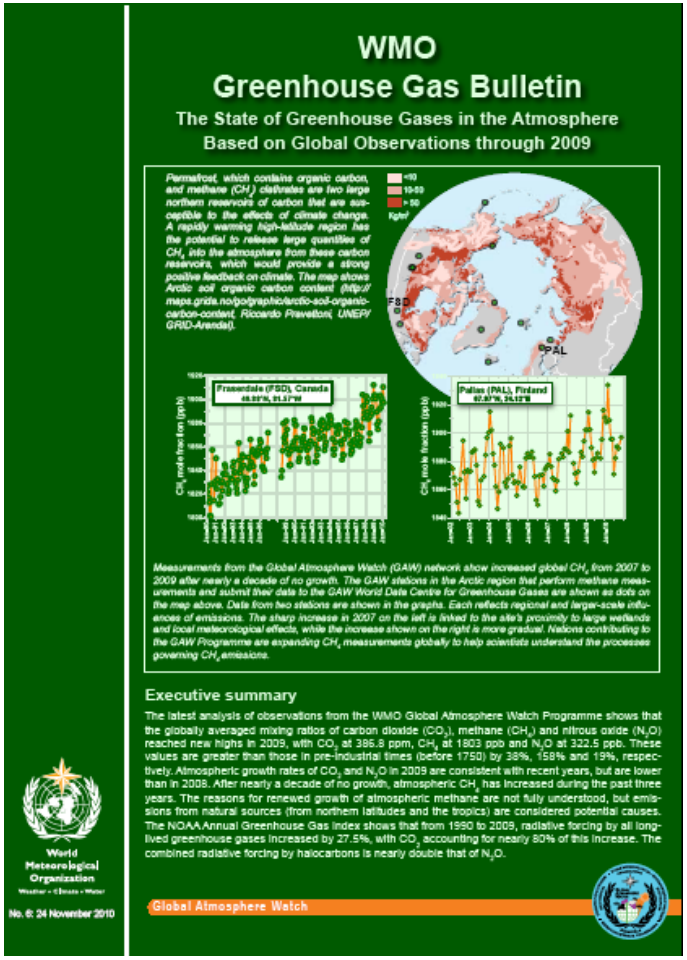
WDCGG Data Submission and Dissemination Guide (PDF

This site is maintained by the Japan Meteorological Agency
in cooperation with the World Meteorological Organization
(Created : 2001/07/02 Modified : 2009/09/02)

WMO World Data Centre for Greenhouse Gases
c/o Japan Meteorological Agency
1-3-4, Otemachi, Chiyoda-ku
Tokyo 100-8122, Japan
Tel:

Done

Annual Greenhouse Gas Bulletins



Bulletin 1 (March 2006) CO_2 global distribution

Bulletin 2 (November 2006) CH_4 global distribution

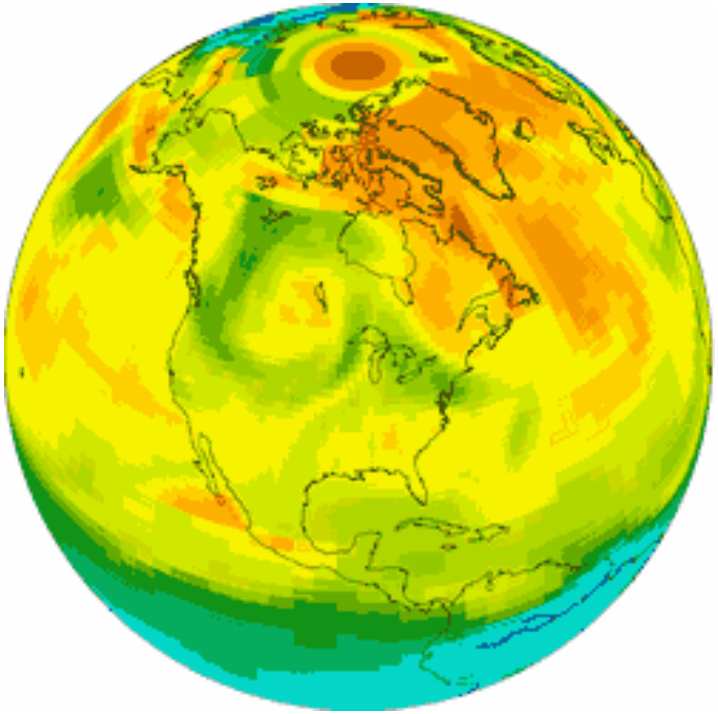
Bulletin 3 (November 2007) *NOAA's CarbonTracker model*

Bulletin 4 (November 2008) Montreal Protocol

Bulletin 5 (November 2009) Importance of CO_2

Bulletin 6 (November 2010) Methane and permafrost

Key issues/ connections

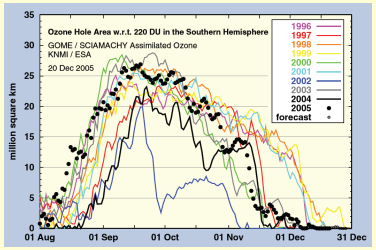


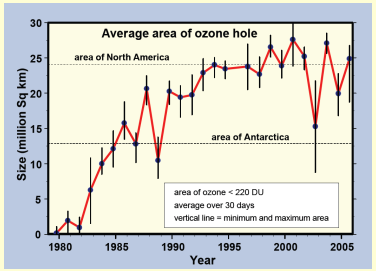
http://www.esrl.noaa.gov/gmd/ccgg/carbontracker/

WMO Antarctic Ozone Bulletins

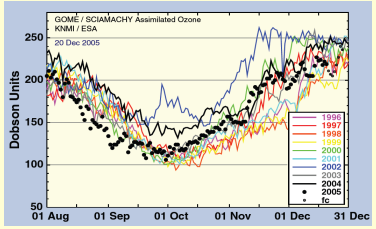
Every Two Weeks Aug to Nov + Summary in Dec/Jan

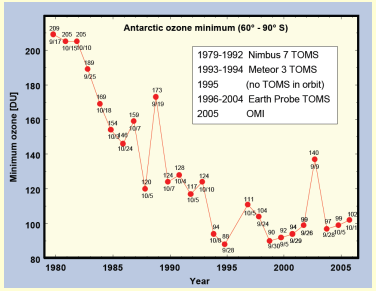
Ozone hole area



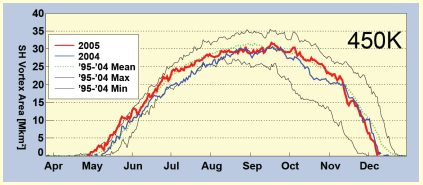


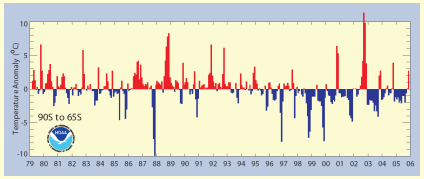
Minimum ozone



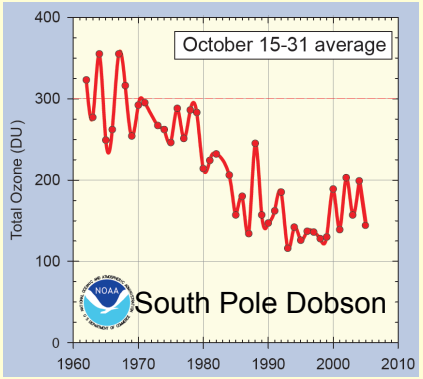


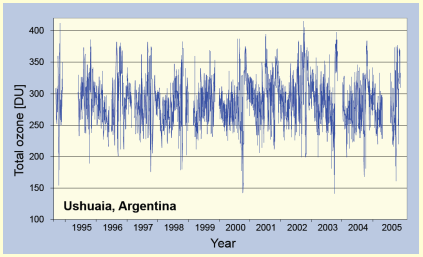
Meteorology



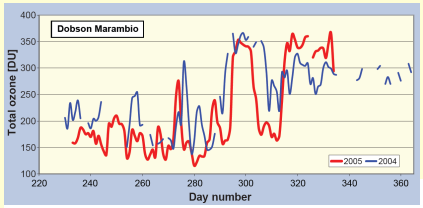


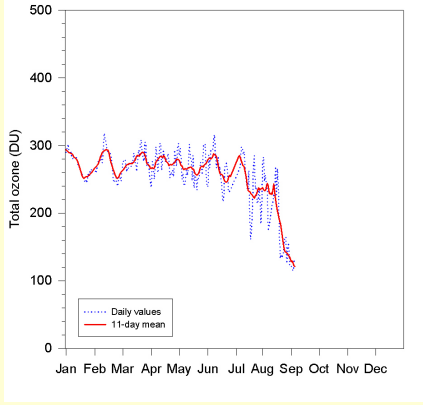
Station climatology



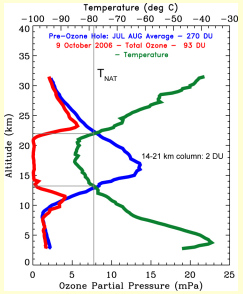


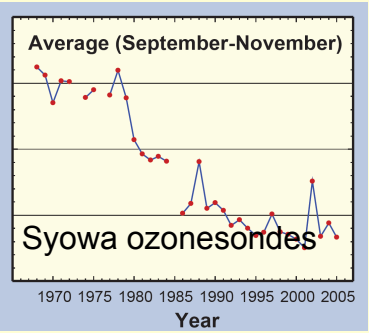
NRT Station data



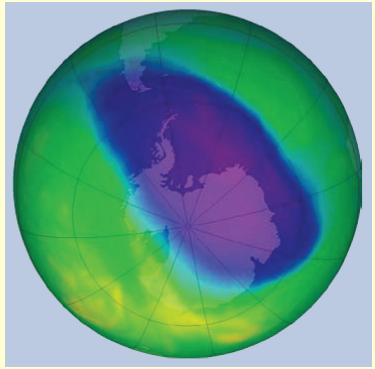


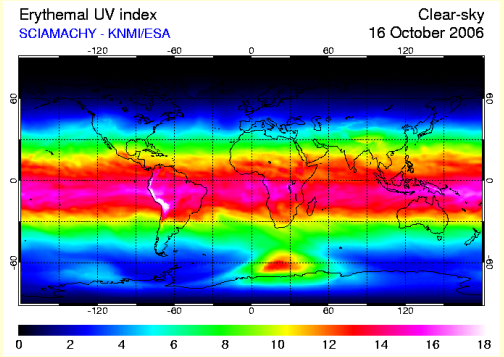
Sonde data



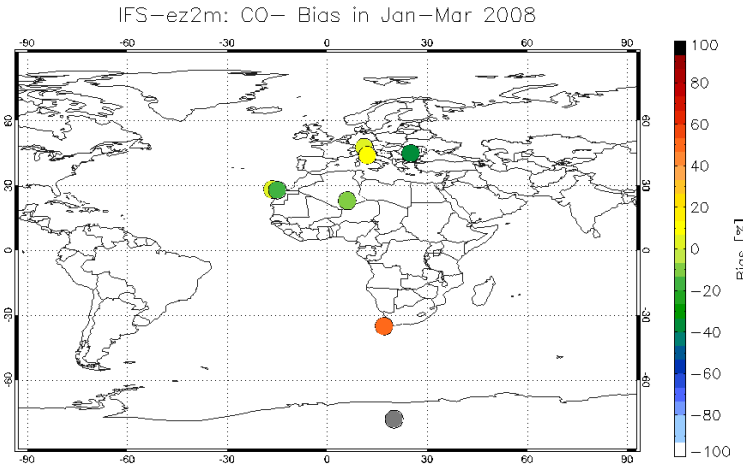


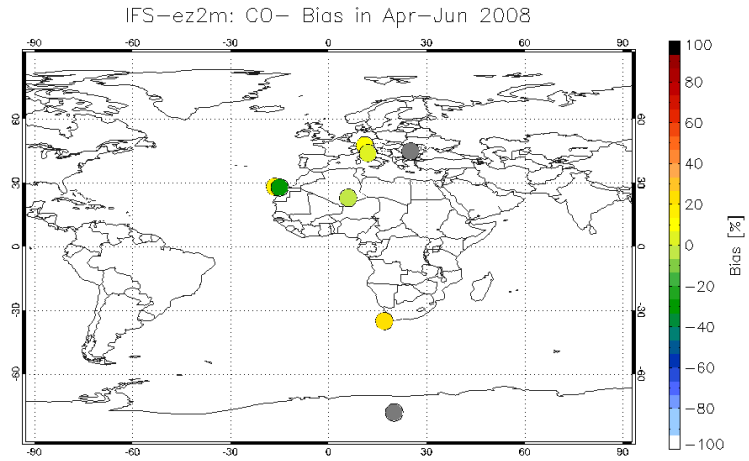
Satellite data + model data

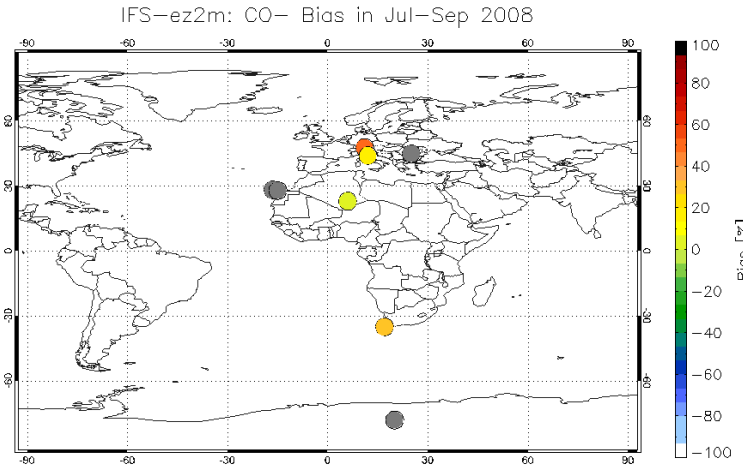


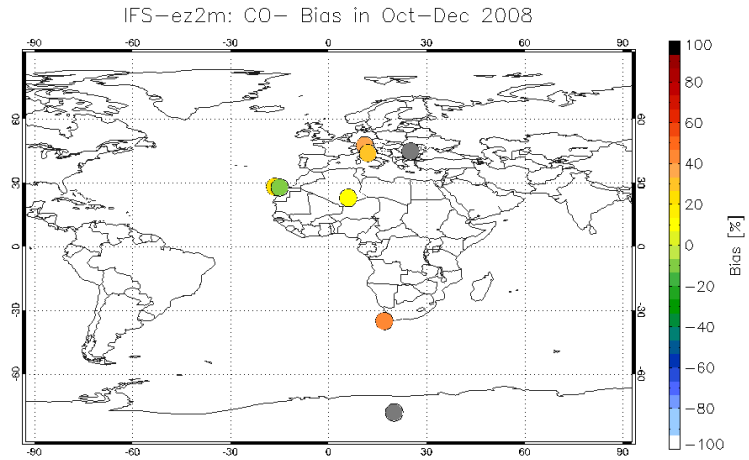


Collaboration with MACC project









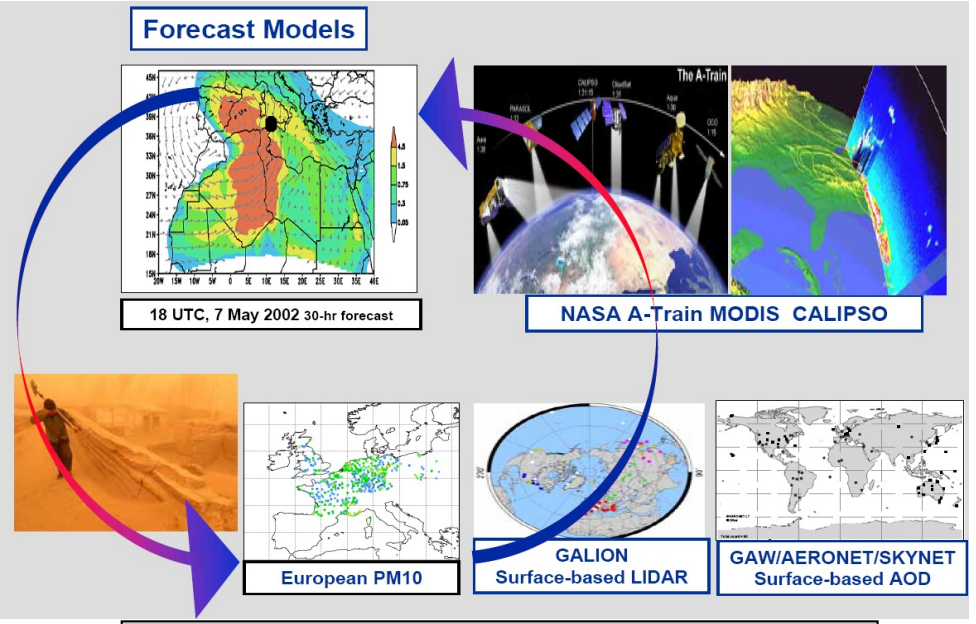
The WMO Sand and Dust Storm Warning, Advisory and Assessment System (SDS-WAS)

A Global Consortium Helping Society Reduce Risk Through Research, Assessments and Forecasts

IMPACTS: Human Health, Agriculture, Marine productivity, Weather and Climate, Aviation

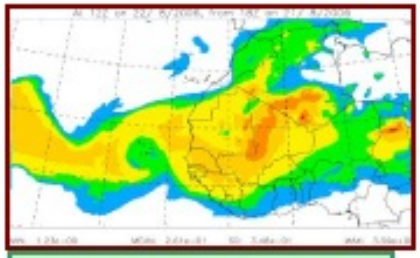
SDS-WAS

- 40 WMO Members interested in the initiative
- ~ 15 institutions running research operational dust model forecasts
- 2 SDS-WAS modes (in China and Spain) established to coordinate regional cooperation
- Joint GAW and WWRP initiative

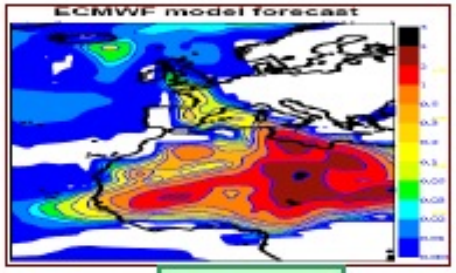


SDS integrates observations, models and delivers products to users

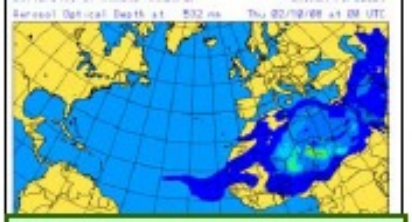
METEOFRANCE



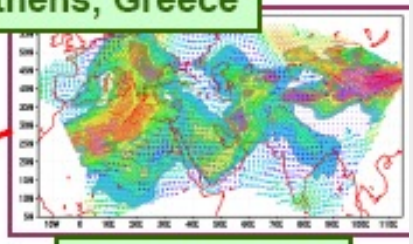
UK MET OFFICE



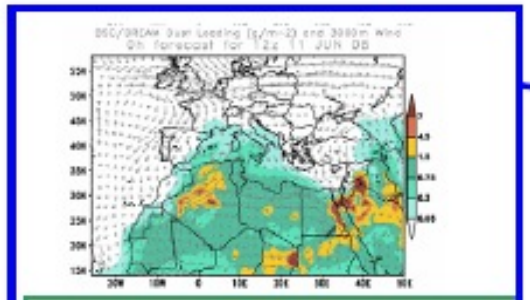
ECMWF



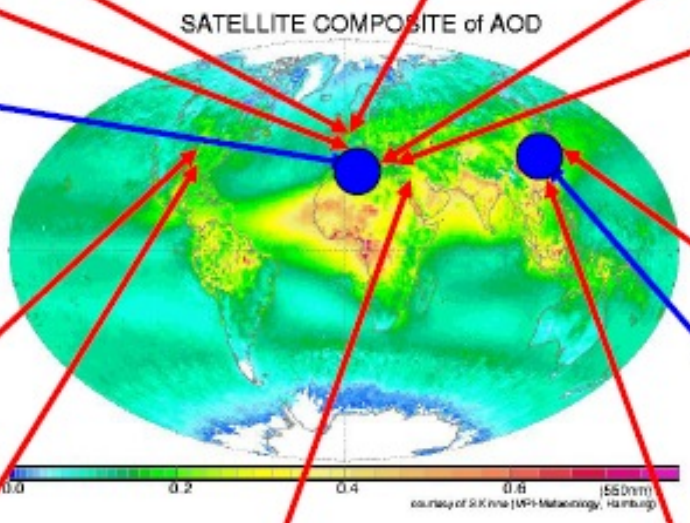
U of Athens, Greece

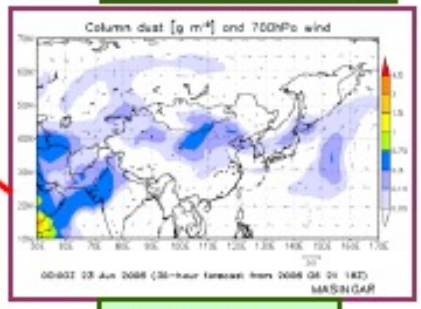


METU, Turkey

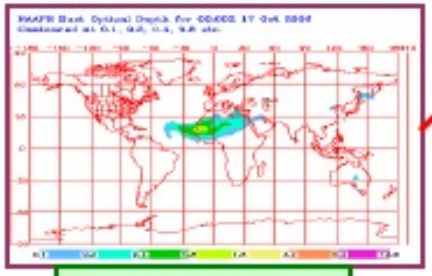


BSC-AEMET-CSIC, Spain

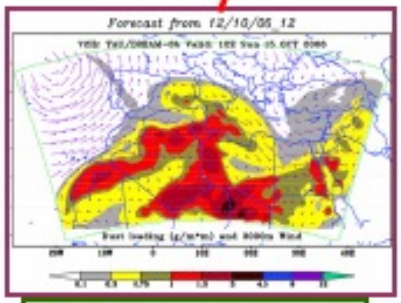




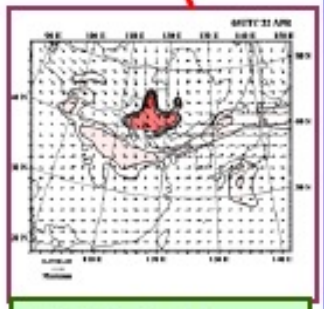
MRI, Japan



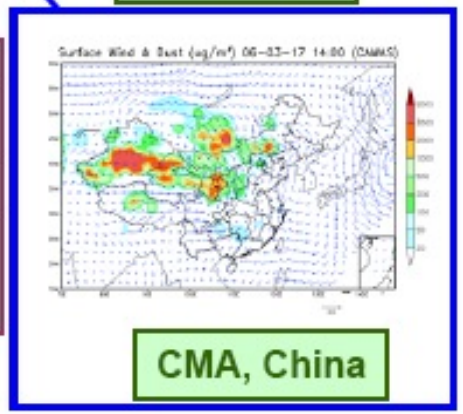
US Navy, USA



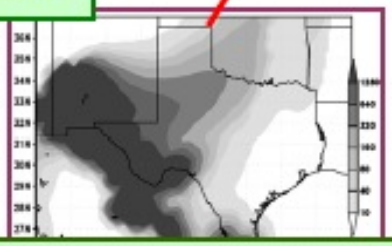
Tel Aviv U, Israel



KMA, S. Korea



CMA, China



Joint U of Arizona
and U of Mexico , USA

SDS-WAS Research and Operational Forecasting

GAW Urban Project

GURME Tasks For The Strategic Planning Period 2008-2015

Observational Needs
- Chemical
- Meteorological

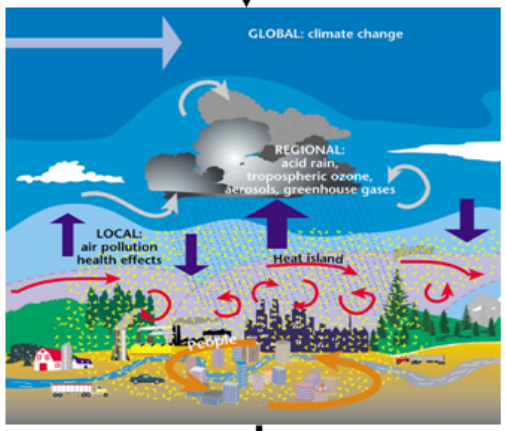
(Tasks: 3,6,17)

Assimilation

Modeling Needs
- Weather prediction
- Chemical weather and air quality prediction

(Tasks: 8,11,13,15)

Demonstration



Coordination

Capacity Building
- Workshops
- Training

(Tasks: 2,4)

Users
- Health
- Agriculture
- Environmental
- Public
- Emergency Response

(Tasks: 9,14,16,18)

Education

Air Quality & Related Products
- Improved Forecasts
- Guidelines
- Pilot Projects

(Tasks: 1,5,7,12)

Dissemination

Example of GURME project: Latin American Cities

Sao Paulo, Brazil

Mexico City, Mexico

Santiago, Chile

Improvement of AQ forecasting in Latin American cities through capacity building

First Air Quality Forecasting Workshop for the Latin American Cities October, 2003, Santiago, Chile;

Workshop on application of WRF/Chem Model and Use of Remote sensing, 2006, Sao Paulo

Training Workshop on AQF for Latin American countries, 2006, Lima

Air Quality Modeling for Latin America, August 2009, Mexico City

NMHSs - Universities - Environmental Agencies

WMO

THANK YOU