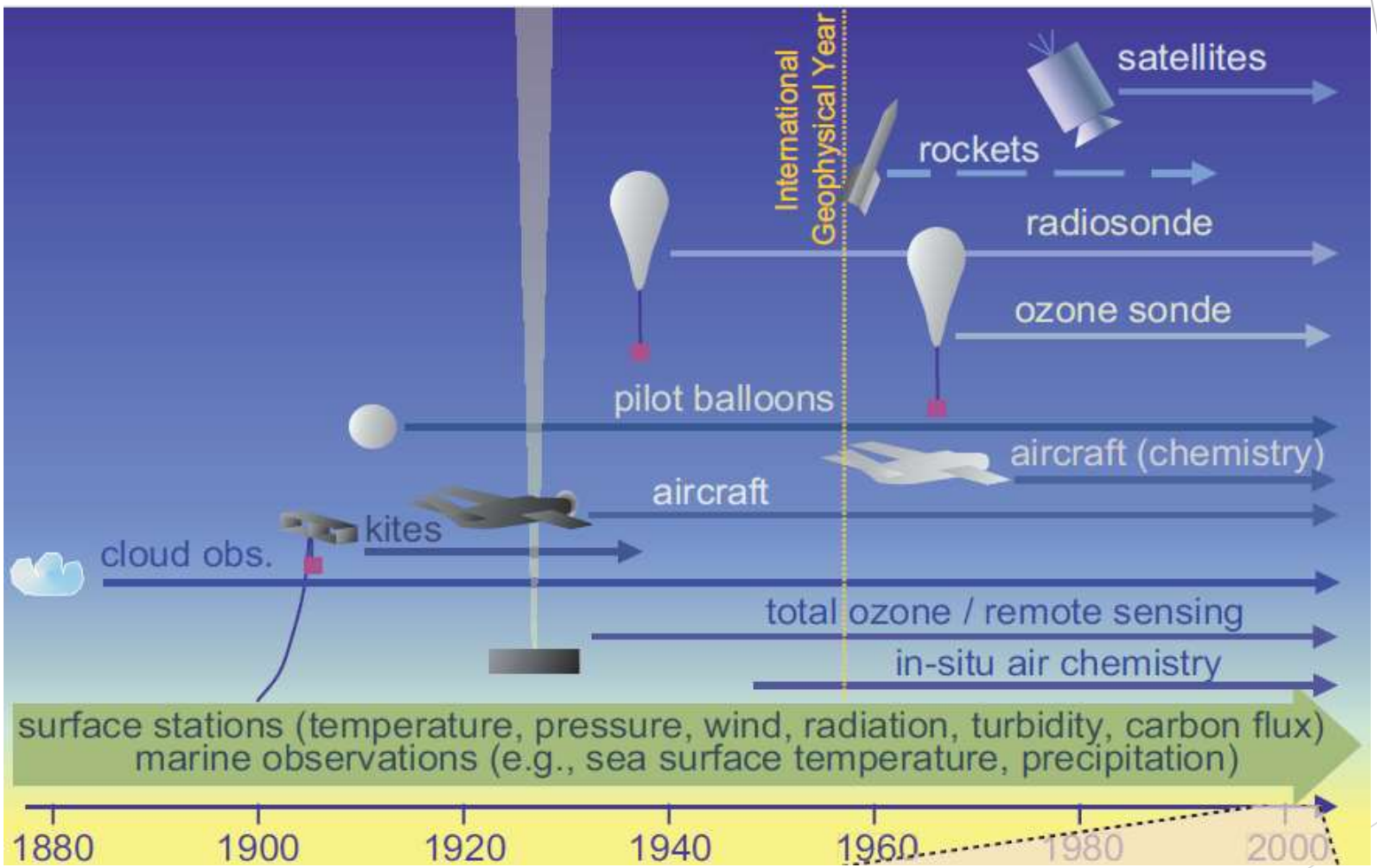
L15. Ground-based observations: basics, approaches, applicability

Professor Natalia Chubarova,

Faculty of Geography, Moscow State University


International Geophysical Year
satellites
rockets
radiosonde
ozone sonde
pilot balloons
aircraft (chemistry)
aircraft
kites
cloud obs.
total ozone / remote sensing
in-situ air chemistry
surface stations (temperature, pressure, wind, radiation, turbidity, carbon flux)
marine observations (e.g., sea surface temperature, precipitation)
1880
1900
1920
1940
1960
1980
2000

IPCC, 2013

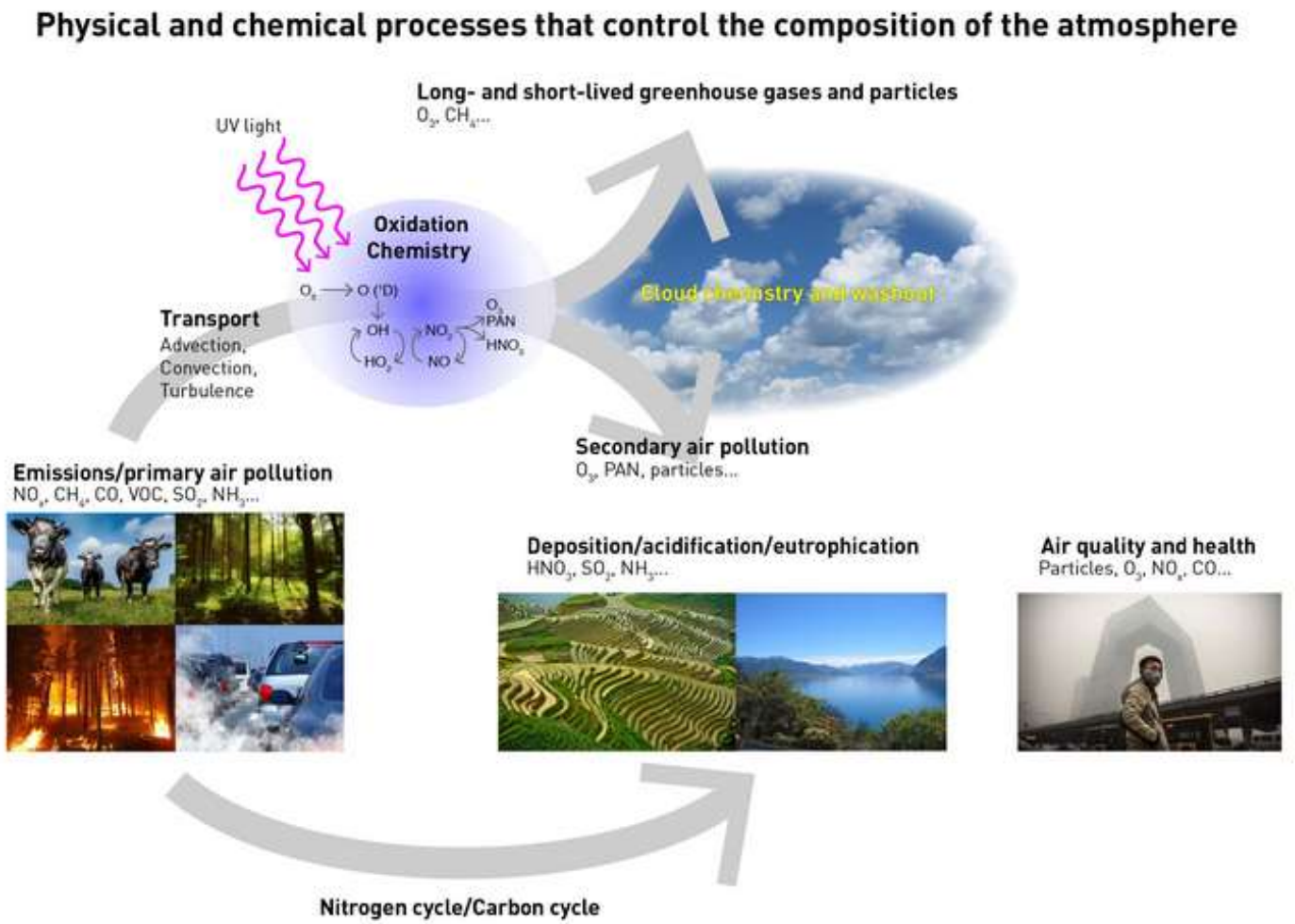
Global Atmospheric Watch

Worldwide system established by the World Meteorological Organization – a United Nations agency – to monitor trends in the Earth's atmosphere. It arose out of concerns for the state of the atmosphere in the 1960s.

Why do we care?

London smog 5 day event in December 1952 – 12000 victims !!

One major aspect of the GAW mission is to organize, participate in and coordinate assessments of the chemical composition of the atmosphere on a global scale.



Global Atmospheric Watch Station information System

GAW structure and focal areas

RESEARCH INFRASTRUCTURE

Expand [-]

- GAW stations
- Central Facilities
- Quality Assurance
- World Data Centres
- Contributing Networks

SCIENTIFIC FOCAL AREAS

Expand [-]

- Aerosols
- Greenhouse Gases
- Reactive Gases
- Stratospheric Ozone and Ultraviolet Radiation
- Atmospheric Deposition
- GURME
- Modelling Applications
- GESAMP

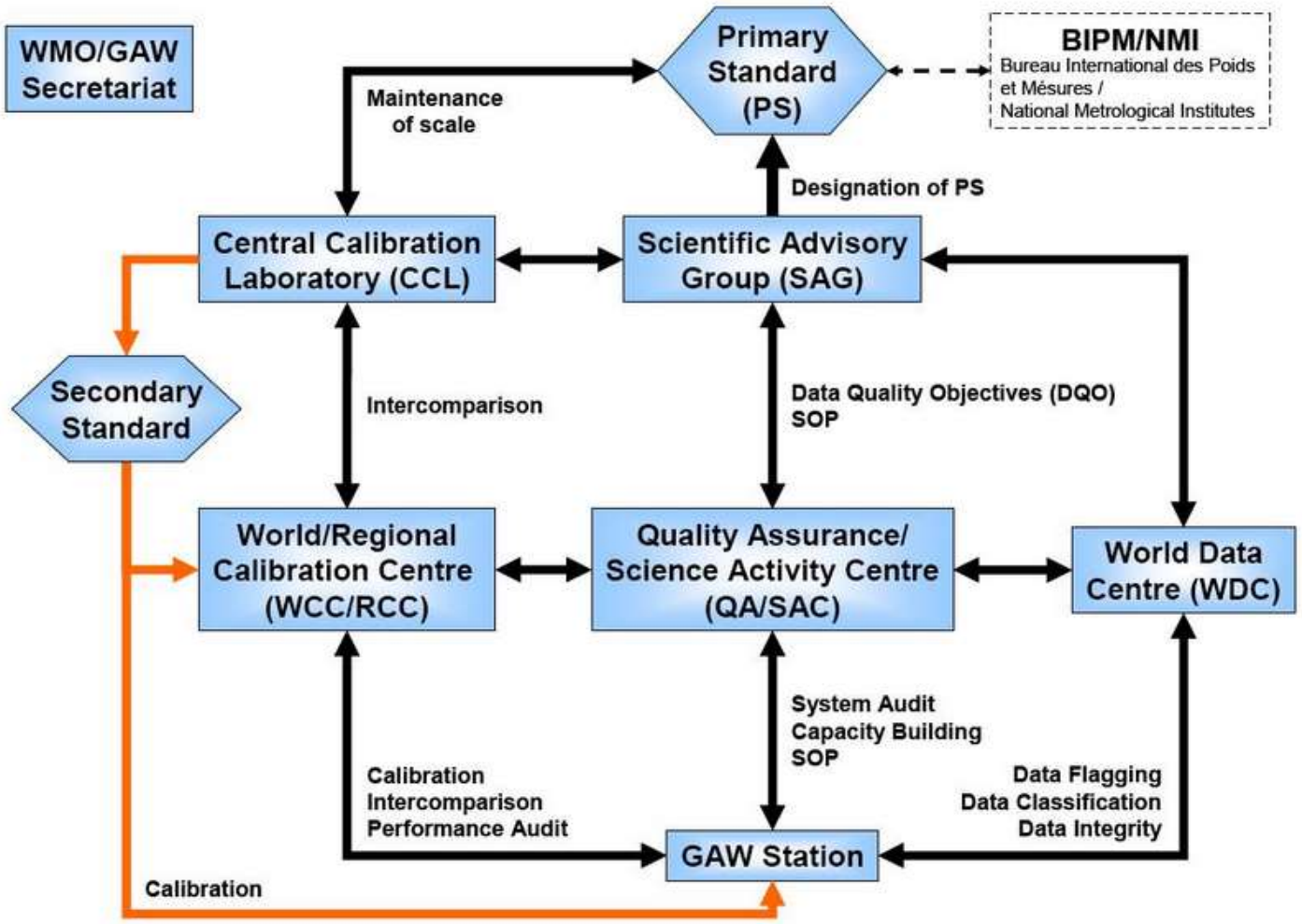
SCIENCE FOR SERVICES

Expand [-]

- Integrated Global Greenhouse Gas Information System IG3IS
- Global Air quality Forecasting and Information Services GAFIS
- Measurement-Model Fusion for Global Total Atmospheric Deposition MMF-GTAD

NEWS

Conceptual framework of the GAW quality system



GAW Global stations

World Data Centres

There are seven GAW World Data Centres (WDCs) each responsible for archiving one or more GAW measurement parameters or measurement types.

GAW World Data Centres

WDC-RSAT (World Data Center for Remote Sensing of the Atmosphere)

WDCA (World Data Centre for Aerosols)

WDCGG (World Data Centre for Greenhouse Gases)

WDCRG (World Data Centre for Reactive Gases)

WOUDC (World Ozone and UV Data Centre)

WRDC (World Radiation Data Centre)

Contributing Data Centres

CASTNET (Clean Air Status and Trends Network)

EMEP (EMEP)

GALION (GAW Aerosol Lidar Observation Network)

GAW-PFR (GAW Precision Filter Radiometer Network)

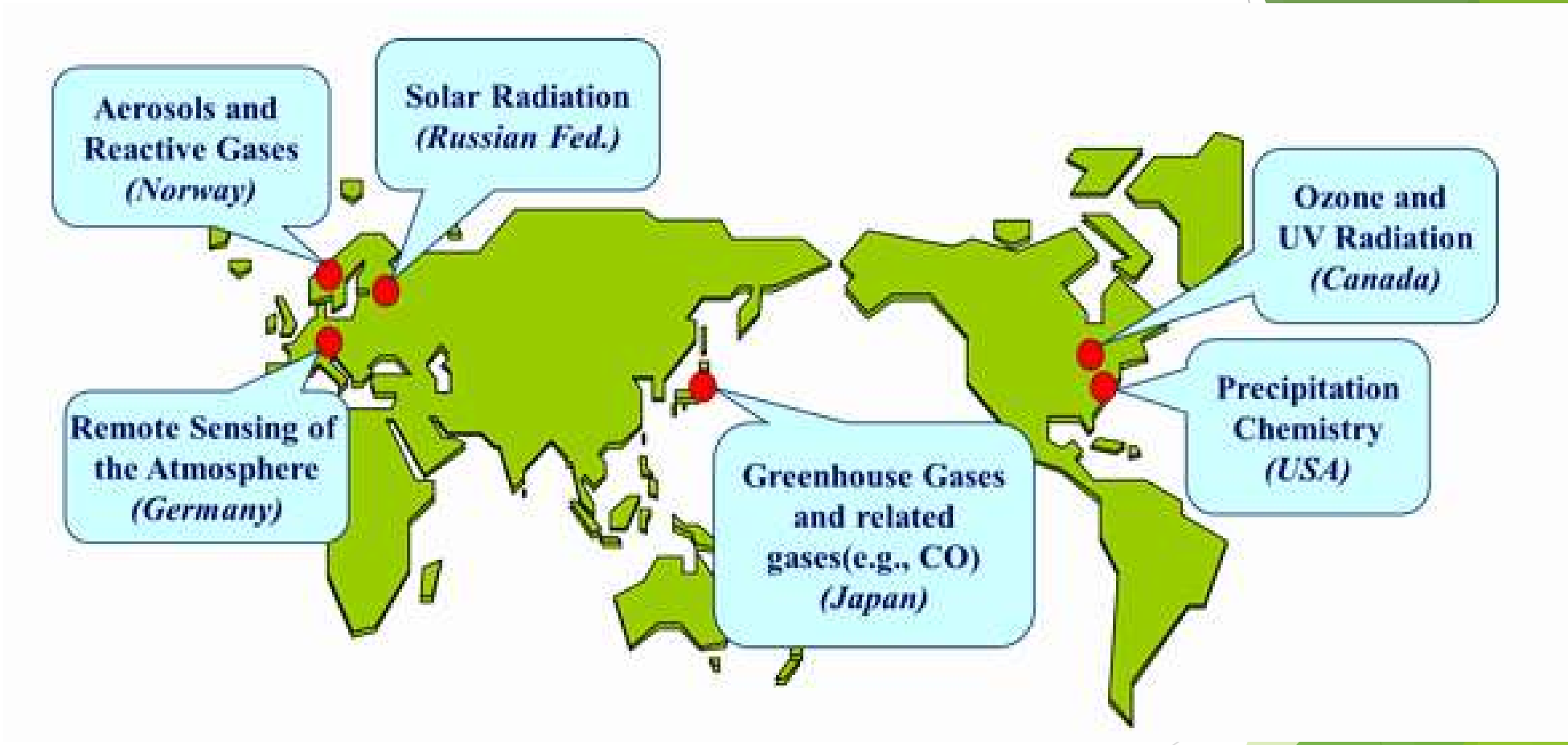
IDAF (IGAC/DEBITS Africa)

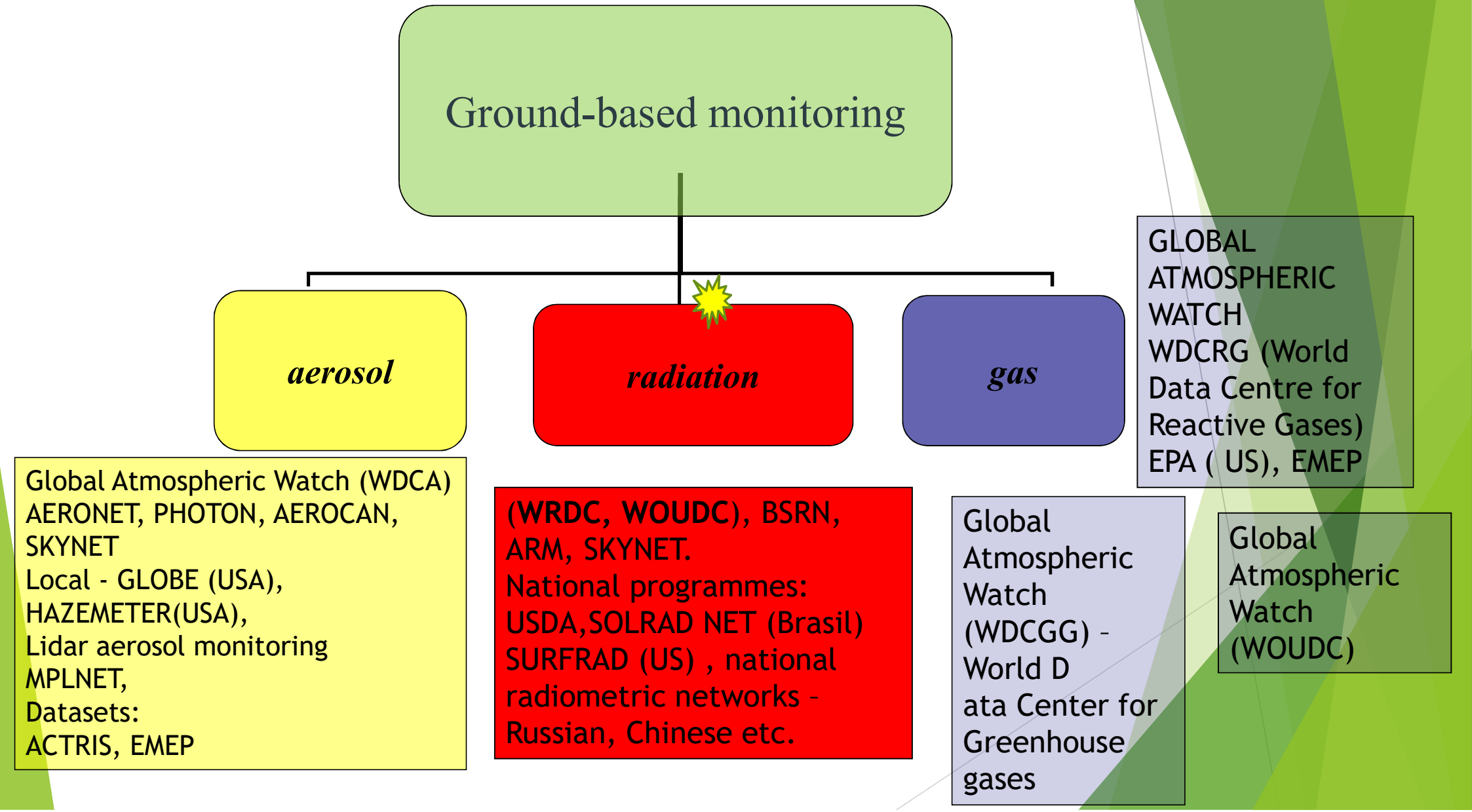
IMPROVE (IMPROVE Optical Aerosol)

NADP (National Atmospheric Deposition Program)

NDACC (NDACC Data Center)

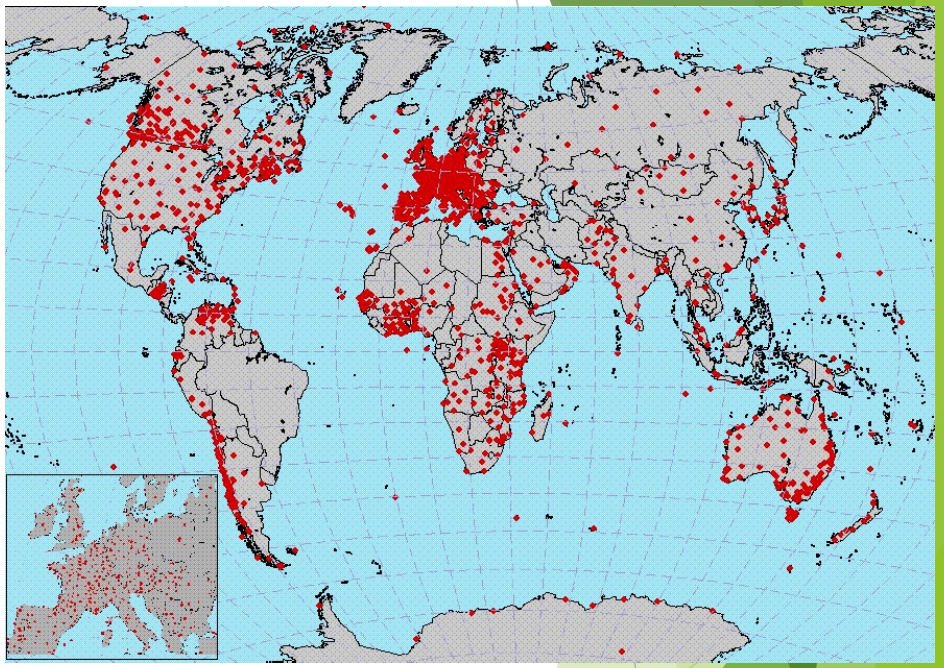
TCCON (Total Carbon Column Observing Network)


Aerosols and Reactive Gases (Norway)
Solar Radiation (Russian Fed.)
Ozone and UV Radiation (Canada)
Precipitation Chemistry (USA)
Remote Sensing of the Atmosphere (Germany)
Greenhouse Gases and related gases(e.g., CO) (Japan)


Ground-based monitoring
aerosol
radiation
gas
Global Atmospheric Watch (WDCA)
AERONET, PHOTON, AEROCAN, SKYNET
Local - GLOBE (USA), HAZEMETER(USA),
Lidar aerosol monitoring MPLNET,
Datasets:
ACTRIS, EMEP
(WRDC, WOUDC), BSRN, ARM, SKYNET.
National programmes:
USDA,SOLRAD NET (Brasil)
SURFRAD (US) , national radiometric networks – Russian, Chinese etc.
Global Atmospheric Watch (WDCGG) – World D ata Center for Greenhouse gases
GLOBAL ATMOSPHERIC WATCH
WDCRG (World Data Centre for Reactive Gases)
EPA (US), EMEP
Global Atmospheric Watch (WOUDC)

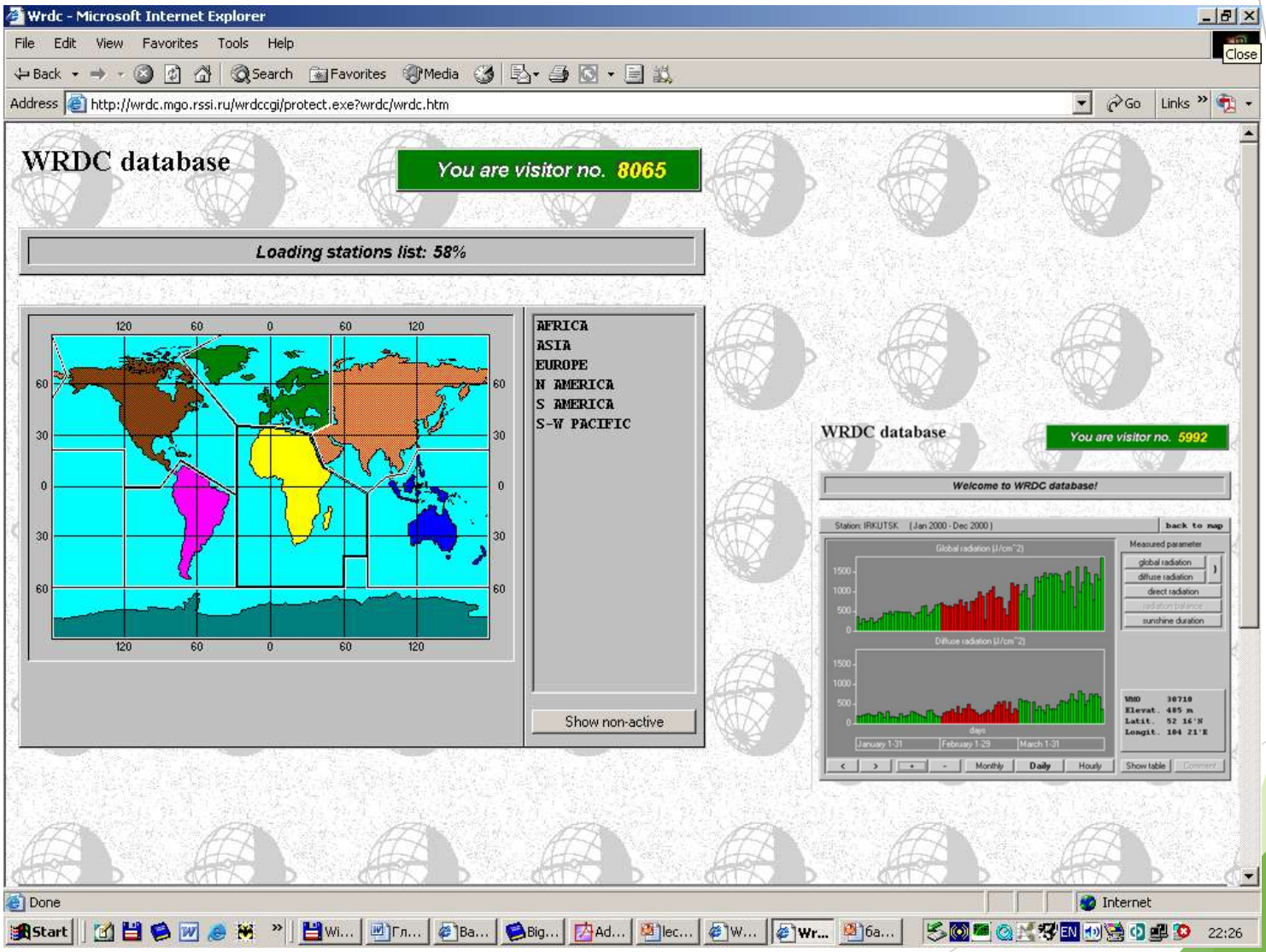
WRDC- World Radiation Data Centre

The World Radiation Data Centre (WRDC) is located in St. Petersburg at the Main Geophysical Observatory of the Russian Federal Service for Hydrometeorology and Environmental Monitoring. The WRDC was established in 1964, and since that time it centrally collects, archives and publishes radiometric data for the world, to ensure the availability of these data for research purposes by the international scientific community.



The WRDC processes solar radiation data currently submitted from more than 500 stations located in 56 countries and operates an archive with more than 1200 stations listed in its catalogue.

The WRDC is the central depository of the measured components such as: global, diffuse and direct solar radiation, downward atmospheric radiation, net total and terrestrial surface radiation (upward), spectral radiation components (instantaneous fluxes), and sunshine duration, on hourly, daily or monthly basis.


Wrdc - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Close
Back Search Favorites Media
Address http://wrdc.mgo.rssi.ru/wrdccgi/protect.exe?wrdc/wrdc.htm
Go Links
WRDC database
You are visitor no. 8065
Loading stations list: 58%
AFRICA
ASIA
EUROPE
N AMERICA
S AMERICA
S-W PACIFIC
Show non-active
WRDC database
You are visitor no. 5992
Welcome to WRDC database!
Done
Internet
Start
22:26

Instrumentation for measuring atmospheric radiation

:

- Kipp@Zonen
- Eppley Lab
- Yes. Inc
- Li-COR Biosciences
- Biospherical Instruments Inc.
- Пеленг - Peleng(Беларусь- Belorussia)

WRMC-BSRN

World Radiation Monitoring Center - Baseline Surface Radiation Network

WRMC-BSRN

Contact persons
Related Pages

In Memoriam: Chuck Long

Welcome to the World Radiation Monitoring Center (WRMC), the central archive of the Baseline Surface Radiation Network (BSRN). All radiation measurements are stored together with collocated surface and upper-air meteorological observations and station metadata in an integrated database. These pages offer both: Information for all scientists who will use BSRN-data as well as information to any station scientist who delivers data.

BSRN is a project of the Data and Assessments Panel from the Global Energy and Water Cycle Experiment (GEWEX) under the umbrella of the World Climate Research Programme (WCRP) and as such is aimed at detecting important changes in the Earth's radiation field at the Earth's surface which may be related to climate changes.

The data are of primary importance in supporting the validation and confirmation of satellite and computer model estimates of these quantities. At a small number of stations (currently 74 in total, 58 active) in contrasting climatic zones, covering a latitude range from 80°N to 90°S (see station maps), solar and atmospheric radiation is measured with instruments of the highest available accuracy and with high time resolution (1 to 3 minutes).

In 2004 the BSRN was designated as the global baseline network for surface radiation for the Global Climate Observing System (GCOS). The BSRN stations also contribute to the Global Atmospheric Watch (GAW). Since 2011 the BSRN and the Network for the Detection of Atmospheric Composition Change (NDACC) have reached a formal agreement to become cooperative networks.

BSRN – Baseline surface radiation network

Atmospheric Radiation Measurement (ARM)

CAPABILITIES

ATMOSPHERIC OBSERVATORIES

Three heavily instrumented fixed-location atmospheric observatories that represent a broad range of conditions are operated by the Atmospheric Radiation Measurement (ARM) user facility to gather massive amounts of atmospheric data. These are:

- Southern Great Plains (SGP) – centered near Lamont, Oklahoma, United States
- North Slope of Alaska (NSA) – located at Utqiaġvik (formerly Barrow), Alaska, United States
- Eastern North Atlantic (ENA) – located on Graciosa Island, Azores, Portugal.

TAKE THE VIRTUAL TOURS

MOBILE AND AERIAL OBSERVATORIES

In addition to the fixed-location observatories, ARM also offers both mobile and aerial facilities:

- ARM Mobile Facility (AMF): Three AMF are used by scientists to obtain atmospheric measurements, similar to those at the fixed-location observatories, for periods of about a year at a time anywhere in the world. The third mobile facility will soon move to the Southeastern United States.
- ARM Aerial Facility (AAF): The AAF obtains aerial measurements in the skies above the fixed-location and AMF observatories. The U.S. Department of Energy (DOE) funded the purchase of a Bombardier Challenger 850 regional jet to expand ARM's scientific data capabilities. The Challenger 850 is expected to be ready for its first ARM campaign in 2023. ARM is also developing uncrewed

INSTRUMENTS

A comprehensive suite of cutting-edge instrumentation deployed at ARM atmospheric observatories is designed specifically to measu clouds, aerosols, radiation, and the interactions among them.

In addition to ARM's extensive collection of instruments, some information is provided about guest and external instruments owned a operated by other programs. All instruments are categorized by:

- Aerosols
- Airborne Observations
- Atmospheric Carbon
- Atmospheric Profiling
- Cloud Properties
- Derived Quantities and Models
- Radiometric
- Satellite Observations
- Surface Meteorology
- Surface/Subsurface Properties

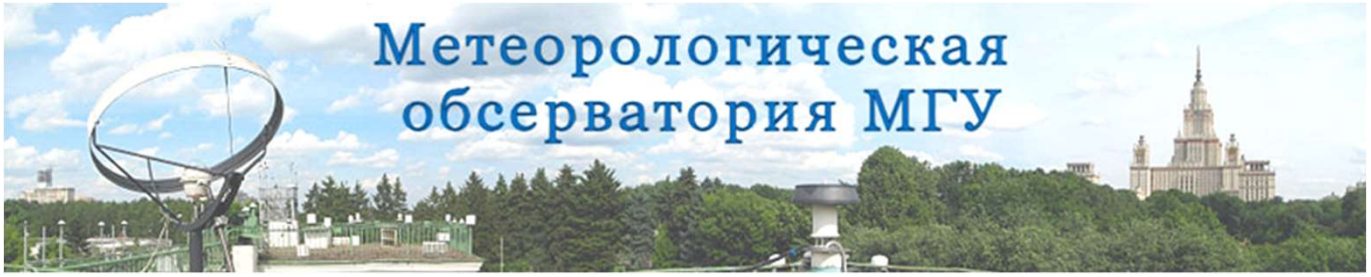
DISCOVER INSTRUMENTS

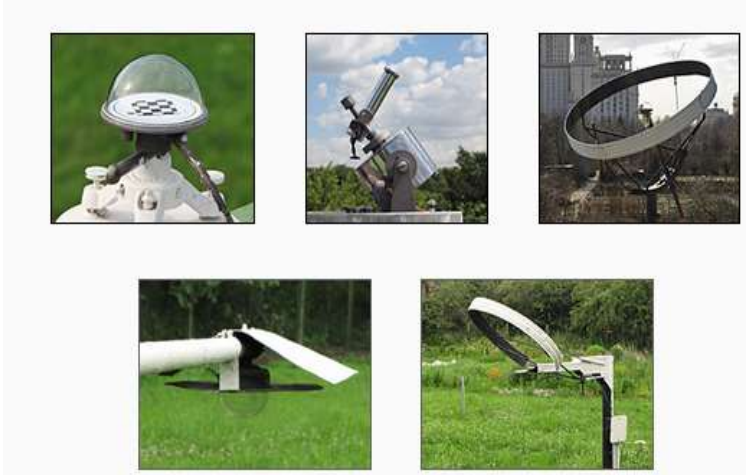
The Global Monitoring Laboratory (GML) of the National Oceanic and Atmospheric Administration conducts research that addresses three major challenges: greenhouse gas and carbon cycle feedbacks, changes in clouds, aerosols, and surface radiation, and recovery of stratospheric ozone.

Russian national radiation network

Meteorological Observatory of Moscow State University - MSU MO

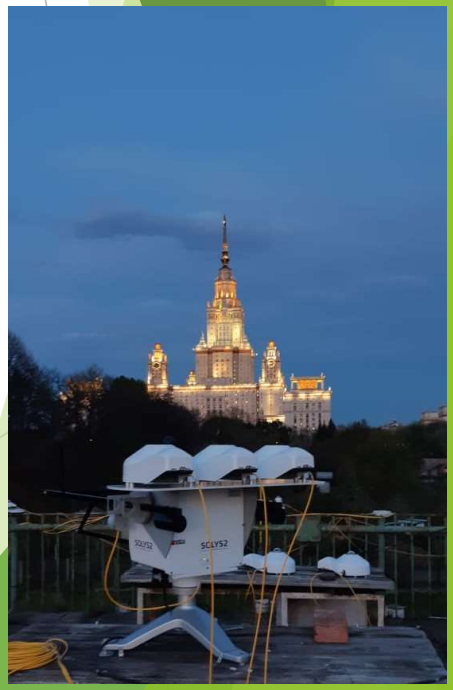
http://www.momsu.ru/



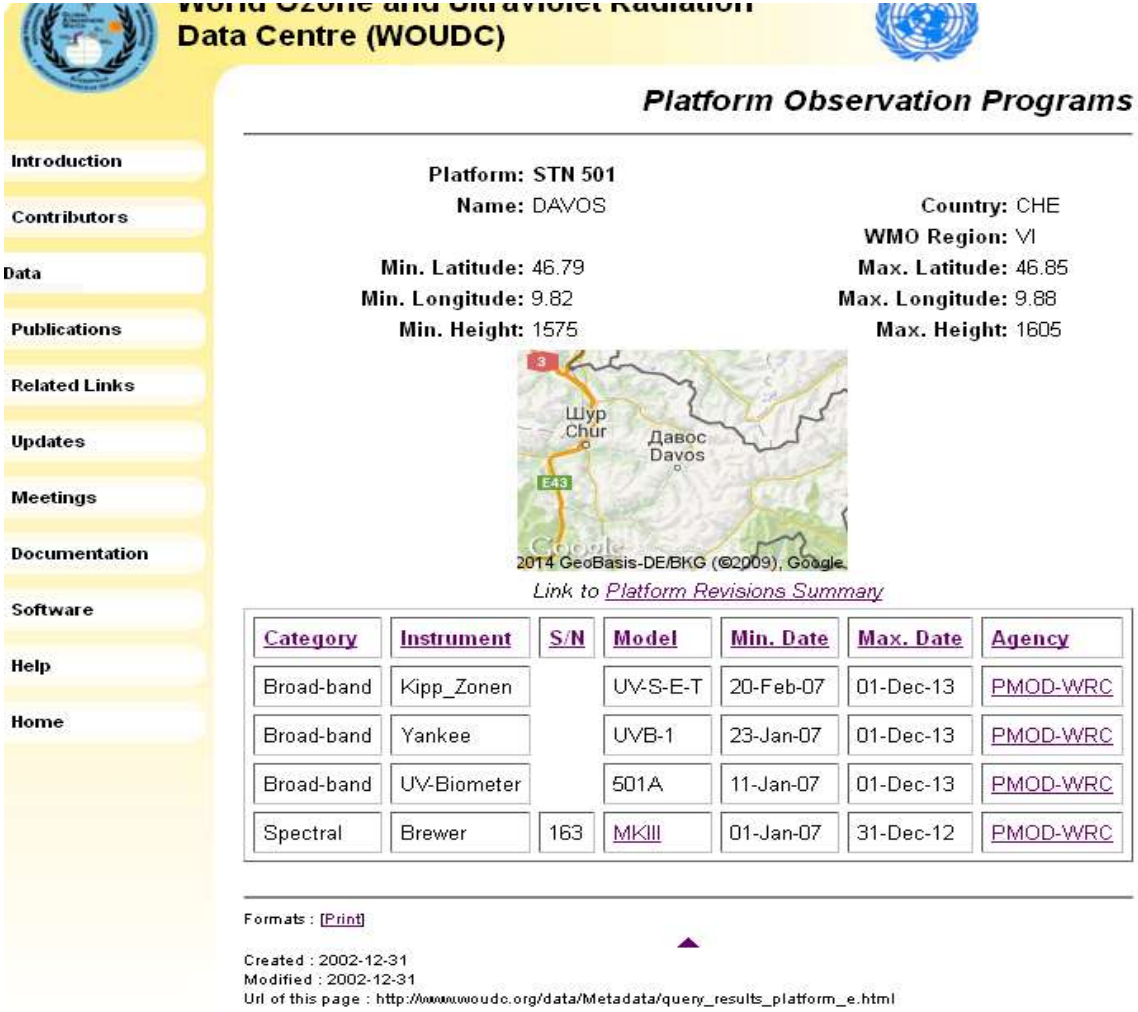


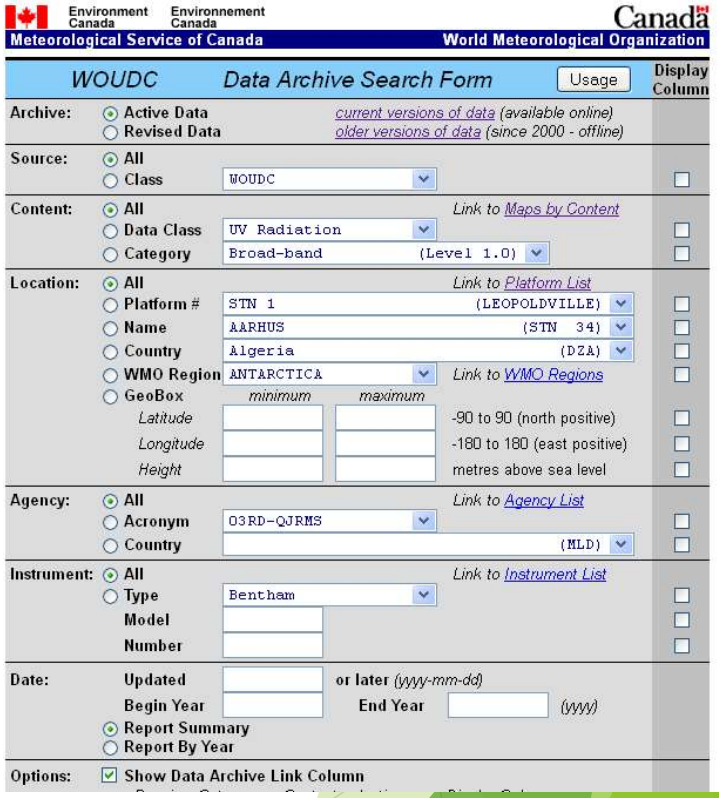
Kipp&Zonen CNR-4, (downward shortwave and longwave radiation, upward shortwave and longwave radiation)

A new radiative BSRN complex at MSU MO

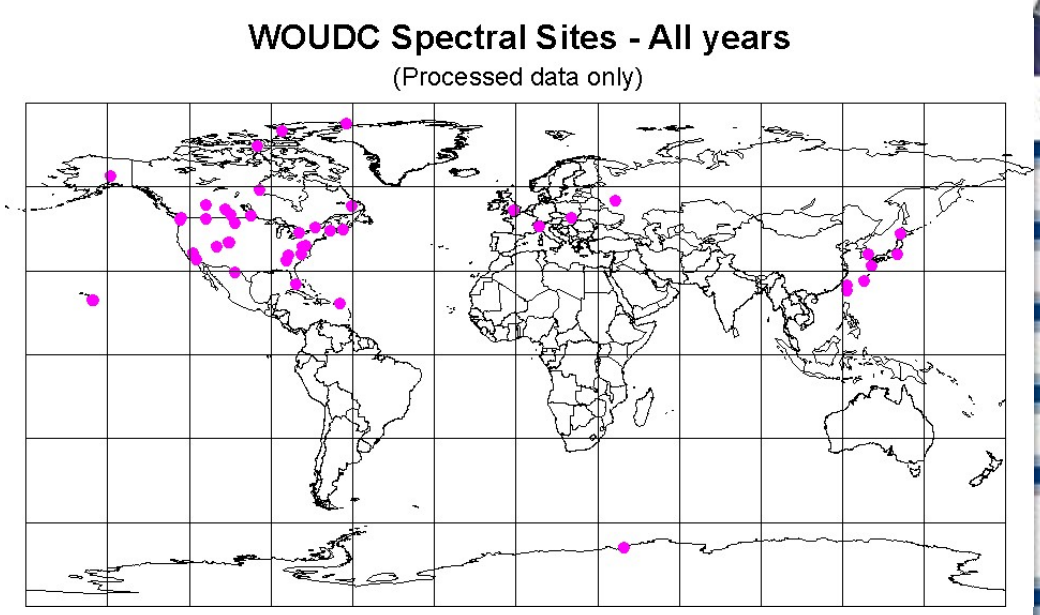


WOUDC - World Ozone and Ultraviolet Data Centre





WOUDC



Environment Canada | Environnement Canada | Canada

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World Ozone and Ultraviolet Radiation Data Centre

(UDC) MSC - EC - GC

- Home
- Introduction
- Contributors
- Data
- Publications
- Related Links
- Help

Home

Link to the international web site and data archive for the WOUDC hosted at www.woudc.org.

The World Ozone and Ultraviolet Radiation Data Centre (WOUDC) is one of the World Data Centres which are part of the Global Atmosphere Watch (GAW) programme of the World Meteorological Organization (WMO). The WOUDC is operated by the Experimental Studies Section of Environment Canada and is located in Toronto.

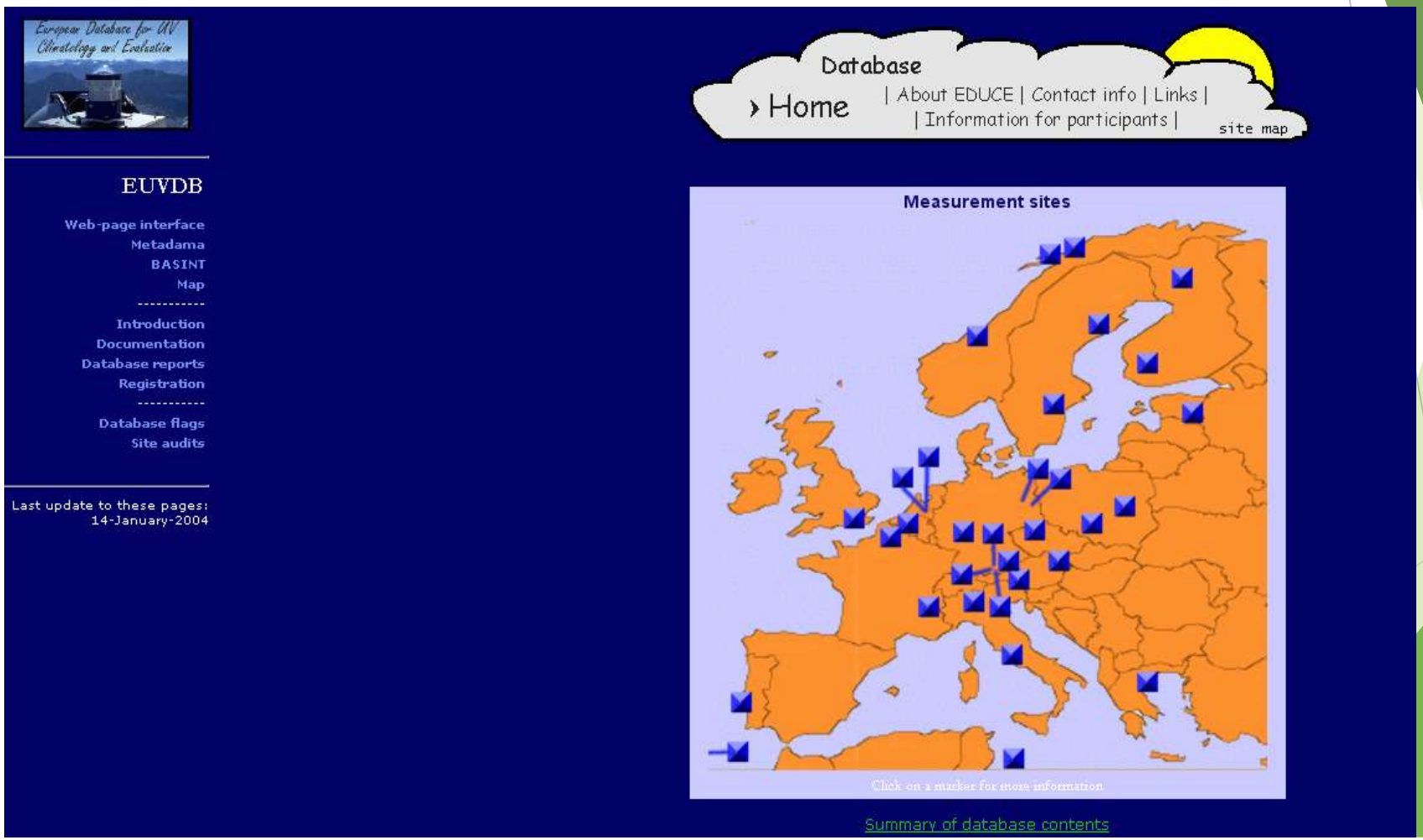
The WOUDC began as the World Ozone Data Centre (WODC) in 1961 and produced its first data publication of *Ozone Data for the World* in 1964. In June 1992, Canada agreed to a request from the WMO to add ultraviolet radiation data to the WODC. The Data Centre has since been renamed to the World Ozone and Ultraviolet Radiation Data Centre (WOUDC) with the two component parts: the WODC and the World Ultraviolet Radiation Data Centre (WUDC).

Several others UV data sites:

- **NSF Polar UV Monitoring Network (http://www.biospherical.com/nsf/),**
- **USDA UV-B Monitoring and Research Program** http://nadp.nrel.colostate.edu/UVB/.
- European UV spectral measurements EUVDB;

http://uv.fmi.fi/uvdb/

European network for UV radiation measurements



National Science Foundation Polar Programs UV Monitoring Network

Maintained by Biospherical Instruments Inc.

Home

Sites

Instruments

Data/Report

Publications

Presentations

Links

Contact Us

User Login

Student's Guide

BSI Home

November 9, 2014

The network has recently been reorganized. Please read this document to learn about these important changes.

Welcome to the NSF Polar UV Monitoring Network Web Site

The National Science Foundation (NSF) Ultraviolet (UV) Monitoring Network was established in 1987 by the NSF Division of Polar Programs in response to serious ozone depletion reported in Antarctica. Biospherical Instruments installed the first instruments in 1988. Observations were extended to the Arctic and are now part of NSF's Arctic Observing Network. The project is providing data to researchers studying the effects of ozone depletion on terrestrial and marine biological systems. Data are also used for the validation of satellite observations and for the verification of models describing the transfer of radiation through the atmosphere.

Material provided on this website is based upon work supported by the National Science Foundation under Grants OPP-89-22832, OPP-0000373, ARC-0907819, ARC-0856268, and ARC-1203250. Any opinions, findings, conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.

Shortcuts

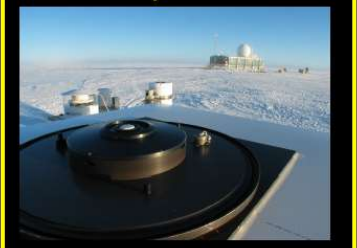
- **Access our latest data**
  View and download our latest data.

Location	Latitude	Longitude	Site Established
McMurdo, Antarctica	77°50' S	166°40' E	March 1988
Palmer, Antarctica	64°46' S	64°03' W	May 1988
South Pole, Antarctica	90°S	—	February 1988
Ushuaia, Argentina	54°49' S	68°19' W	November 1988
San Diego, California	32°46' N	117°12' W	November 1992
Barrow, Alaska	71°19' N	156°41' W	December 1990
Summit, Greenland	72°35' N	38°27' W	August 2004

SUV-100 spectroradiometers

- Spectral Irradiance between 280 and 600 nm
- 1 nm resolution

SUV-150B spectroradiometer

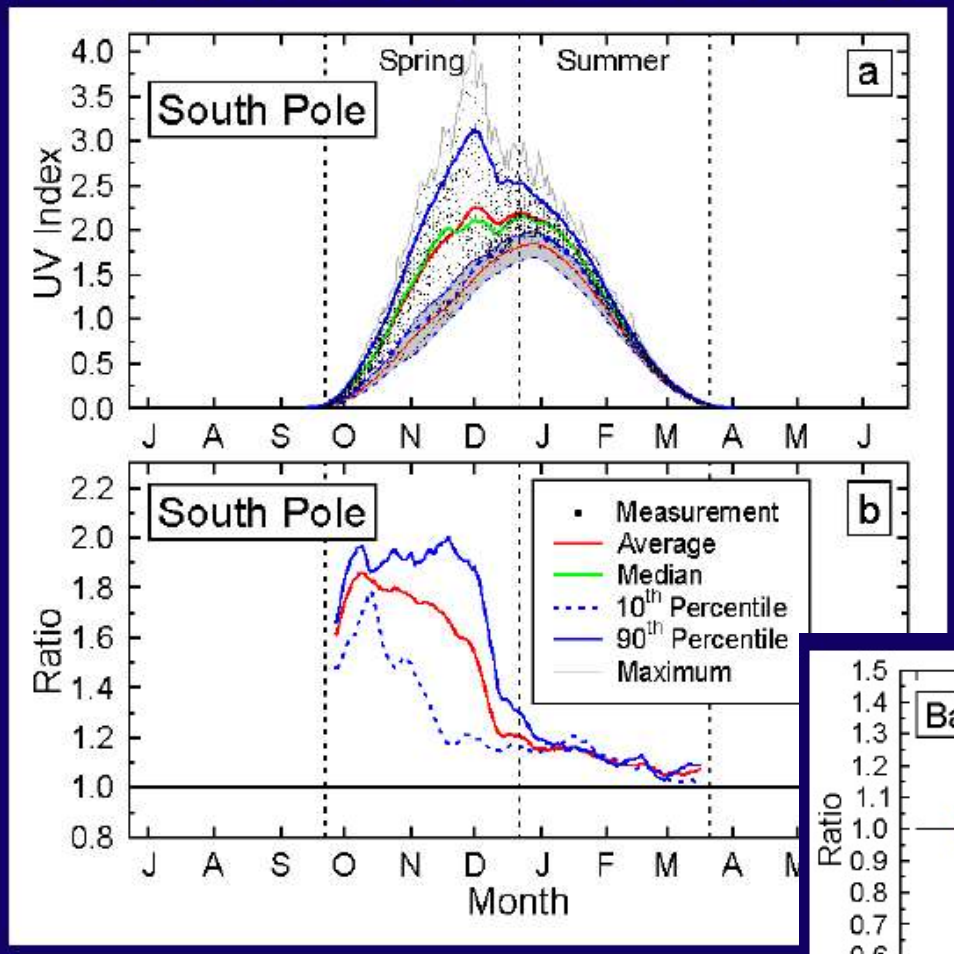


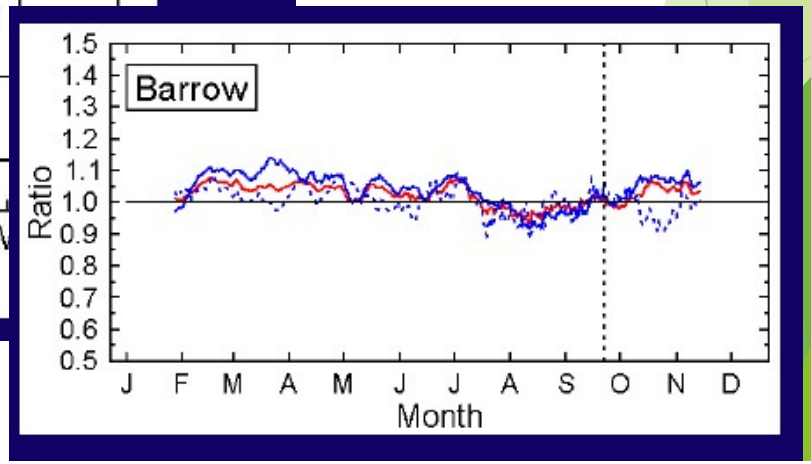
- Spectral Irradiance between 280 and 600 nm
- 0.63 nm resolution

Data Products:

- Spectra of global irradiance, sampled quarter-hourly
- Integrated irradiance (e.g. UV-B, UV-A, and visible irradiance)
- Biologically effective irradiance (e.g., the UV Index)
- Additional: total ozone, effective albedo, modeled spectra

UV Index at South Pole: Then and Now





UV measurements at the MSU MO

Measurements of erythemal UV irradiance since 1999

The longest in the world measurements of UV 300-380nm since 1968!!

Regular calibration of the UV instruments against world standards

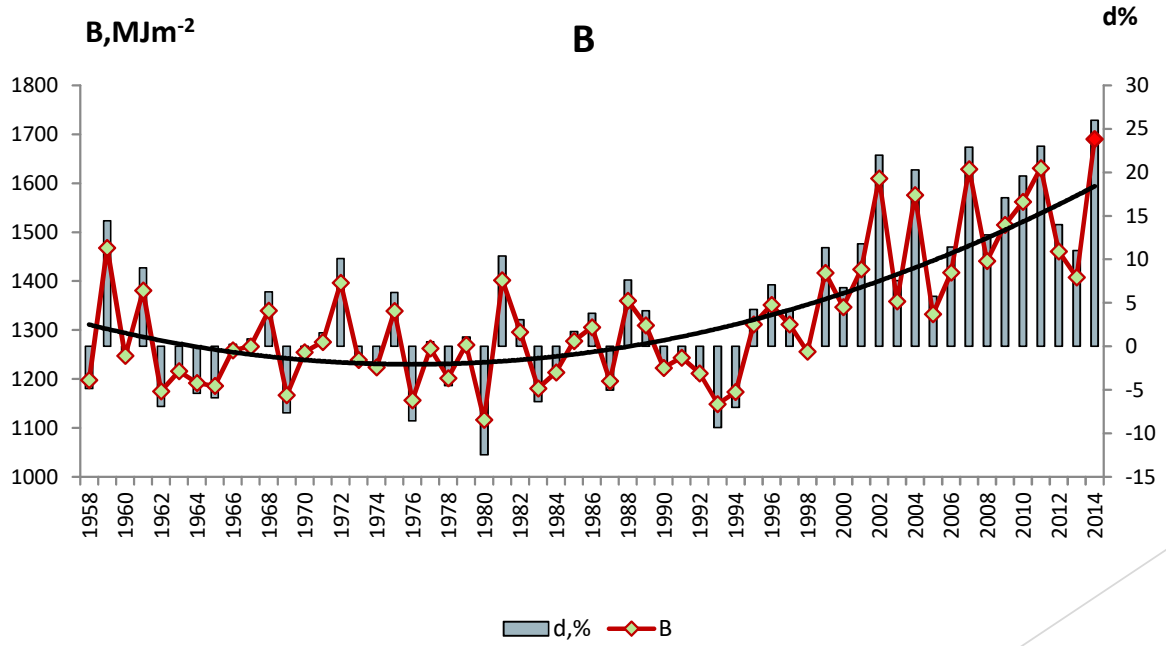
Applicability

- Most accurate data quality – used for the analysis, especially long –term monitoring analysis.
- Testing satellite retrievals :
  - Radiation
  - Gas
  - Aerosol
  - Surface characteristics - albedo
  - UV Radiation

- The use as input parameters/assimilation in modelling;
- Testing different kinds of models

Applicability

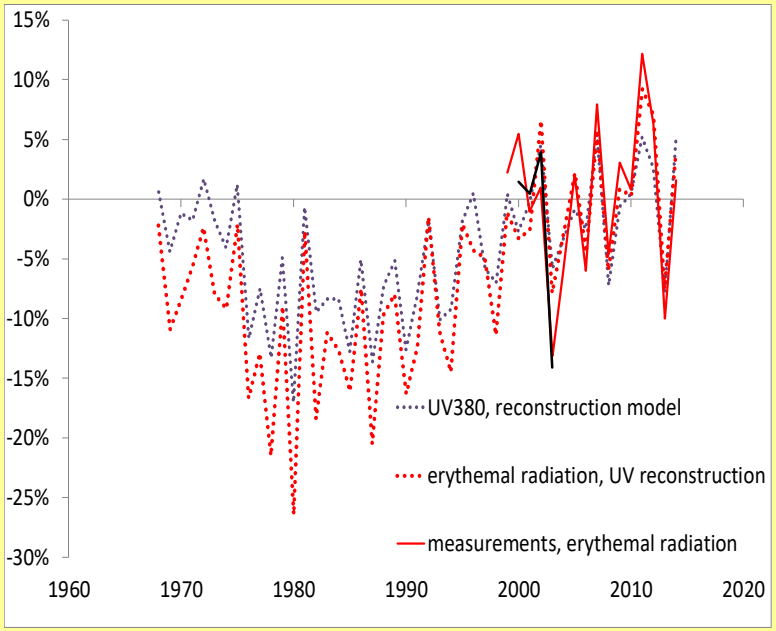
Interannual changes in total (shortwave +longwave) net radiation. Moscow.

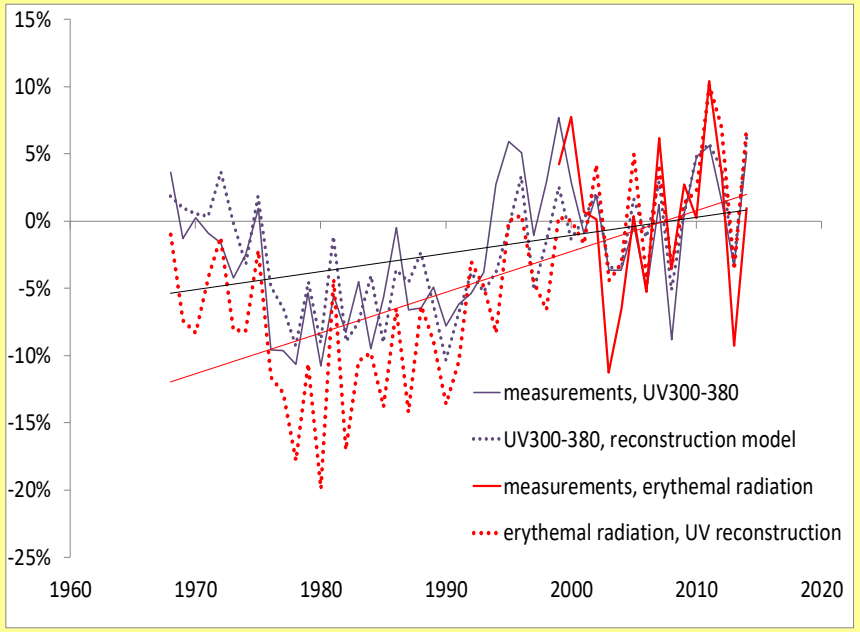


Gorbarenko , 2019

Applicability

Validation of UV reconstructed values against long-term measurements at the MSU MO





Chubarova et al., 2018

Applicability:

Evaluation of the quality of solar irradiance reconstruction model using long-term solar irradiance and UV irradiance data at MSU MO.

Solar irradiance

$R^2 = 0.80$

Erythemal UV irradiance

$R^2 = 0.89$

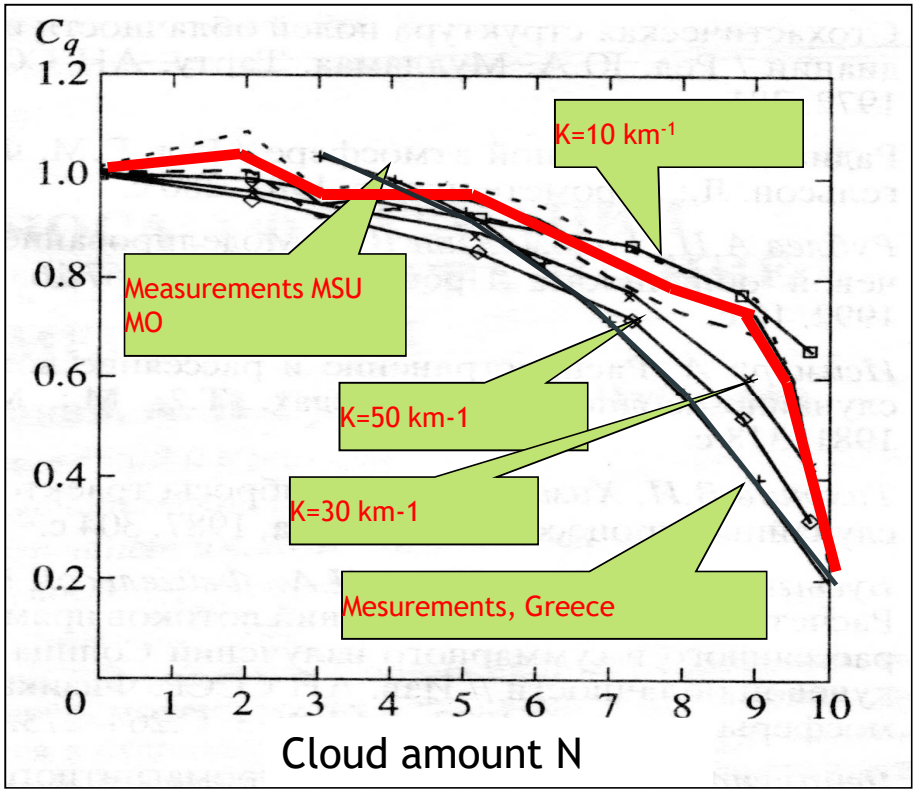
Factor	SOLAR		UV	
	Decadal trend		Decadal trend	
	1979-2016		1979-2016	
Due to AOT	*+ 0.4% ± 0.1%*		*+ 0.7% ± 0.3%*	
	1979-2016		1979-2016	
Due to cloud optical thickness	*- 0.3% ± 0.2%*		*- 0.2% ± 0.1%*	
			1979-2016	
Due to ozone			*+ 2.1% ± 0.8%*	
Due to cloud transmission	1968-1978	1979-2016	1968-1978	1979-2016
	- 10.8% ± 0.8%	*+ 2.4% ± 0.9%*	*- 9.8% ± 0.7%*	*+ 2.1% ± 0.8%*
All factors	1968-1978	1979-2016	1968-1978	1979-2016
	- 10.6% ± 0.8%	*+ 2.5% ± 0.9%*	*- 11.6% ± 1.6%*	*+ 5.1% ± 1.9%*

Volpert, Chubarova 2021

Applicability

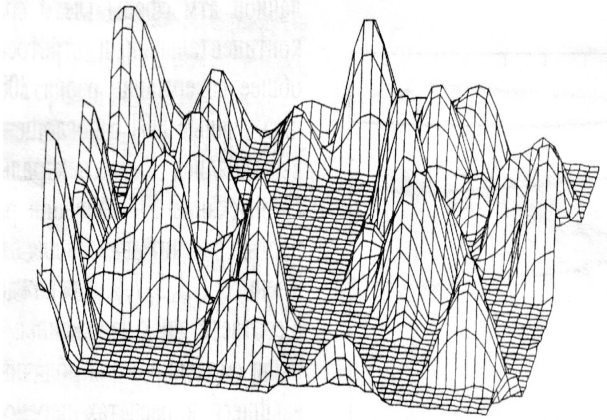
Validation of 3-D Monte-Carlo model using long-term cloud amount transmittance for UV radiation

C_Q



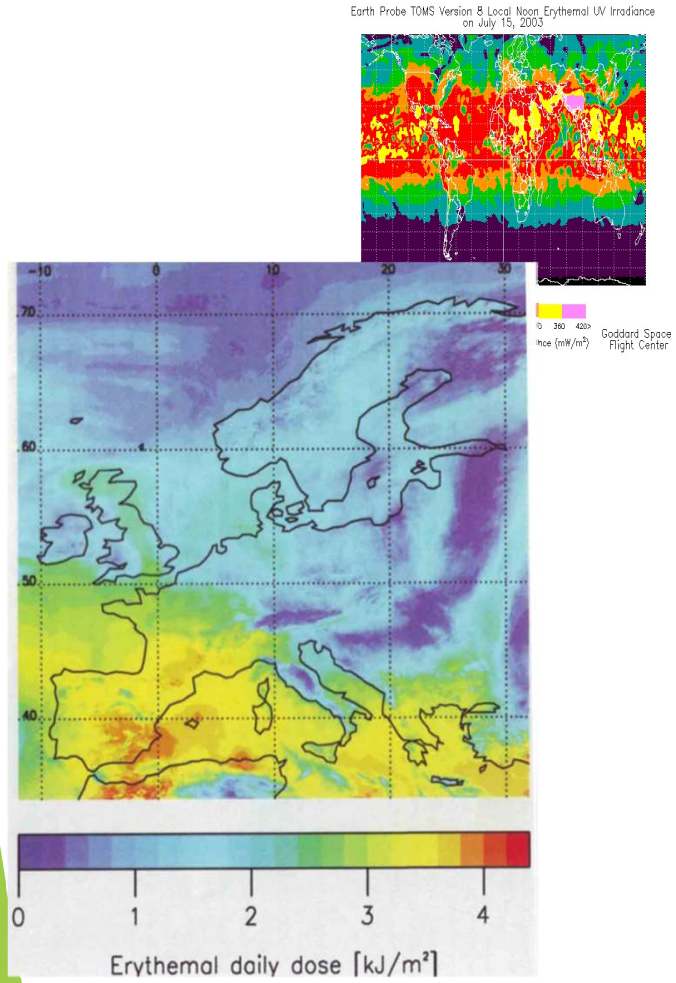
Chubarova et al., 1998

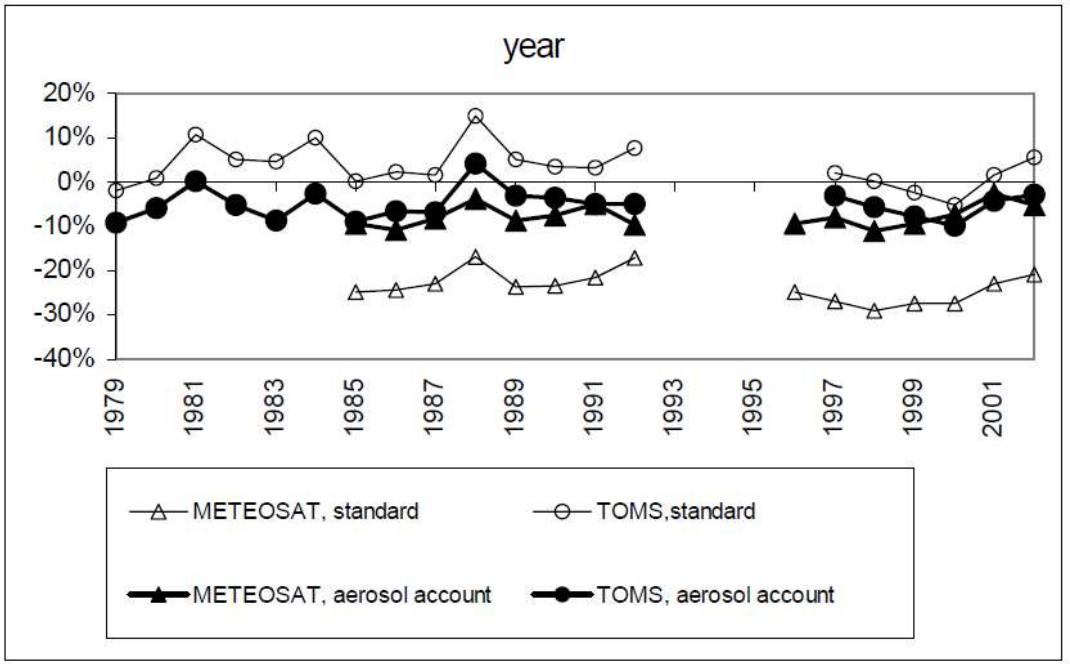
An example of cloud modelling at Na=5



Rublev, 1998

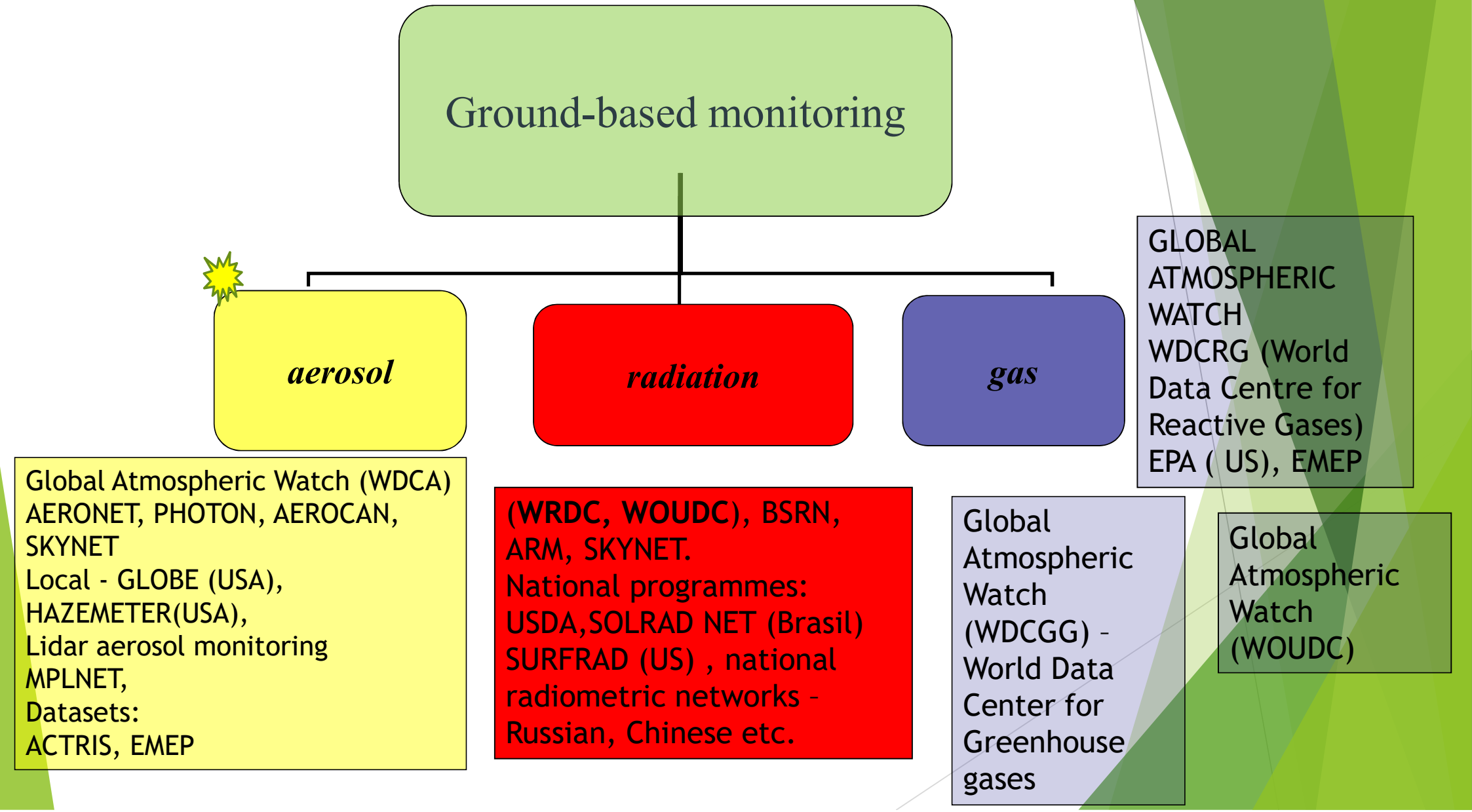
Satellite retrievals validation (TOMS, METEOSAT) using ground-based UV radiation datasets at MSU MO





Difference between ground-based and TOMS data in clear sky conditions:

Chubarova et al , 2005


Ground-based monitoring
aerosol
radiation
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National programmes:
USDA,SOLRAD NET (Brasil)
SURFRAD (US) , national radiometric networks – Russian, Chinese etc.
Global Atmospheric Watch (WDCGG) – World Data Center for Greenhouse gases
GLOBAL ATMOSPHERIC WATCH
WDCRG (World Data Centre for Reactive Gases)
EPA (US), EMEP
Global Atmospheric Watch (WOUDC)

WMO Global Atmosphere Watch

World Data Centre for Aerosols

News & Events

The World Data Centre for Aerosols (WDCA)
is the data repository and archive for microphysical, optical, and chemical properties of atmospheric aerosol of the World Meteorological Organisation's (WMO) Global Atmosphere Watch (GAW) programme.

"The goal of the Global Atmosphere Watch (GAW) programme is to ensure long-term measurements in order to detect trends in global distributions of chemical constituents in air and the reasons for them. With respect to aerosols, the objective of GAW is to determine the spatio-temporal distribution of aerosol properties related to climate forcing and air quality on multi-decadal time scales and on regional, hemispheric and global spatial scales."

AEROSOL PARAMETERS at WDCA

GAW aerosol long-term observation core parameters:

- Physical Properties:
  - particle number concentration (size integrated)
  - particle number size distribution
  - particle mass concentration (two size fractions)
  - cloud condensation nuclei number concentration (at various super-saturations)
- Optical Properties:
  - light scattering coefficient (various wavelengths)
  - light hemispheric backscattering coefficient (various wavelengths)
  - light absorption coefficient (various wavelengths)
- Chemical Properties:
  - mass concentration of major chemical components (two size fractions)
- Column and Profile:
  - aerosol optical depth (various wavelengths)
  - vertical profile of aerosol backscattering coefficient
  - vertical profile of aerosol extinction coefficient

Additional parameters recommended for long-term or intermittent observation:

- dependence of aerosol properties on relative humidity
- detailed, size segregated chemical composition.

The extent of the observation programme varies between observatories networked in GAW. The observations are reported by the GAW observatories on a voluntary basis, while the station infrastructure is a contribution of the participating national authorities to the GAW programme.

ACTRiS

About | Projects | **Data & Services** | Outreach | Events | Documentation | Contact | Countries

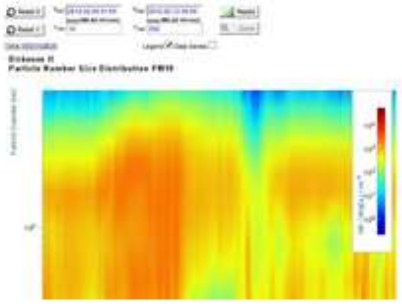
ACTRIS Data Centre

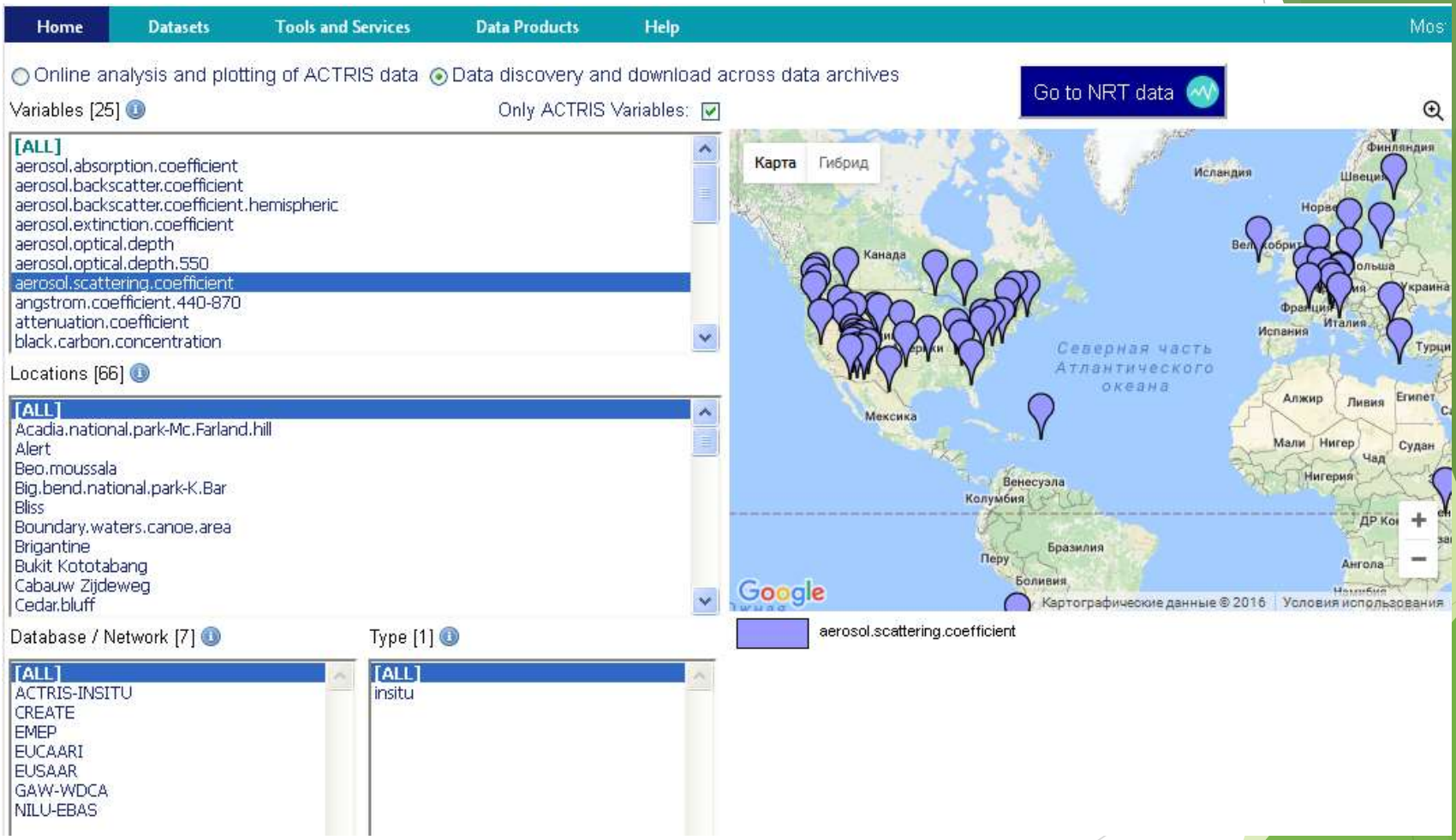
The ACTRIS Data Centre web portal allows you to search, analyse, and download atmospheric composition data from a multitude of data archives. The data results from the activities of the ACTRIS infrastructure network complemented with data from other relevant networks, and gives free access to atmospheric observational data to analyze atmospheric composition.

Almost 135 different atmospheric variables are included in ACTRIS and about 65 sites are active. The measurements are done with 25 different methodologies with time resolution ranging from seconds to 1 week. The ACTRIS data management plan describes the data sets ACTRIS generates, how the data is made available, and the data repositories. The document also includes a list with all ACTRIS atmospheric variables together with recommended methodology.

ACTRIS Data Policy: DataPolicy.pdf

Data Center Website: actris.nilu.no




Home
Datasets
Tools and Services
Data Products
Help
Online analysis and plotting of ACTRIS data
Data discovery and download across data archives
Go to NRT data
Variables [25]
Only ACTRIS Variables:
[ALL]
aerosol.absorption.coefficient
aerosol.backscatter.coefficient
aerosol.backscatter.coefficient.hemispheric
aerosol.extinction.coefficient
aerosol.optical.depth
aerosol.optical.depth.550
aerosol.scattering.coefficient
angstrom.coefficient.440-870
attenuation.coefficient
black.carbon.concentration
Locations [66]
[ALL]
Acadia.national.park-Mc.Farland.hill
Alert
Beo.moussala
Big.bend.national.park-K.Bar
Bliss
Boundary.waters.canoe.area
Brigantine
Bukit Kototabang
Cabauw Zijdeweg
Cedar.bluff
Database / Network [7]
[ALL]
ACTRIS-INSITU
CREATE
EMEP
EUCAARI
EUSAAR
GAW-WDCA
NILU-EBAS
Type [1]
[ALL]
insitu
Карта
Гибрид
Северная часть Атлантического океана
Канада
Мексика
Венесуэла
Колумбия
Бразилия
Перу
Боливия
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Финляндия
Швеция
Норвегия
Франция
Испания
Италия
Украина
Польша
Алжир
Ливия
Египет
Мали
Нигер
Судан
Чад
Нигерия
Ангола
Google
Картографические данные © 2016
Условия использования
aerosol.scattering.coefficient

ACTRiS Data Centre

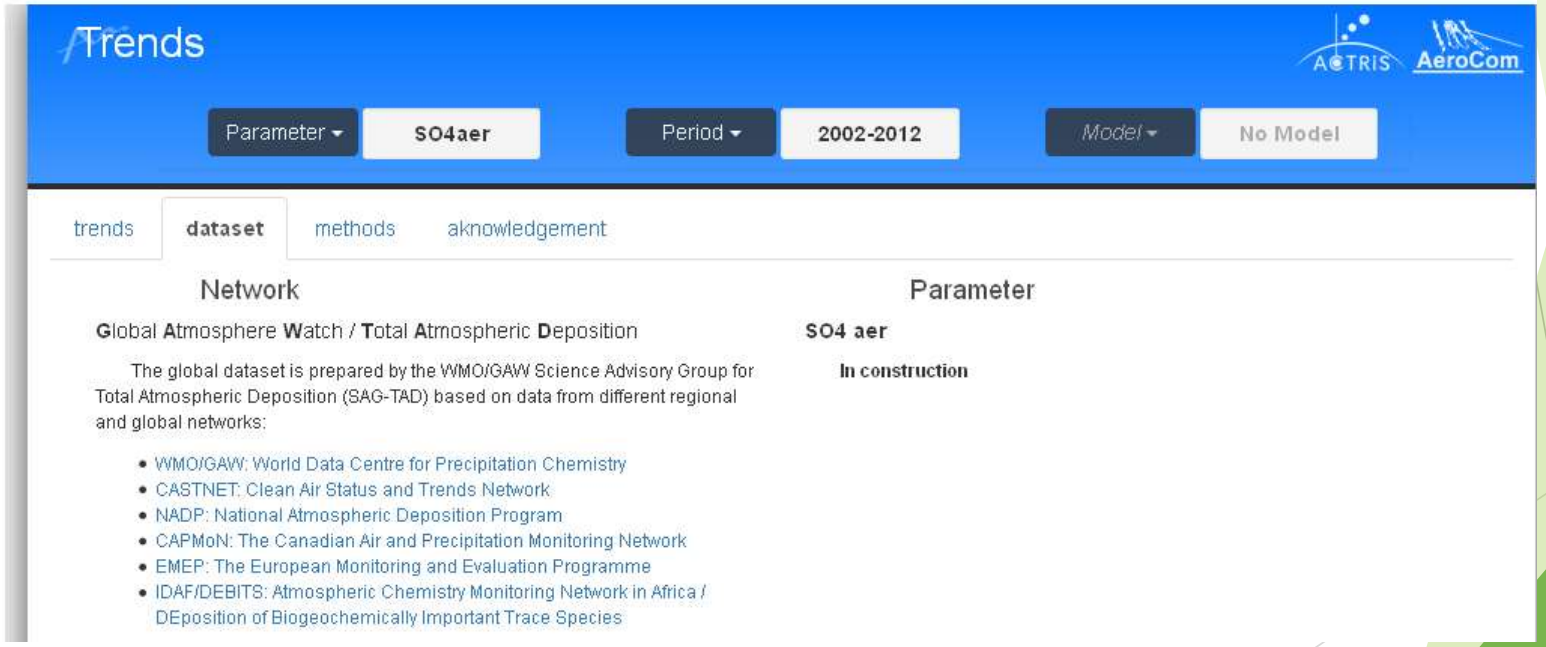
- an atmospheric data portal

User Manual | Abo

Home | Datasets | Tools and Services | Data Products | Help | TRIS-EARLINET (1 files)

Trend Analysis

An online interface with visualization of aerosol trends from observational networks and atmospheric models based on individual time series.



ACTRiS Data Centre

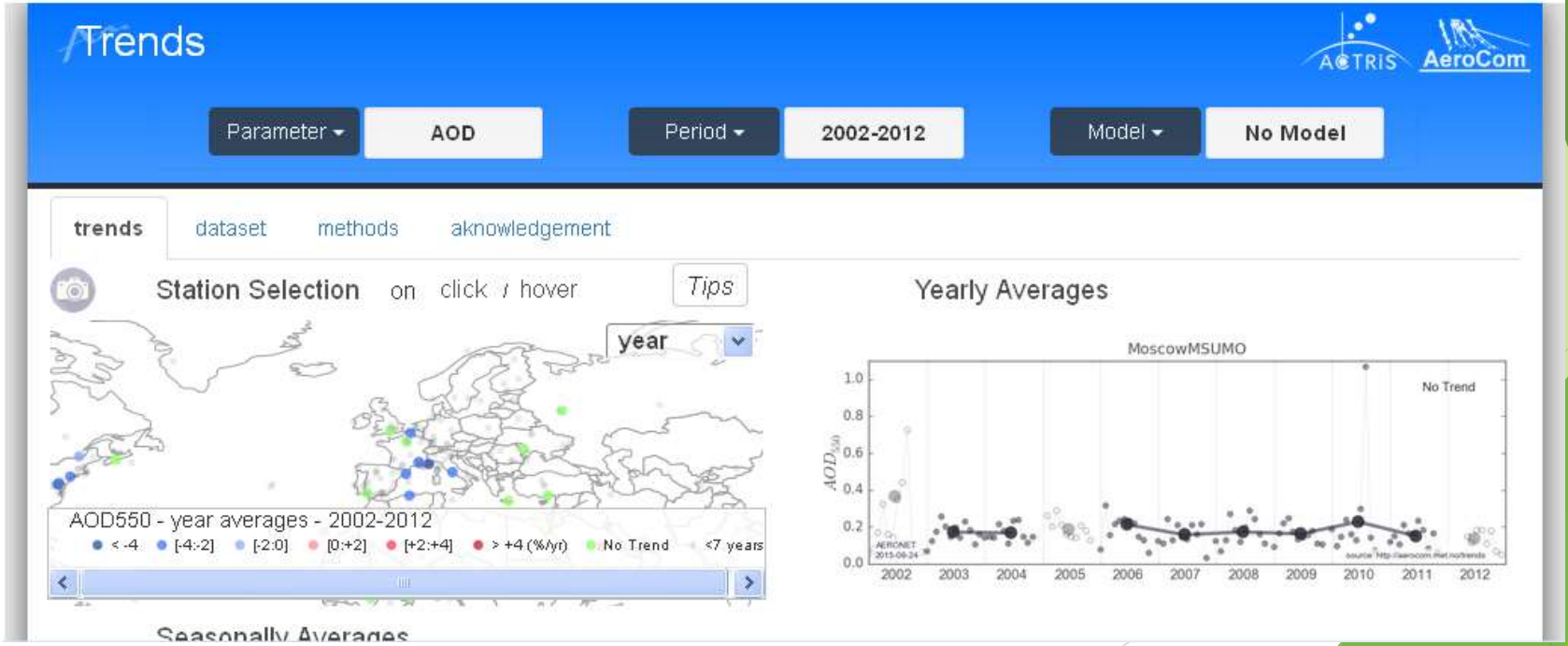
- an atmospheric data portal

User Manual | About

Home | Datasets | Tools and Services | Data Products | Help | Mos

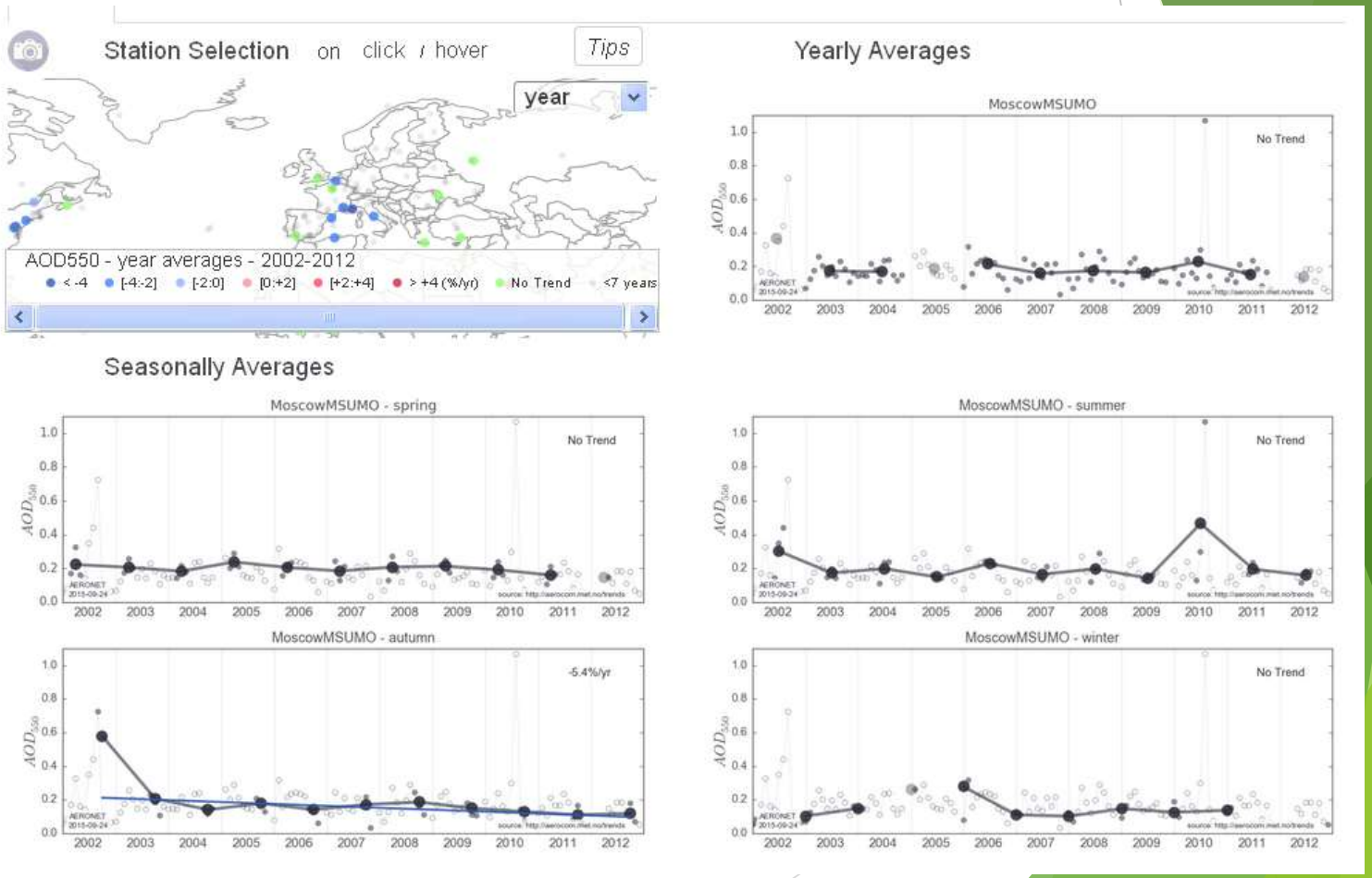
Trend Analysis

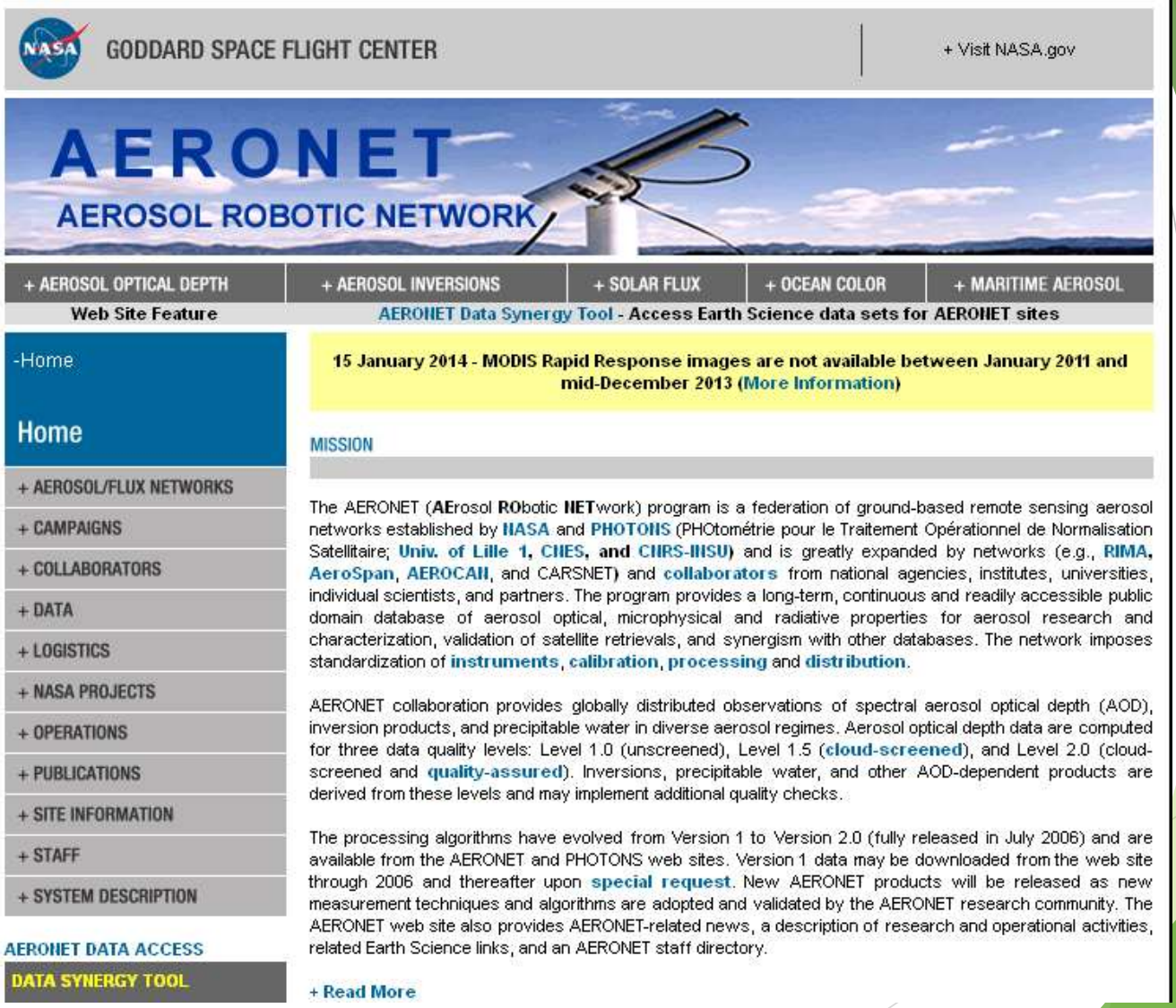
An online interface with visualization of aerosol trends from observational networks and atmospheric models based on individual time series.



Applicability

- Long-term analysis

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AERONET
AEROSOL ROBOTIC NETWORK
+ AEROSOL OPTICAL DEPTH
+ AEROSOL INVERSIONS
+ SOLAR FLUX
+ OCEAN COLOR
+ MARITIME AEROSOL
Web Site Feature
AERONET Data Synergy Tool - Access Earth Science data sets for AERONET sites
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Home
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+ DATA
+ LOGISTICS
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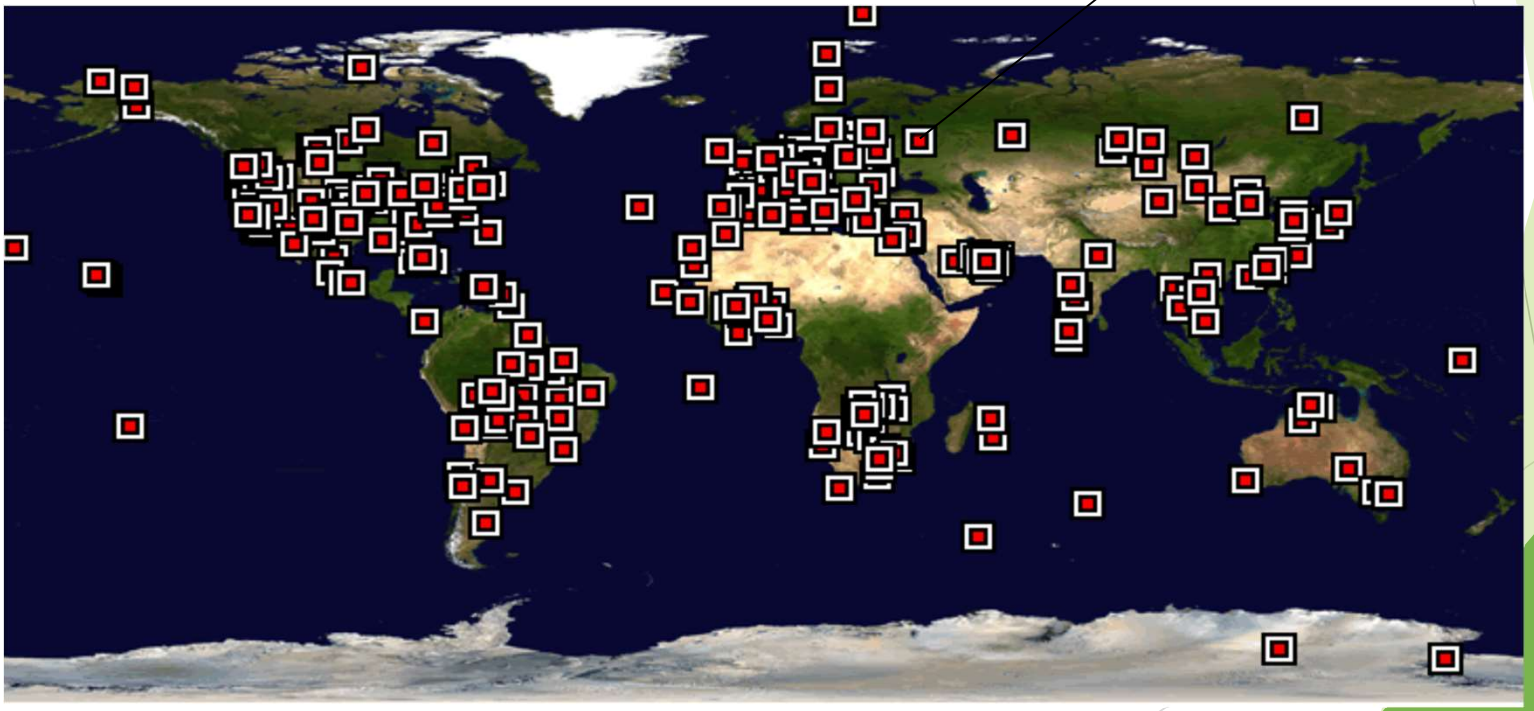
+ OPERATIONS
+ PUBLICATIONS
+ SITE INFORMATION
+ STAFF
+ SYSTEM DESCRIPTION
AERONET DATA ACCESS
DATA SYNERGY TOOL
15 January 2014 - MODIS Rapid Response images are not available between January 2011 and mid-December 2013 (More Information)
MISSION
The AERONET (AErosol RObotic NETwork) program is a federation of ground-based remote sensing aerosol networks established by NASA and PHOTONS (PHOtométrie pour le Traitement Opérationnel de Normalisation Satellitaire; Univ. of Lille 1, CNES, and CNRS-INSU) and is greatly expanded by networks (e.g., RIMA, AeroSpan, AEROCAN, and CARSNET) and collaborators from national agencies, institutes, universities, individual scientists, and partners. The program provides a long-term, continuous and readily accessible public domain database of aerosol optical, microphysical and radiative properties for aerosol research and characterization, validation of satellite retrievals, and synergism with other databases. The network imposes standardization of instruments, calibration, processing and distribution.
AERONET collaboration provides globally distributed observations of spectral aerosol optical depth (AOD), inversion products, and precipitable water in diverse aerosol regimes. Aerosol optical depth data are computed for three data quality levels: Level 1.0 (unscreened), Level 1.5 (cloud-screened), and Level 2.0 (cloud-screened and quality-assured). Inversions, precipitable water, and other AOD-dependent products are derived from these levels and may implement additional quality checks.
The processing algorithms have evolved from Version 1 to Version 2.0 (fully released in July 2006) and are available from the AERONET and PHOTONS web sites. Version 1 data may be downloaded from the web site through 2006 and thereafter upon special request. New AERONET products will be released as new measurement techniques and algorithms are adopted and validated by the AERONET research community. The AERONET web site also provides AERONET-related news, a description of research and operational activities, related Earth Science links, and an AERONET staff directory.
+ Read More

AERONET network

MSU MO since 2001



DATA SYNERGY TOOL
+ Data Display

AEROSOL OPTICAL DEPTH (V3)
+ Data Display
+ Download Tool
+ Web Service

AEROSOL OPTICAL DEPTH (V2)
+ Data Display
+ Download Tool
+ Download All Sites
+ Climatology Tables
+ Climatology Maps
+ Data Availability (L2.0)

AEROSOL INVERSIONS (V2)
+ Data Display
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+ Download All Sites

SOLAR FLUX
+ Data Display

OCEAN COLOR
+ Data Display

CLOUD MODE
+ Data Display

+ Read More

NEWS

14 July 2016
+Version 3 Announcement
+ V3 Kaufman Symposium Presentation

22 June 2016

- The AERONET V3 Level 1.0 and Level 1.5 near-real time (NRT) database is now available. The V3 announcement
  + Read More

10 May 2016

- The Distributed Regional Aerosol Gridded Observation Networks (DRAGON)-KORUS-AQ instrument deployment has been established in South Korea, Japan, and China from 1 April to 31 July 2016. The network will be strategically located to take advantage of KORUS-AQ in situ and airborne resources from mid-June 2016.
  + Read More

2 October 2015

- CE318-T Sun-Sky-Lunar spectral photometer is accepted for AERONET use. Extensive testing of the new model Cimel photometer has been completed and is now fully integrated into the AERONET network.

  The new model is essentially a new control box that has all the functionality of the current CE318 photometers. It is fully compatible with the existing robots and the latest Version 5 sensor heads (with an upgrade kit). We note the following characteristics:

  --Improved solar tracking accuracy and operational range

Applicability

Interannual variability of aerosol optical thickness according to long-term measurements at the MSU MO

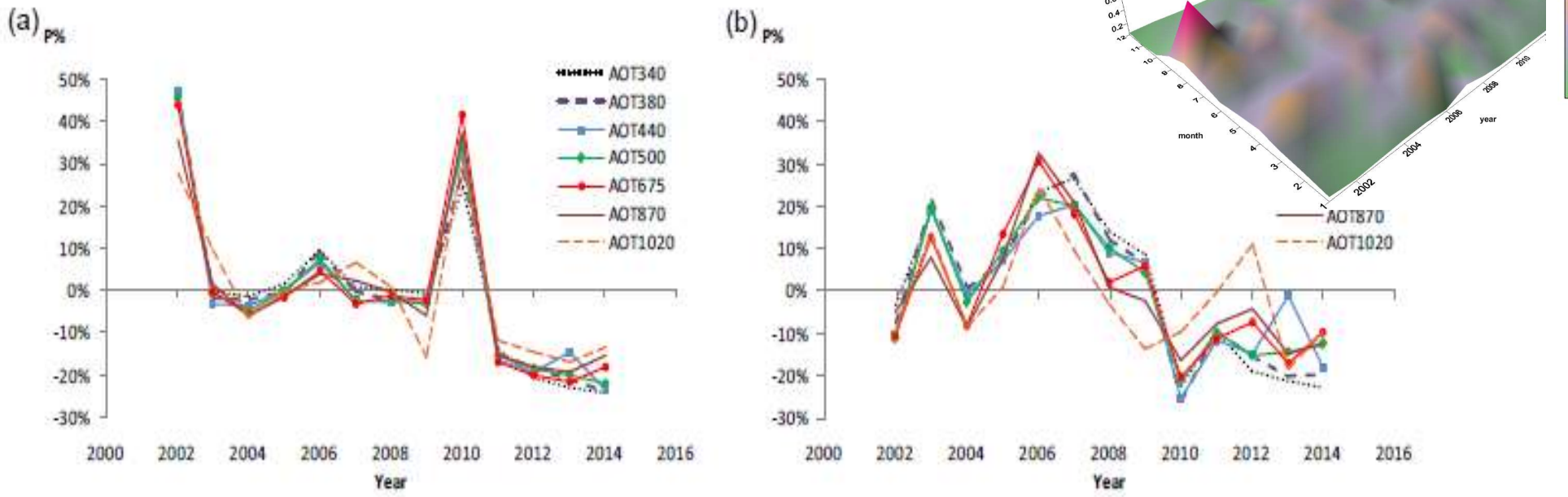
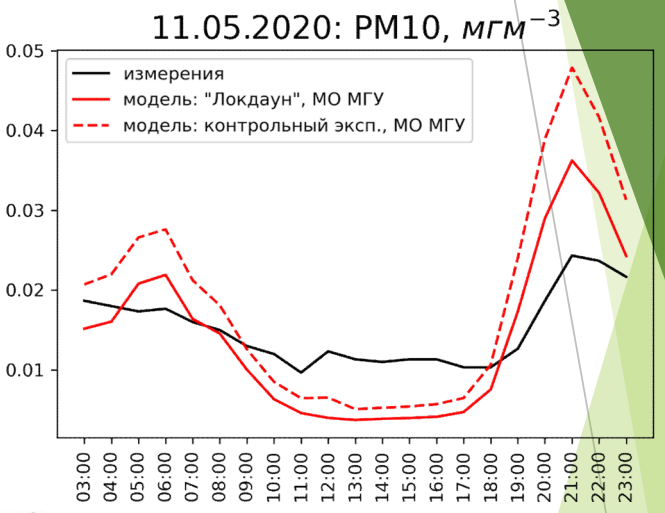
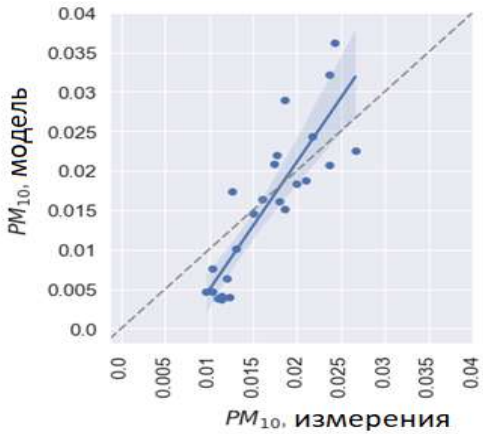


Figure 10. Interannual variations of the revised annual mean (a) and 50 % quantile (b) AOT at several wavelengths (Moscow). Comment: the annual 50 % quantile AOT is estimated from monthly 50 % quantile AOT values. For consistency the 2001 data were not used since the measurements have been in operation only since August.

From Chubarova et al., 2016, AMT

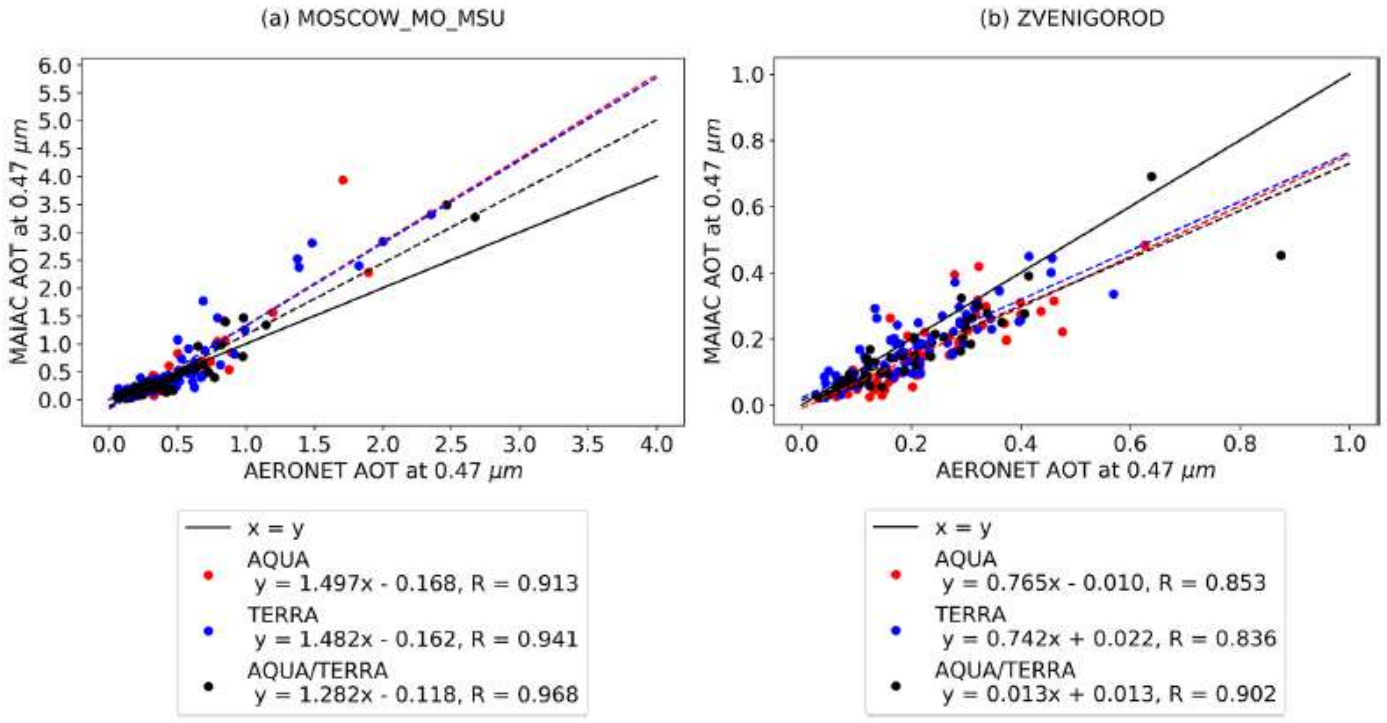
Applicability





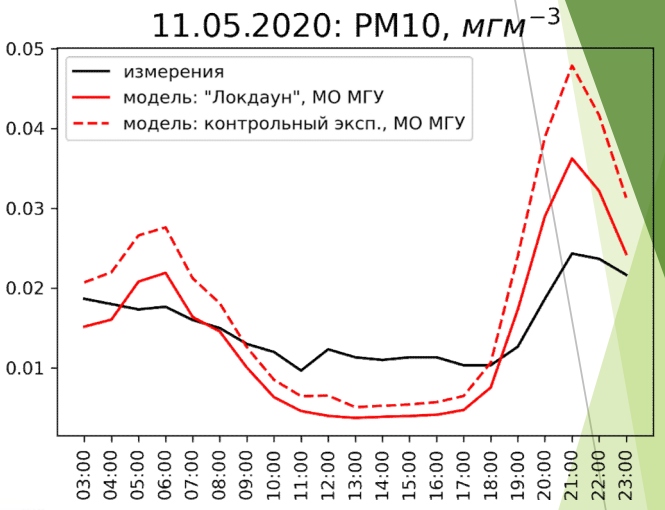
Applicability

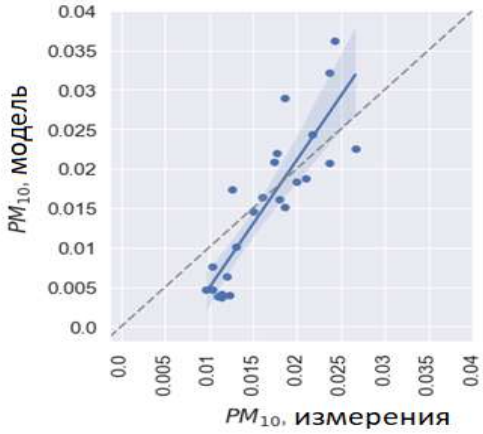
Aerosol optical thickness MAIAC/MODIS retrieval validation against AERONET MSU MO AOT dataset.



Applicability

Diurnal variation of PM10 11.05.2020 according to COSMO-ART model and measured data. MSU MO.





Applicability

AEROSOLS

AeroCom

Home Experiments Publications Events Participants Tools Data FAQ Contact

Introduction

The AeroCom-project is an open international initiative c
understanding of the global aerosol and its impact on c
MODIS, POLDER, MISR, AVHHR, SEAWIFS, TOMS, AERON
more than 22 global models have been assembled to do
the global aerosol. A common protocol has been estab
AeroCom emission inventories for the year 2000 and
interactive websites which give access to 2D fields anc
workshops are held to discuss findings and future directic

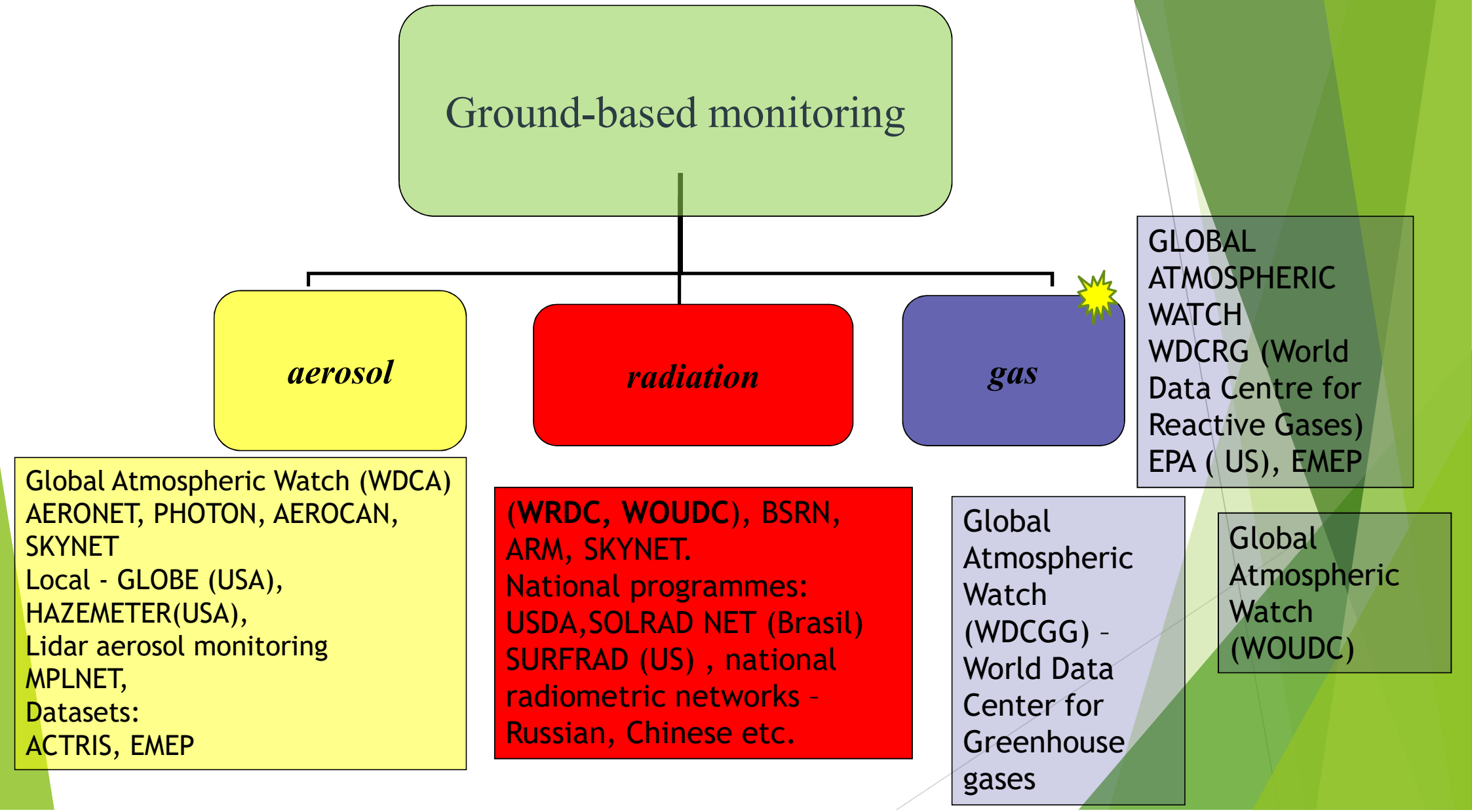
Background

Experiments Publications Events Participants Tools Data FAQ Contact

Experiments

- glissetal-2020
- PIII-CTRL2016
- PIII-optics2019-Cl
- PIII-optics2019-
- PIII-optics2019-e
- optics-highres
- AP3-abs

AeroCom Phase III 2019 evaluation of aerosol optical properties.
No summary available


Ground-based monitoring
aerosol
radiation
gas
GLOBAL ATMOSPHERIC WATCH
WDCRG (World Data Centre for Reactive Gases)
EPA (US), EMEP
Global Atmospheric Watch (WDCA)
AERONET, PHOTON, AEROCAN, SKYNET
Local - GLOBE (USA), HAZEMETER(USA),
Lidar aerosol monitoring MPLNET,
Datasets:
ACTRIS, EMEP
(WRDC, WOUDC), BSRN, ARM, SKYNET.
National programmes: USDA,SOLRAD NET (Brasil) SURFRAD (US) , national radiometric networks – Russian, Chinese etc.
Global Atmospheric Watch (WDCGG) – World Data Center for Greenhouse gases
Global Atmospheric Watch (WOUDC)

World Data Center for Greenhouse Gases

World Data Centre for Greenhouse Gases

Login to WDCGG as User Contributor

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Welcome to WDCGG!

- About WDCGG
- Data (surface/mobile)
- Data (satellite)
- Current State of GHGs
- Publications
- Manuals
- Statistics
- 日本語版 (Japanese)

ATTENTION
Reactive gases measurement data (except for CO) have been agreed to be transferred under the responsibility of the newly established GAW World Data Centre for Reactive

About WDCGG

The World Data Centre for Greenhouse Gases (WDCGG) is a World Data Centre (WDC) operated by the Japan Meteorological Agency (JMA) under the Global Atmosphere Watch (GAW) programme of the World Meteorological Organization (WMO). WDCGG collects, archives and distributes data provided by contributors on greenhouse gases (such as CO_2, CH_4, CFCs, N_2O) and related gases (such as CO) in the atmosphere and elsewhere.

This website is operated by the JMA in collaboration with WMO.

Read more

Data Archive

The WDCGG data archive provides observation data on greenhouse
related gases along with basic associated information known as me

Click here for details.

This website has a user registration function to help support contri

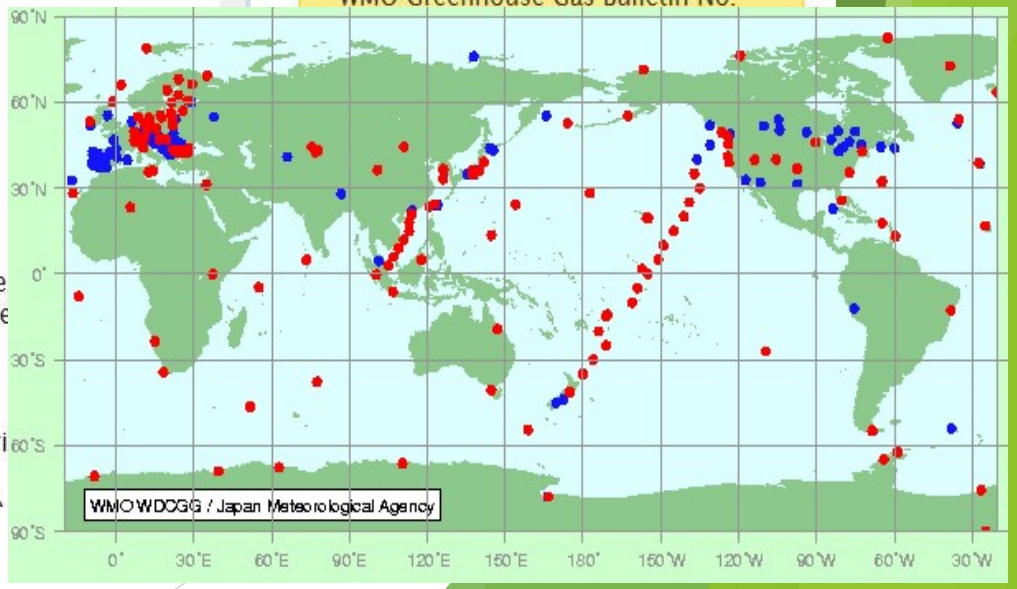
Many contributors face difficulties with ongoing monitoring due to

What's new

See what's new in WDCGG. Also refer to "Data Update Information."

25 Oct. 2021

WMO Greenhouse Gas Bulletin No.



WMO Global Atmosphere Watch

World Data Centre for Greenhouse Gases

GAW WDCGG

Introduction
Contributors
Data/ Quick Plot
CFCs
Summit

Catalogue search
Search form
Map search
Advanced search and plot

Data Archives

Sample programs

CFCs

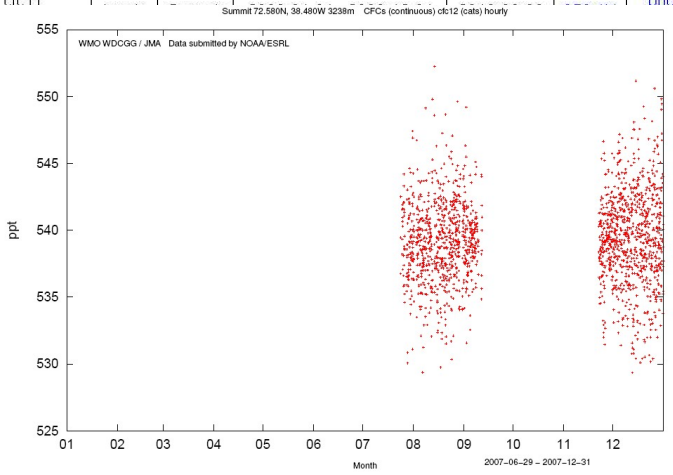
Summit - NOAA/ESRL

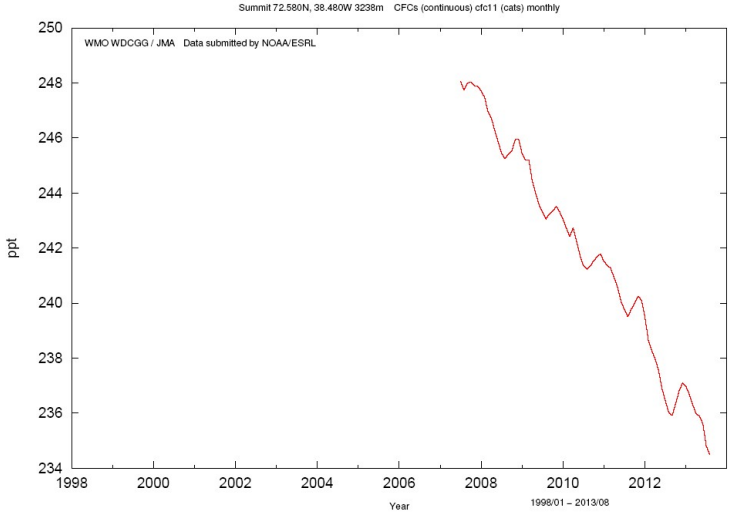
Note: On any publication using data from the individual station, the author must contact the data submitters concerning co-authorship or acknowledgments, and make proper descriptions on the data sources in their references.

Type	File Total	Total Size	File Inventory/ Quick Plot	Archive
hourly	21	11.8M	File/Quick Plot	tar+gzip tar+bzip2
daily	3	518.1K	File/Quick Plot	tar+gzip tar+bzip2
monthly	3	48.1K	File/Quick Plot	tar+gzip tar+bzip2

HOURLY Data Total : 21 (11.8M) (Top)

Parameter	Type	Station	Period	Update	Data	Quick Plot
cfc11 (continuous,cats)	hourly	Summit	2007-06-26 - 2007-12-31	2013-08-30	314.3K	png (>7K) pdf (>250K)
cfc11 (continuous,cats)	hourly	Summit	2008-01-01 - 2008-12-31	2013-08-30	657.1K	png (>7K) pdf (>250K)
cfc11						png pdf

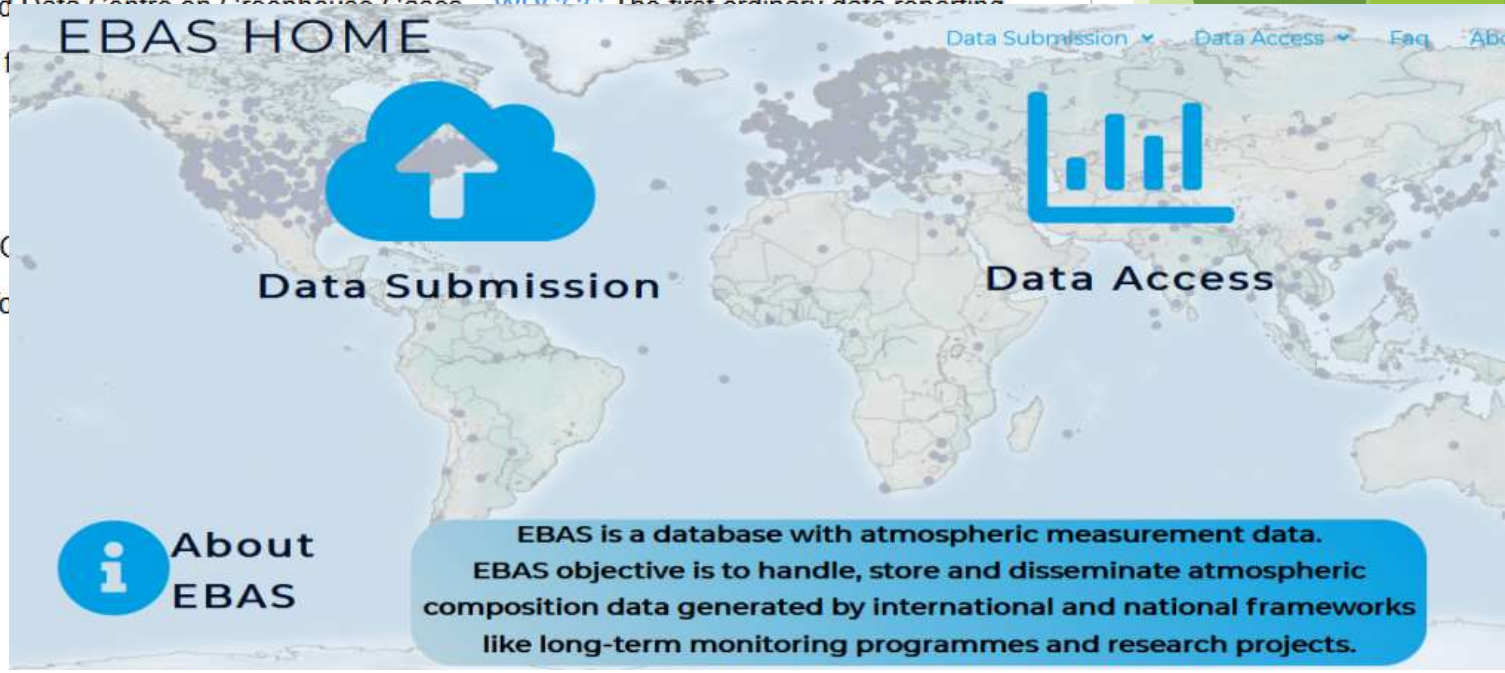




World Data Centre for Reactive Gases WDCRG

The World Data Centre for Reactive Gases (WDCRG) is the data repository and archive for reactive gases of the World Meteorological Organisation's (WMO) Global Atmosphere Watch (GAW) programme. The WDCRG was established January 1. 2016 and took over the responsibility of this part of the GAW programme after Japan Meteorological Agency (which continue to host the World Data Centre on Greenhouse Gases – WDCGG. The first ordinary data reporting deadline was by end 2016 (data f

The reactive gases to be hosted at WDCRG are: SO
additional variables are added to the monitoring effo



Network for the Detection of Atmospheric Composition Change

NDACC | STATIONS | INSTRUMENTS | DATA | ABOUT NDACC

Measurement Stations

Select a station on the map or in the list to access its public data.

Filter by:

HEMISPHERE

- Northern Hemisphere
- Southern Hemisphere

LATITUDINAL BAND

- Subtropics and Tropics
- Mid Latitude
- High Latitude

INSTRUMENT STATUS

- Active

INSTRUMENT

- Brewer
- Dobson
- FTIR Spectrometer
- Lidar
- Microwave Radiometer
- Sonde
- UV Spectroradiometer
- UV/Visible Spectrometer

Clear all

The international Network for the Detection of Atmospheric Composition Change (NDACC) is composed of more than 70 high-quality, remote-sensing research stations for observing and understanding the physical and chemical state of the stratosphere and upper troposphere and for assessing the impact of stratosphere changes on the underlying troposphere and on global climate.

Home > NDACC Measurement Stations > NDACC Station: St Petersburg, Russia

NDACC Station: St Petersburg, Russia

Latitude 59.88 ° N, Longitude 29.83 ° E
Elevation 20 m asl

Hot News
Newsletter
Goals and Organization
Instruments
Protocols
M&A Directory
Measurement Stations
NDACC Data&Formats
Working Groups:
Dobson (@WMO)
Brewer (off site)
FTIR (@NCAR)
Lidar (off site)
Microwave (@U Bern)
Satellite (@BIRA)
Sondes (U Wyoming)
Theory (@KIT)
UV/Vis (@BIRA)
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NDACC News
Ozone Q&A (@ESRL)
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Featured Link:
SPARC Report on Halogen/O3 Initiative
SC Resource Page
Contact Us

Station Representative:
Dr. Maria Makarova
Faculty of Physics
St. Petersburg State University
St. Petersburg, Russia

URL: http://troll.phys.spbu.ru/Peterhof_FTIR_site/welcome.html (off site)
NDACC public data: ftp://ftp.cpc.ncep.noaa.gov/ndacc/station/st.petersburg

NDACC Measurements at the St. Petersburg Station

Instrument & Period	Parameter	Cooperating Institutions	Comments
FTIR (Bruker 125HR) Interferometer 2009 -	CH_4, CO, C_2H_6, HCN, HCl, HF, N_2O, O_3, $ClONO_2$, HNO_3	St. Petersburg State University	

WOUDC
- total ozone:

Environment Canada | Environnement Canada | Canada

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World Ozone and Ultraviolet Radiation Data Centre

UDC) MSC - EC - GC

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Home

Link to the international web site and data archive for the WOUDC hosted at www.woudc.org.

The World Ozone and Ultraviolet Radiation Data Centre (WOUDC) is one of the World Data Centres which are part of the Global Atmosphere Watch (GAW) programme of the World Meteorological Organization (WMO). The WOUDC is operated by the Experimental Studies Section of Environment Canada and is located in Toronto.

The WOUDC began as the World Ozone Data Centre (WODC) in 1961 and produced its first data publication of *Ozone Data for the World* in 1964. In June 1992, Canada agreed to a request from the WMO to add ultraviolet radiation data to the WODC. The Data Centre has since been renamed to the World Ozone and Ultraviolet Radiation Data Centre (WOUDC) with the two component parts: the WODC and the World Ultraviolet Radiation Data Centre (WUDC).

Environment Canada | Environnement Canada | Canada

Meteorological Service of Canada | Français | Contact Us | WMO

World Ozone and Ultraviolet Radiation Data Centre (WOUDC)

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Platform List

WOUDC Defined Platforms - Use the Data Search Form to access the data files

Platform	Name	Country	Minimum Latitude	Maximum Latitude	Minimum Longitude	Maximum Longitude	Minimum Height	Maximum Height
STN 1	LEOPOLDVILLE	COD	-4.33	-4.27	15.52	15.58	435	465
STN 2	TAMANRASSET	DZA	22.77	22.83	5.487	5.547	1362	1392
STN 3	ALMA-ATA	KAZ	43.203	43.263	76.903	76.963	832	862
STN 5	DIKSON ISLAND	RUS	73.47	73.53	80.203	80.263	3	33
STN 6	HABBANIYA	IRQ	33.337	33.397	43.537	43.597	29	59
STN 7	KAGOSHIMA	JPN	31.5	31.66	130.5	130.63	30	285
STN 8	KODAIKANAL	IND	10.203	10.263	77.437	77.497	2328	2358
STN 9	MOUNT ABU	IND	24.57	24.63	72.67	72.73	1205	1235
STN 10	NEW DELHI / NEW DELHI SONDE	IND	28.3	28.68	77.07	77.25	220	275
STN 11	QUETTA	PAK	30.08	30.14	66.54	66.6	1706	1736

Dataset Information: Total Ozone - Daily Observations

Title: Total Ozone - daily observations

Abstract: A measurement of the total amount of atmospheric ozone in a given column from the surface to the edge of the atmosphere. Ground based instruments such as spectrophotometers and ozonemeters are used to measure results daily.

Dataset URI: http://geo.woudc.org/def/data/ozone/total-column-ozone/totalozone

DOI: doi:10.14287/10000001

Temporal Extent: From 1924-08-18 to now

ISO Topic Category: climatologyMeteorologyAtmosphere

Keywords: total | ozone | level 1.0 | column | dobson | brewer | saoz | atmosphericComposition | pollution | observationPlatform | rocketSounding | vassey | pion | microtops | spectral | hoelper | filter

Access Links:

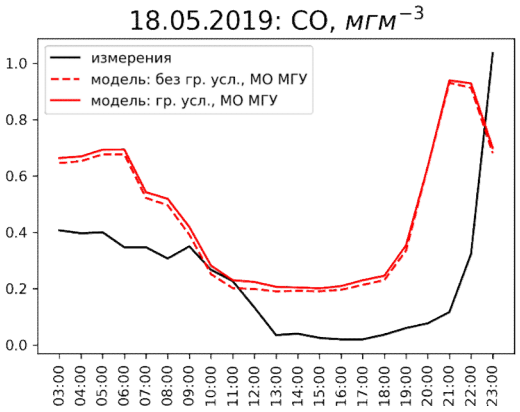
- Web Accessible Folder (WAF)
- OGC Web Map Service (WMS)
- OGC Web Feature Service (WFS)
- Data Search / Download User Interface

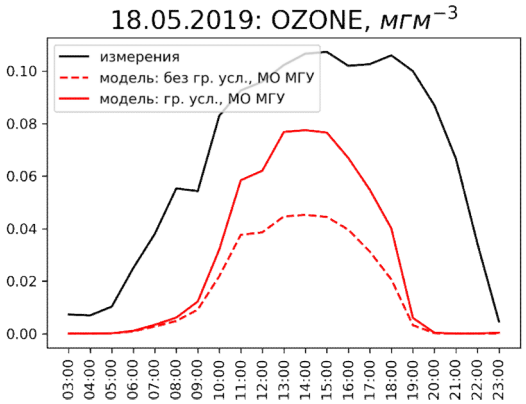
Station Map

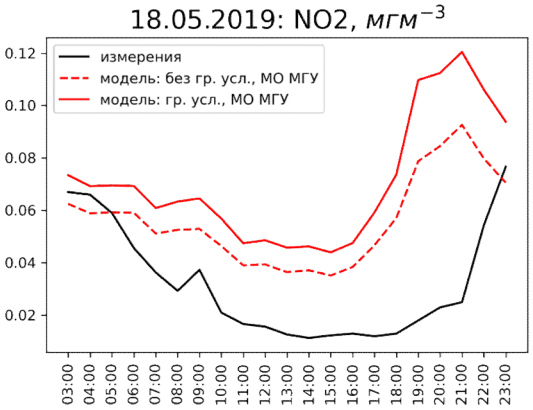
How to Use: Interactive Map

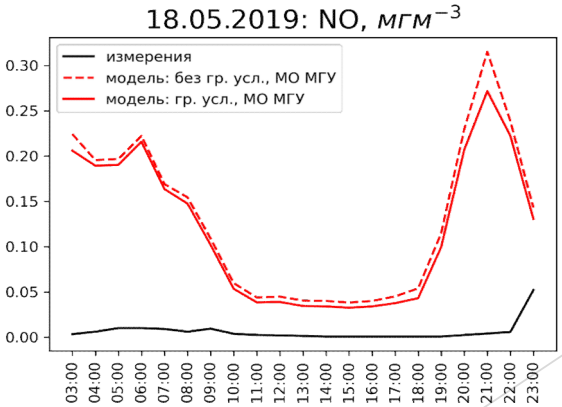
Applicability

Validation chemical-transport model COSMO-ART against measurements of urban gas and aerosol component at MSU MO.

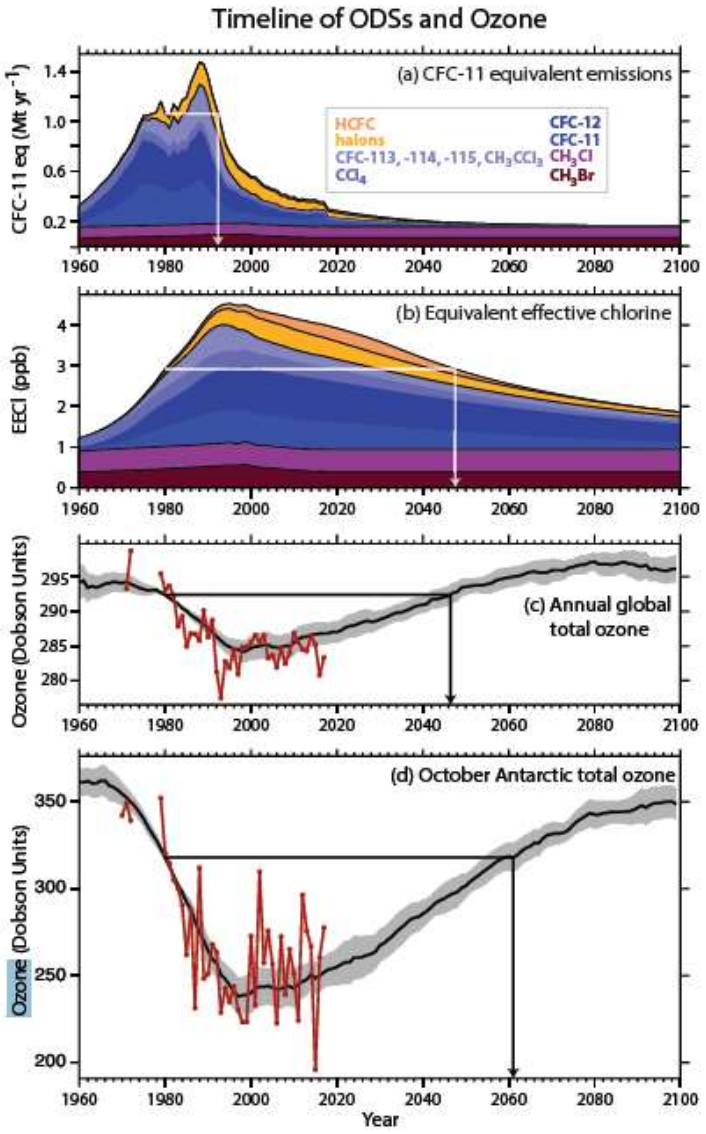








Applicability



QUESTIONS?