

Thoughts from WMO

Polar & global ozone
IGOS, IGACO, IGACO-O3, GAW

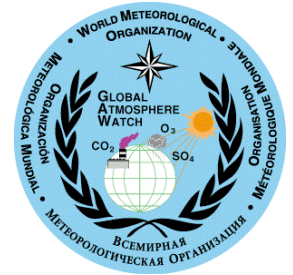
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WMO

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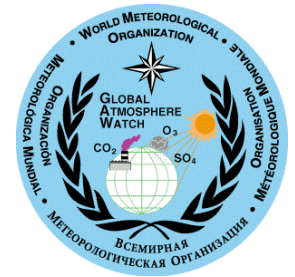
WMO
OMM

SPARC-DA: Workshop at ESTEC 2-4 Oct 2006

What is IGOS & IGACO about?



- ♣ The satellites are there!
- ♣ The ground-based network is there!
- ♣ The data is there!
- ♣ The competence is there!
- ♣ So, what's the problem?



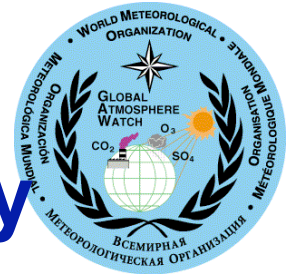
Do we have a rational system?

”No”

- ♣ Each individual system works well, but:
- ♣ Lack of integration and coordination
- ♣ Cumbersome data access
- ♣ Need for more data in real or near real time
- ♣ Need for tools for graphical visualisation and analysis
- ♣ Relatively small effort needed to tie this together

Buzzword: Data at your fingertips

IGOS: Integrated Global Observing Strategy



♣ Approved themes

- Global carbon cycle
- Geohazards
- Ocean
- Water cycle
- **Atmospheric chemistry**

♣ Under preparation

- Coastal observations
- Coral Reefs sub-theme
- Land
- Cryosphere

♣ Proposed theme

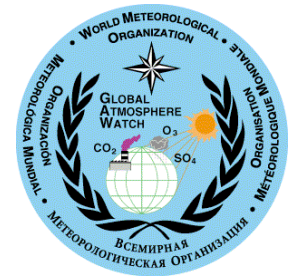
- Dynamic earth

♣ Principal objective

- Integrate satellite, airborne and in-situ observation systems
- IGACO can be regarded as GAW 2nd generation.

IGOS Partners

Integrated Global Observing Strategy



CEOS
Committee on Earth Observation Satellites
<http://www.ceos.org>



FAO
Food and Agriculture Organization of the United Nations
<http://www.fao.org>



GCOS
Global Climate Observing System
<http://www.wmo.ch/web/gcos/gcos/home.html>



GOOS
Global Ocean Observing System
<http://ioc.unesco.org/goos/>



GOS/GAW
Global Observing System/
Global Atmosphere Watch of WMO
<http://www.wmo.ch>



GTOS
Global Terrestrial Observing System
<http://www.fao.org/gtos/>



ICSU
International Council for Science
<http://www.icsu.org>



IGBP
International Geosphere-Biosphere Programme
<http://www.igbp.kva.se/>



IGFA
International Group of Funding Agencies
for Global Change Research
<http://www.igfagr.org>



IOC-UNESCO
Intergovernmental Oceanographic
Commission of UNESCO
<http://ioc.unesco.org/iocweb/>



UNEP
United Nations Environmental Programme
<http://www.unep.org>



UNESCO
United Nations Environmental Programme
<http://www.unesco.org>

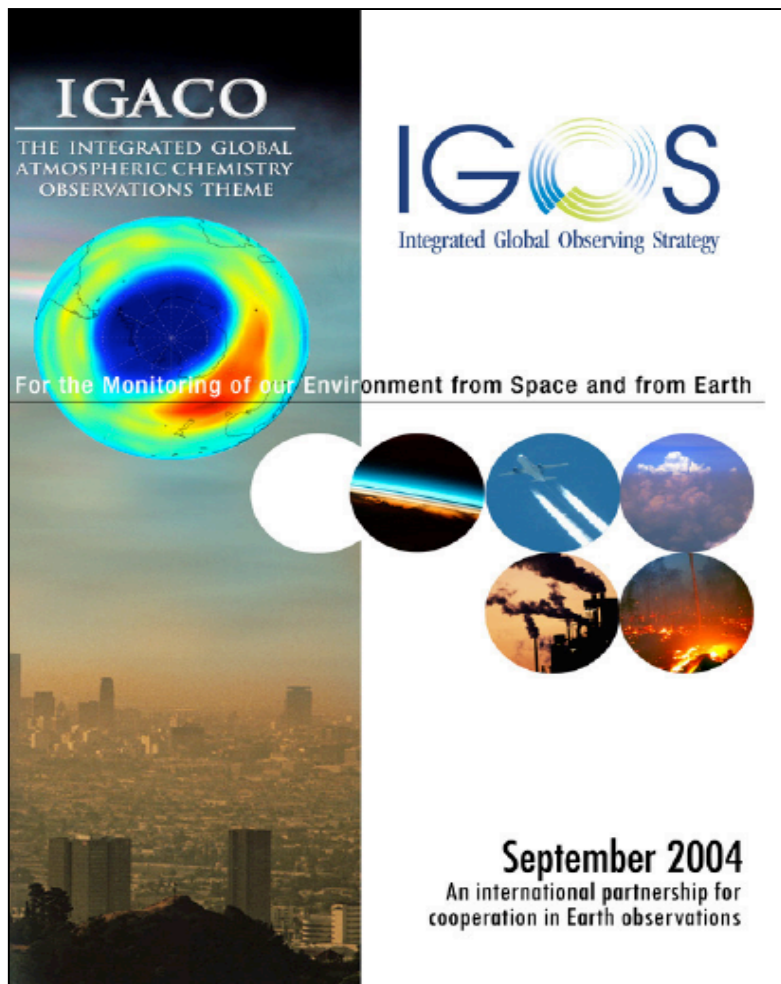


WCRP
World Climate Research Programme
<http://www.wmo.ch/web/wcrp/wcrp-home.html>



WMO
World Meteorological Organization
<http://www.wmo.ch>

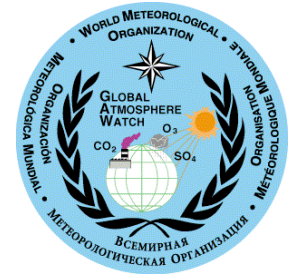
IGACO: Integrated Global Atmospheric Chemistry Observations Theme



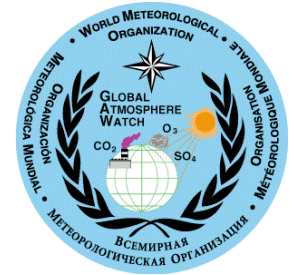
The IGACO report:

- ♣ Presents the reason and need for Integrated Global Atmospheric Chemistry Observations
- ♣ Targets 13 variable groups including reactive gases
- ♣ Assesses past, current and expected state of observing system for each target variable
- ♣ Reviews requirements for observations for each target variable group
- ♣ Makes 12 General Recommendations and 7 Specific Recommendations
- ♣ Provides a framework for the next generation GAW programme 2008-2015
- ♣ IGACO is a strategy!

IGACO Goals (1)



- ♣ Detection of long-term man-made trends
 - GHG, aerosols, ozone, ozone depleting substances
- ♣ Better environmental assessments
 - Climate, Air quality, Ozone depletion, LRTAP
- ♣ Better quantification of pollution sources and their atmospheric pathways
- ♣ Reliable global concentration fields
 - 3D distribution of gases and aerosols



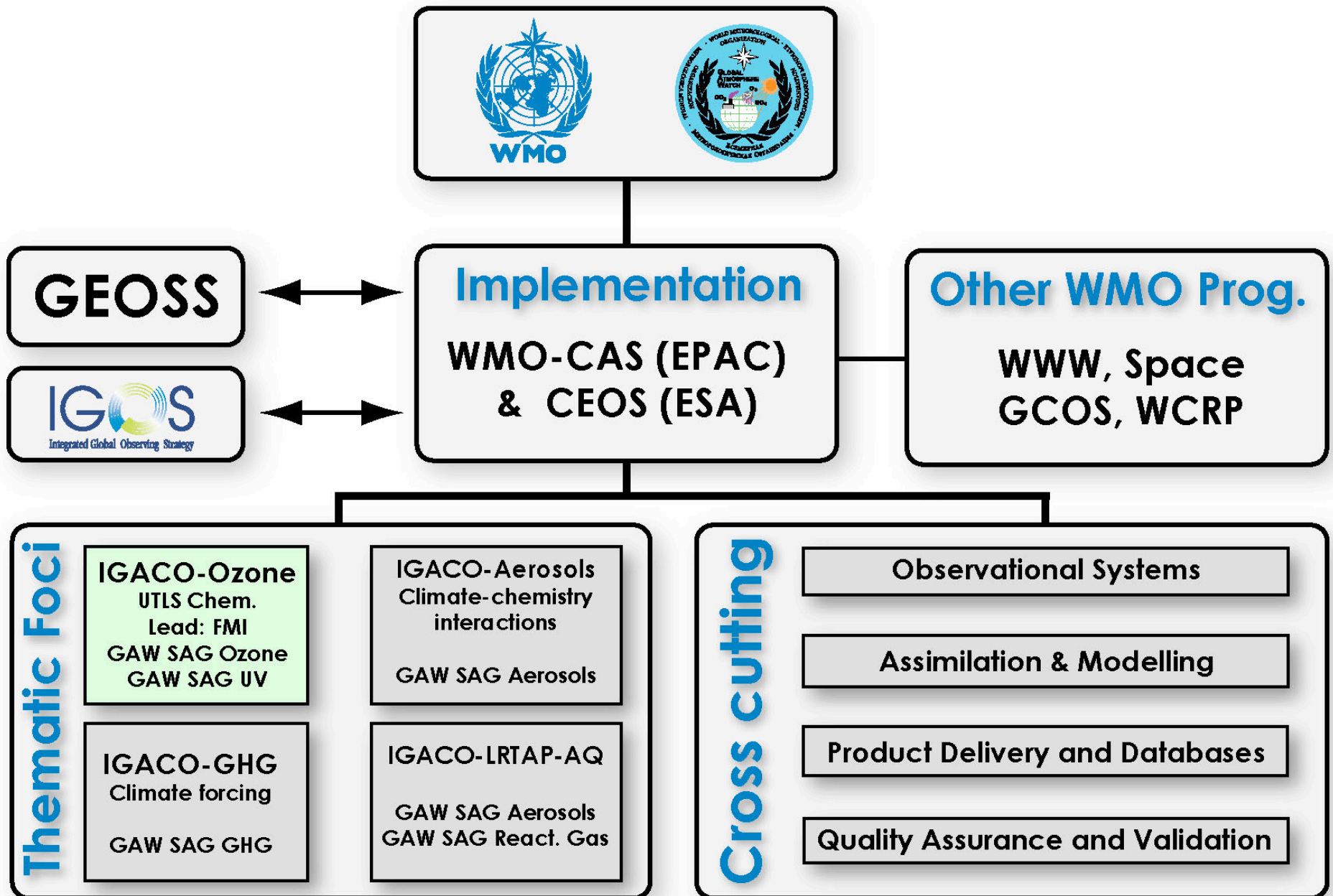
IGACO Goals (2)

- ♣ Better predictions of UV intensities
- ♣ Direct observation of plumes
 - Forest fires, dust storms, volcanos,
- ♣ Improved regional forecasts of weather and air quality
 - Also forecasts in regions that are not currently covered
- ♣ Improved Ozone Bulletins (Arctic and Antarctic)
- ♣ Support to the WMO/UNEP Scientific Ozone Assessment

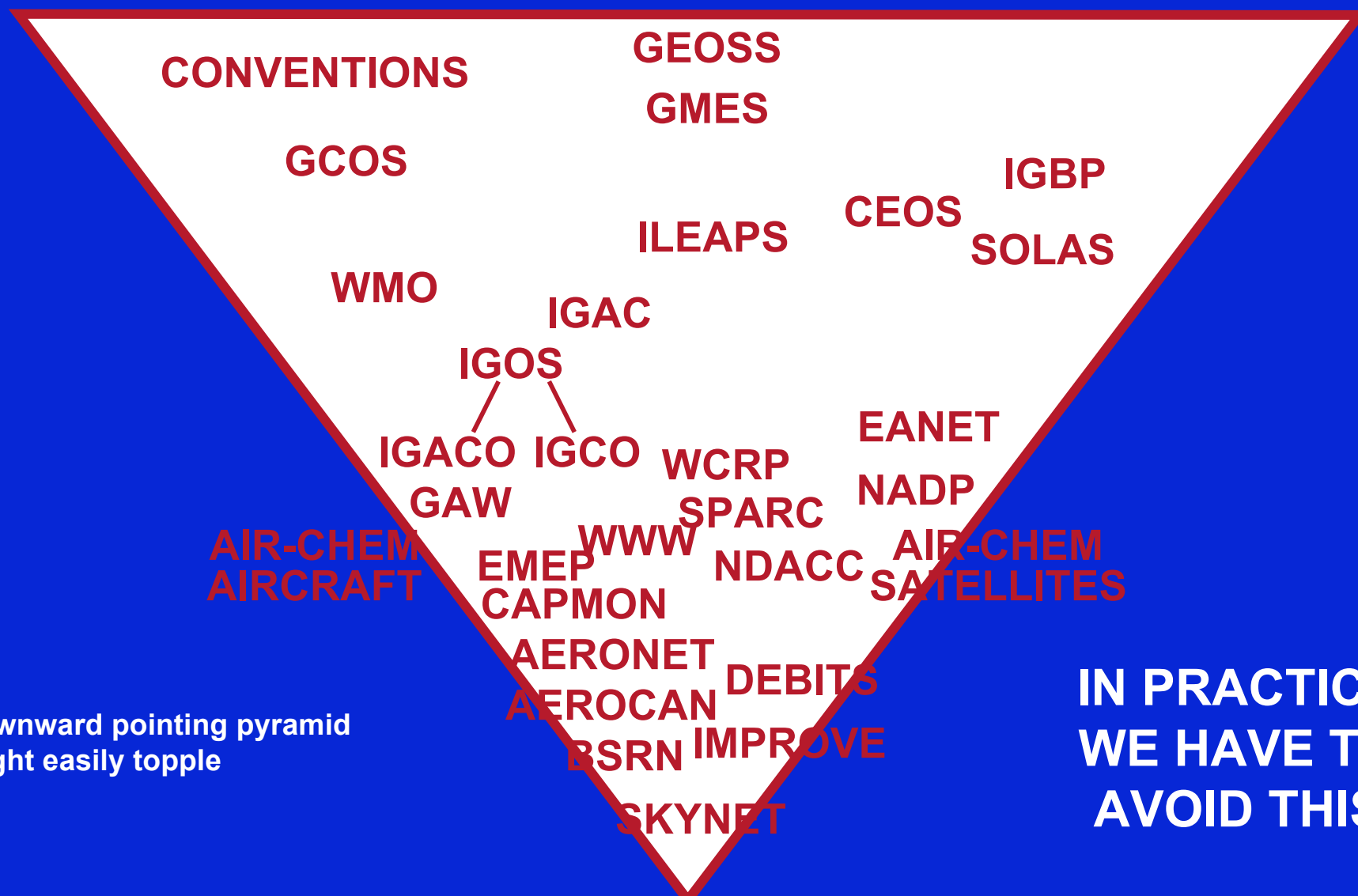
IGACO TARGET VARIABLE LIST

Chemical species	Air Quality	Oxidation Capacity	Climate	Stratospheric Ozone Depletion
O₃				
H₂O (water vapour)				
CO				
CO₂				
CH₄				
HCHO				
VOCs				
N₂O				
NO_x = NO+NO₂				
HNO₃				
SO₂				
BrO, ClO, OClO HCl, ClONO₂ CH₃Br, CF₃Br, CFC-11, CFC-12, HCFC-22				
aerosol optical properties				
actinic flux				

The IGACO structure



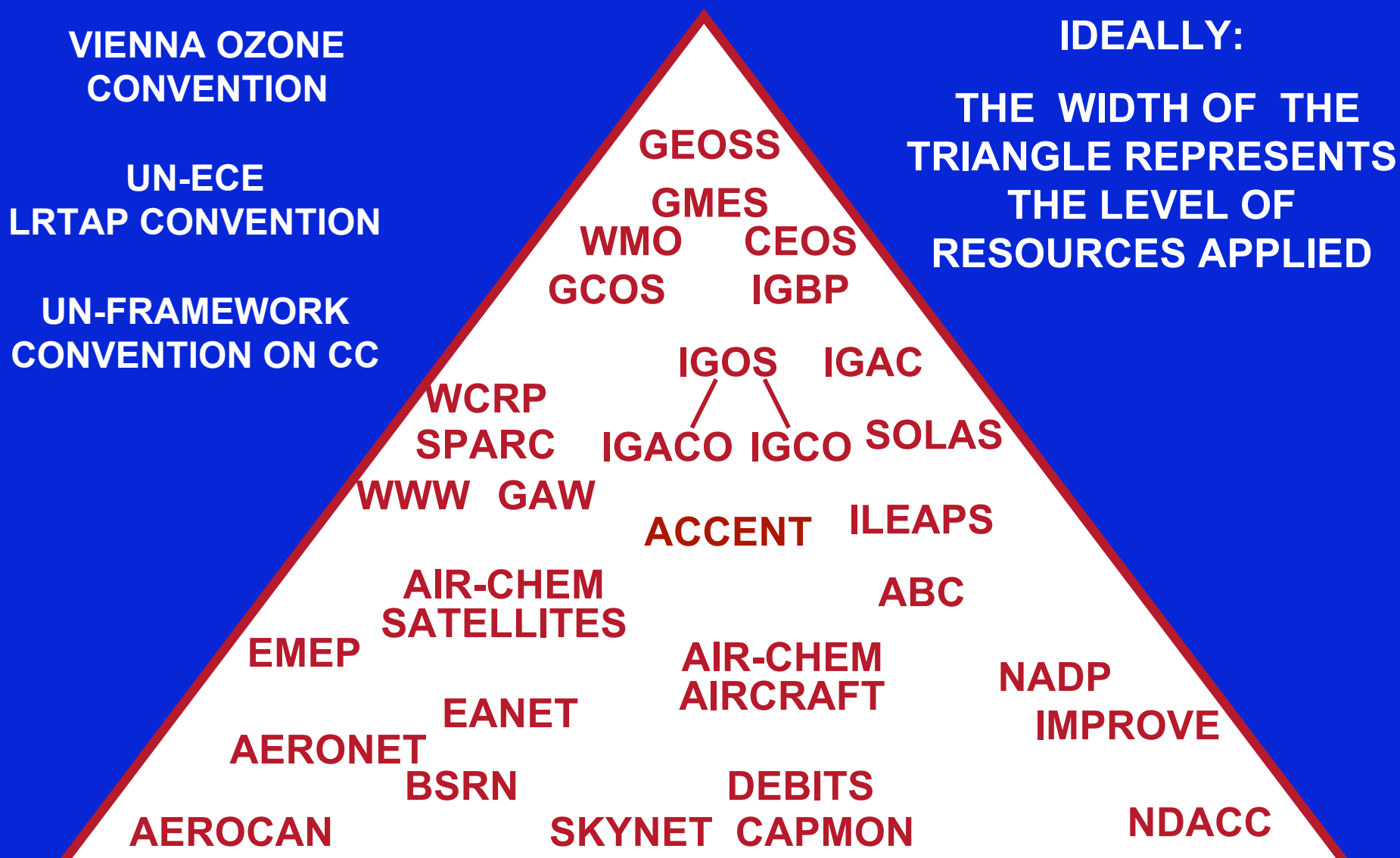
A Hierarchy Of Conventions, Strategies, Systems, Programmes, Networks, Related To Systematic Atmospheric Chemistry Observations



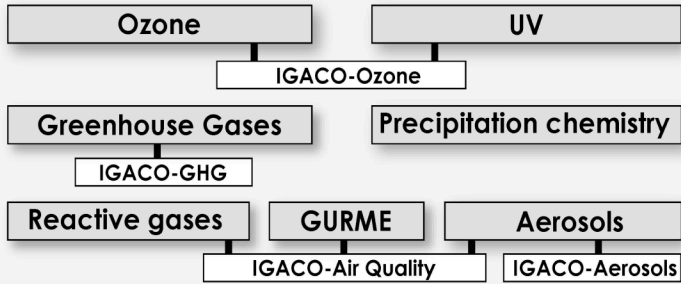
Downward pointing pyramid
might easily topple

**IN PRACTICE
WE HAVE TO
AVOID THIS**

A Hierarchy Of Conventions, Strategies, Systems, Programmes, Networks, Related To Systematic Atmospheric Chemistry Observations



SAGS



GAW Secretariat

CAS Open Programme Area Group
EPAC
Environmental Pollution & Atmospheric Chemistry
Joint Scientific Steering Committee

Quality Assurance & Science Activity Centres
World & Regional Calibration Centres

GHG NOAA ESRL/GMD (USA)	N₂O VOC IMK-IFU (DE)	CH₄ JMA (JP)	Precip. chem. SUNY Albany (USA)	Physical aerosol properties IFT (DE)	In situ O₃, CO, CH₄ EMPA (CH)	Optical depth WORCC (CH)	Total O₃ 3 WCC (US, CA, RU) 6 Dobson RCC (JP, AU, ZA, AR, DE, CZ) 1 Brewer RCC (ES)	O₃ Sondes FZJülich (DE)
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Central Calibration Laboratories
Host GAW World Reference Standards

CO ₂ , CH ₄ , N ₂ O CO, Dobson O ₃ NOAA ESRL/GMD (USA)	Brewer total O ₃ Environment Canada	Ozone-sondes FZJülich (DE)	In situ O ₃ NIST (USA)
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Contributing networks

BSRN

GAW stations & GAWSYS

Satellites & Aircraft

World Data Centres

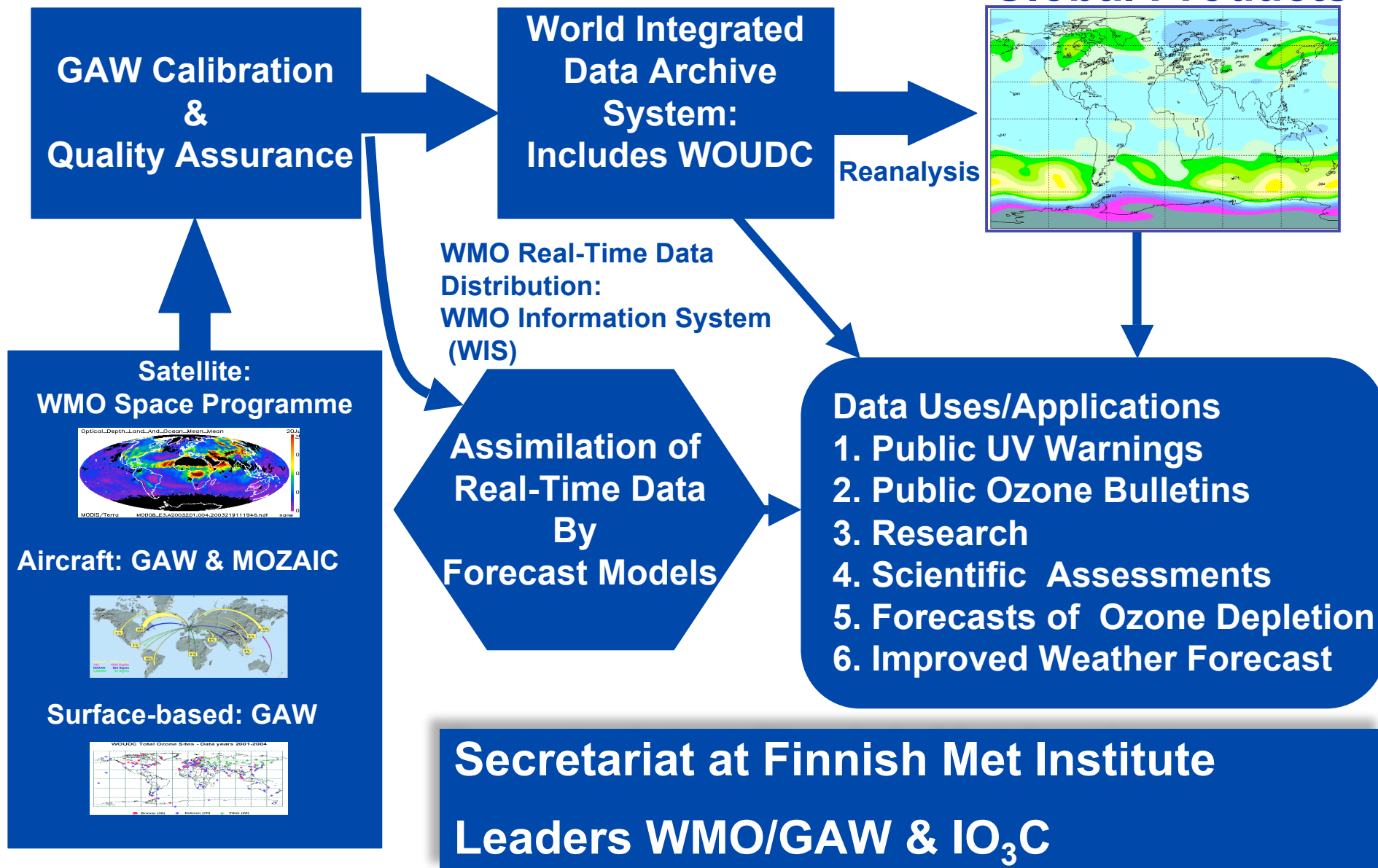
WOUDC Ozone & UV Environment Canada (CA)	WDCGG Greenhouse gases JMA (JP)	WDCA Aerosols JRC (EU)	WRDC Radiation MGO (RU)	WDCPC Precip. chem. SUNY Albany (USA)
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IGACO products
Bulletins
Assessments
Global fields

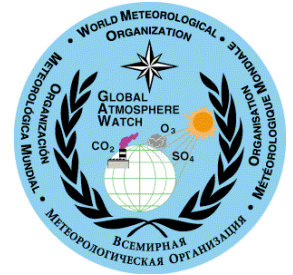
IGACO-Ozone

in operation by end of 2006

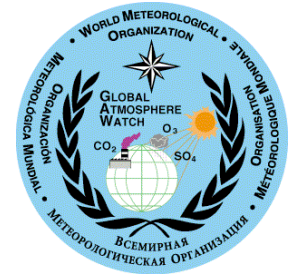
Global Products



IGACO-Ozone

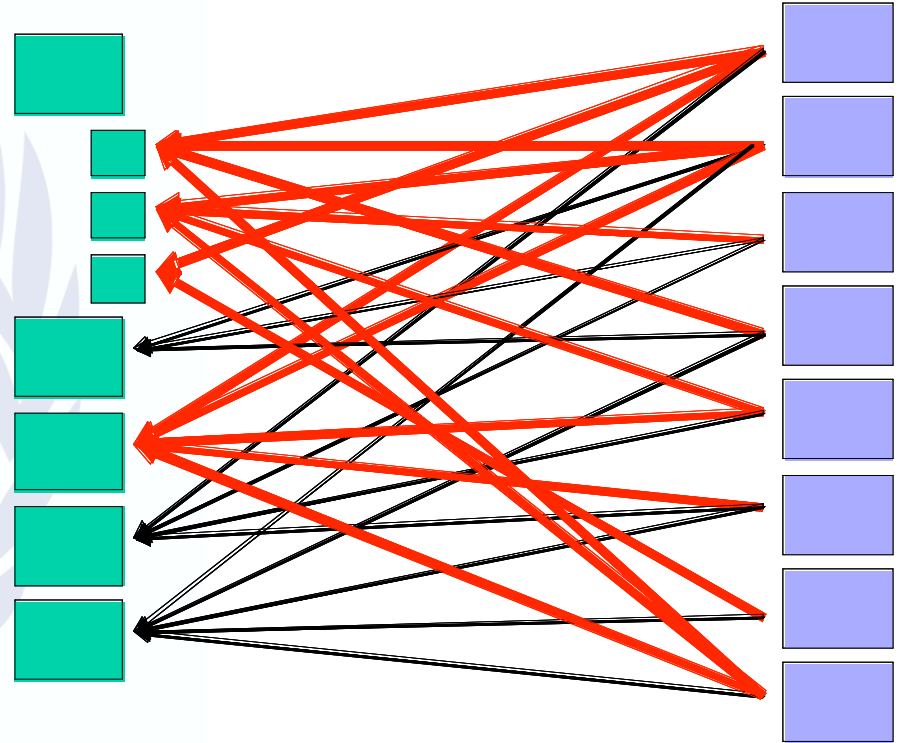


- IGACO-O3 secretariat working since ~ 1 year at FMI.
- Implementation Plan in preparation (joint effort with O3 SAG and WMO AREP).
- Implementation Workshop in May 2006 resulted in definition of 13 useful and practical activities that would improve over the existing system.
- 3 of the 13 are in active implementation. For the rest, (more) detailed work plans are in preparation.
- NDACC as an active and well-organised network is seen as a valuable partner.
- IGACO-O3 latest news and documentation are available on <http://www.igaco-o3.fi/>



Current situation

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

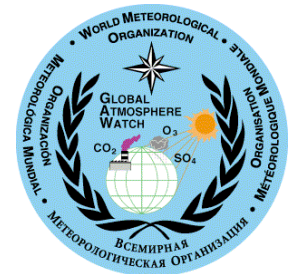


data users
 (individual research groups)

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

← simple registration or free access

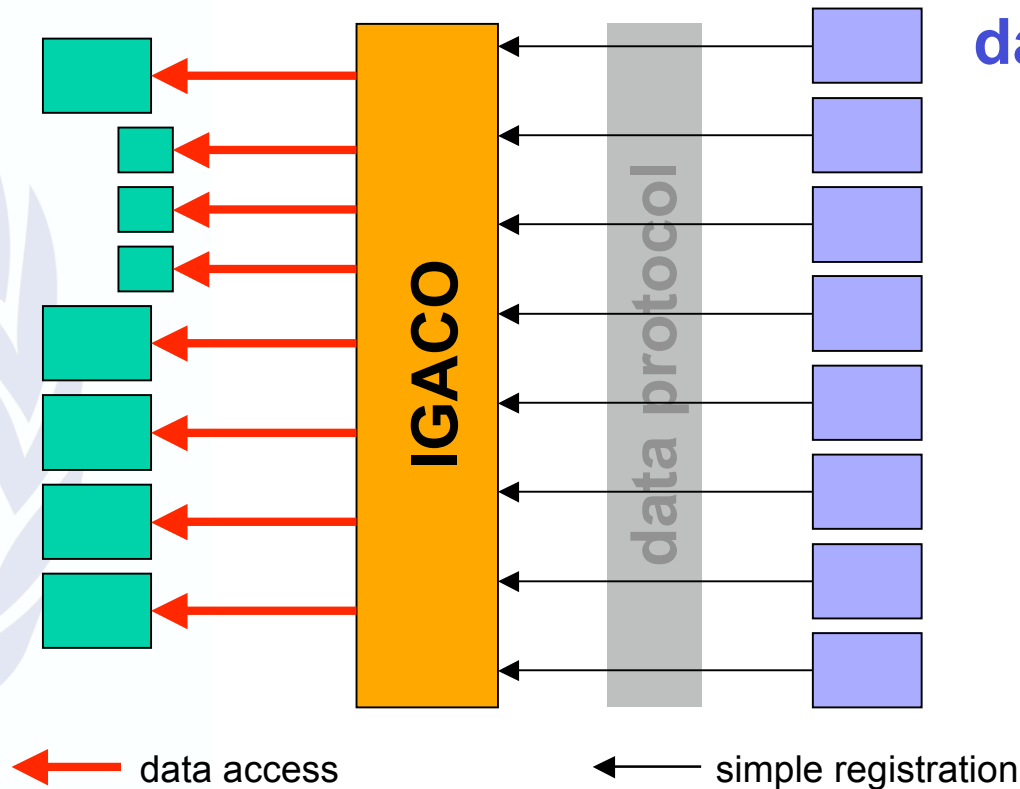
Illustration courtesy of M. Rex, AWI Postdam



A scientist's dream

data providers

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



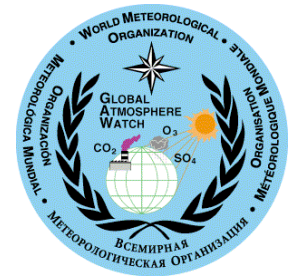
data users

(individual research groups)

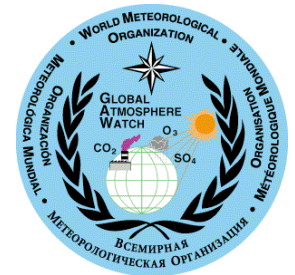
- Each user has to establish just one link to IGACO get access to all atmospheric data, including a complete overview over all data sets

Illustration courtesy of M. Rex, AWI Postdam

Some activities defined at workshop in May 2006

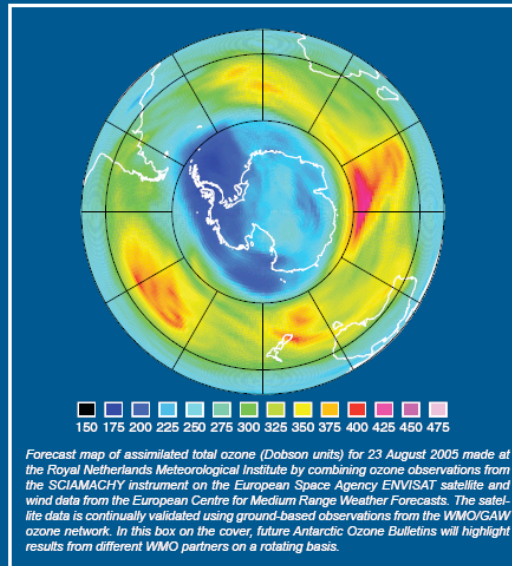


- ♣ Better data access and archiving
 - Workshop to be held early 2007
- ♣ More total ozone and ozonesondes on GTS/WIS
- ♣ Easier access to meteorological data



Antarctic Ozone Bulletin

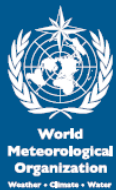
No 1
23 August 2005



Executive summary

During the May-August 2005 time period, the temperature conditions in the south polar stratospheric vortex have been close to the 1995-2004 average. The vortex is colder than at the same time in 2004, but somewhat milder than in 2003. Total ozone column values are quite low along the edge of the polar vortex and lower than at the same time in both 2003 and 2004. It is still too early to give a reliable statement about the development of this year's ozone hole, so WMO and the scientific community will use ozone observations and meteorological data to keep a close eye on the development during the coming weeks and months.

Global Atmosphere Watch



World
Meteorological
Organization
Weather • Climate • Water

WMO Antarctic Ozone Bulletins

An example of a need for integrated products in near-real time

<http://www.wmo.int/web/arep/ozone.html>

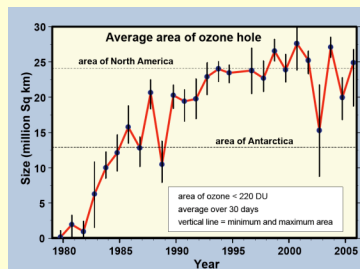
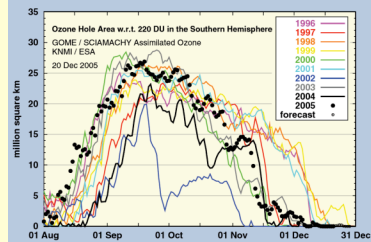
WMO
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SPARC-DA: Workshop at ESTEC 2-4 Oct 2006

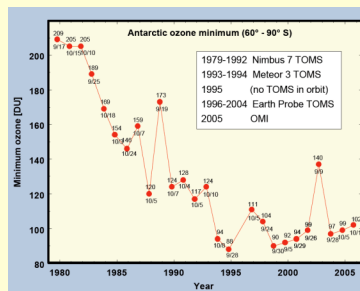
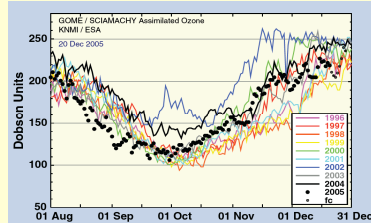
WMO Antarctic Ozone Bulletins

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

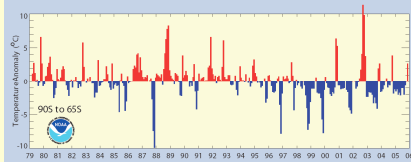
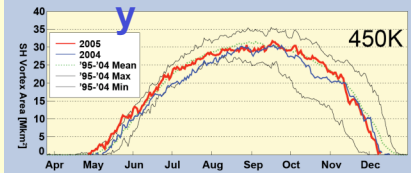
Ozone hole area



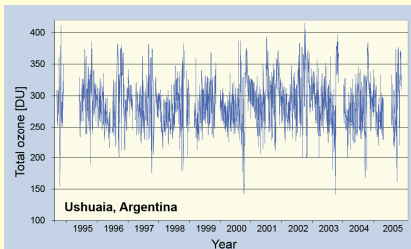
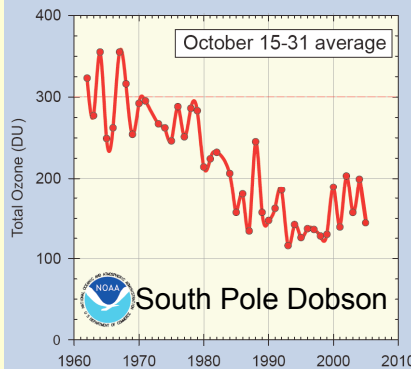
Minimum ozone



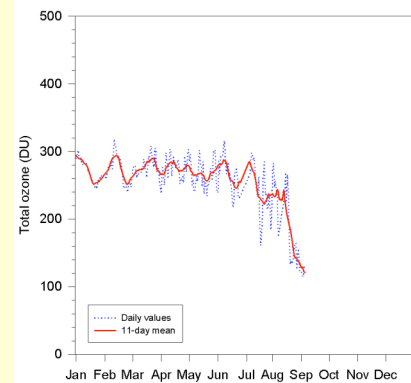
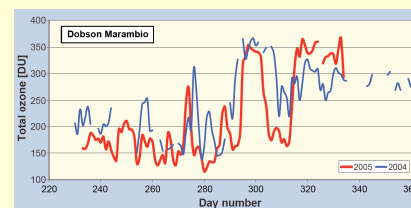
Meteorolog



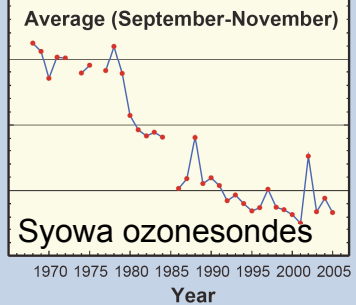
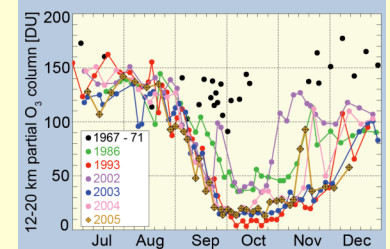
Station climatology



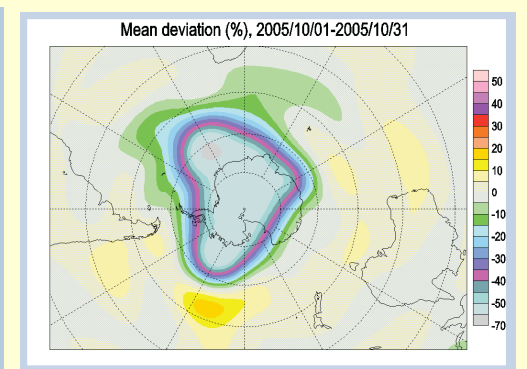
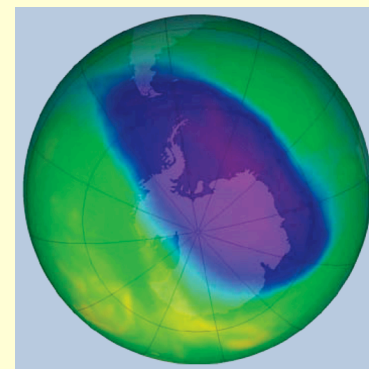
NRT Station data

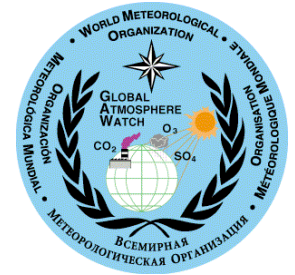


Sonde data



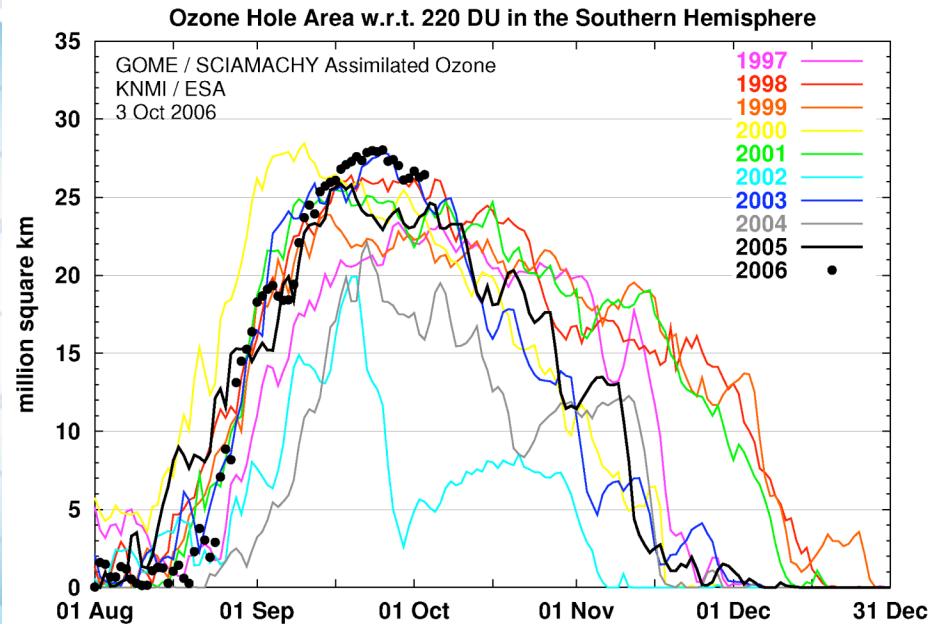
Satellite data



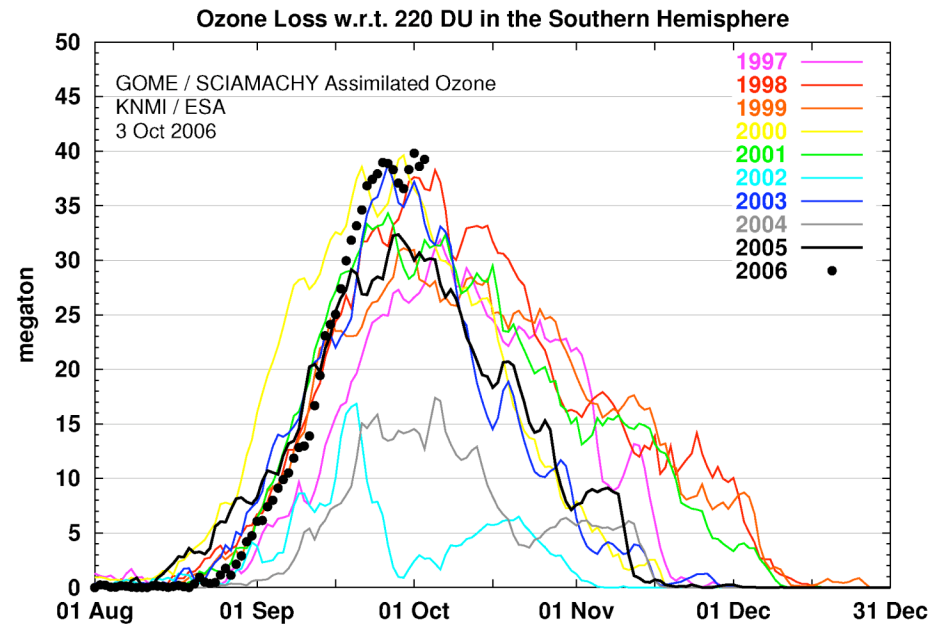


Area and mass deficit < 220 DU

Are these meaningful metrics for assessing degree of ozone destruction?
Linked to EESC?

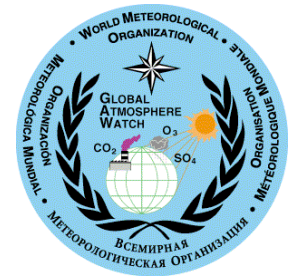


Area where total $O_3 < 220$ DU

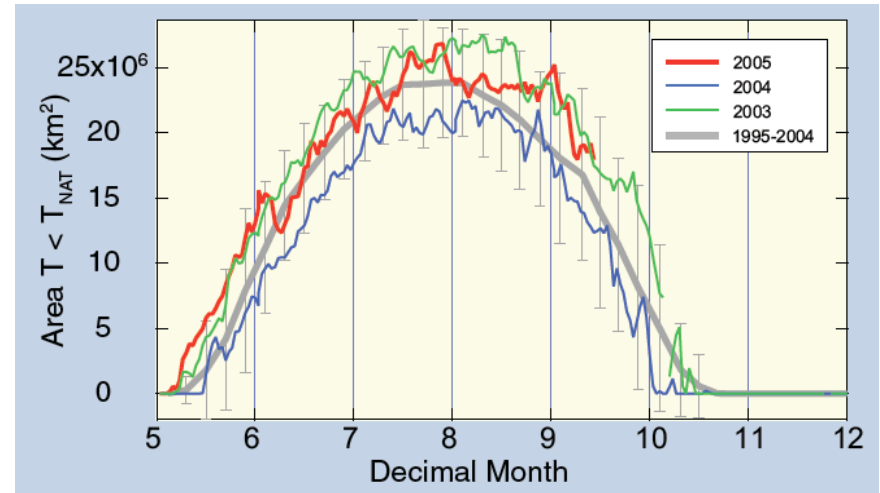
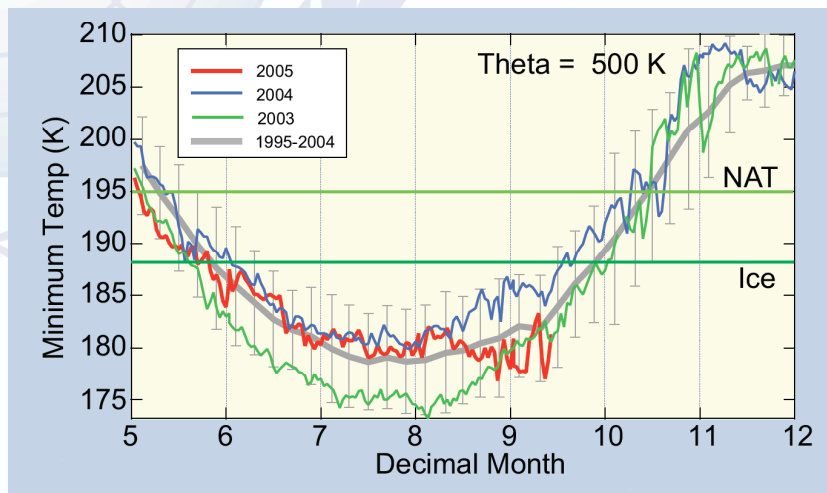


O_3 deficit within 220 DU contour

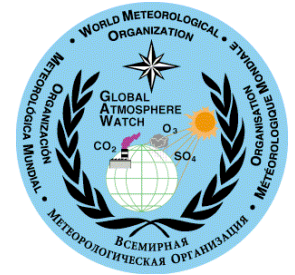
Meteorological data



- ♣ Would be useful with better description of the vortex dynamics in the Bulletins
- ♣ Can the science community put some pressure on ECMWF to fix the oscillation problem?



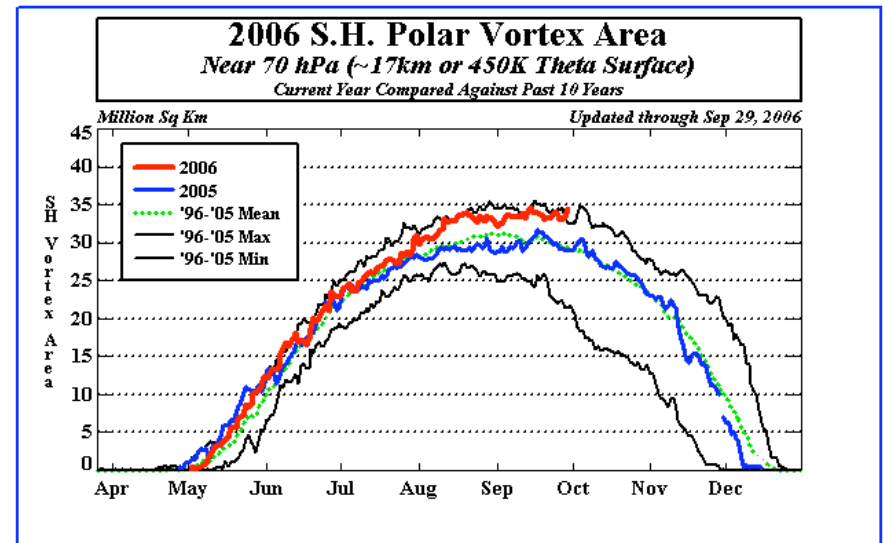
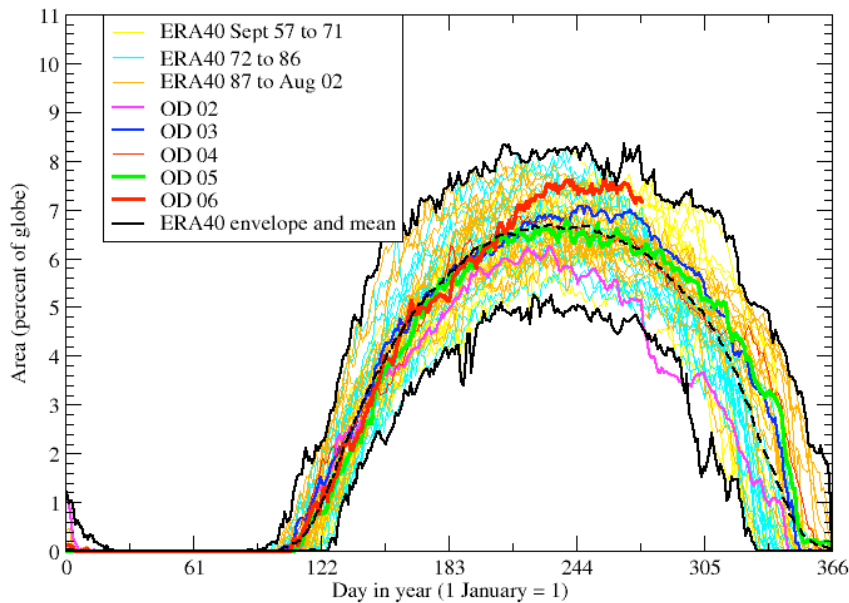
Meteorological data



ECMWF

NOAA/CPC

Area (PV gt 28 PVU) 90 S- 30 S at 450 K

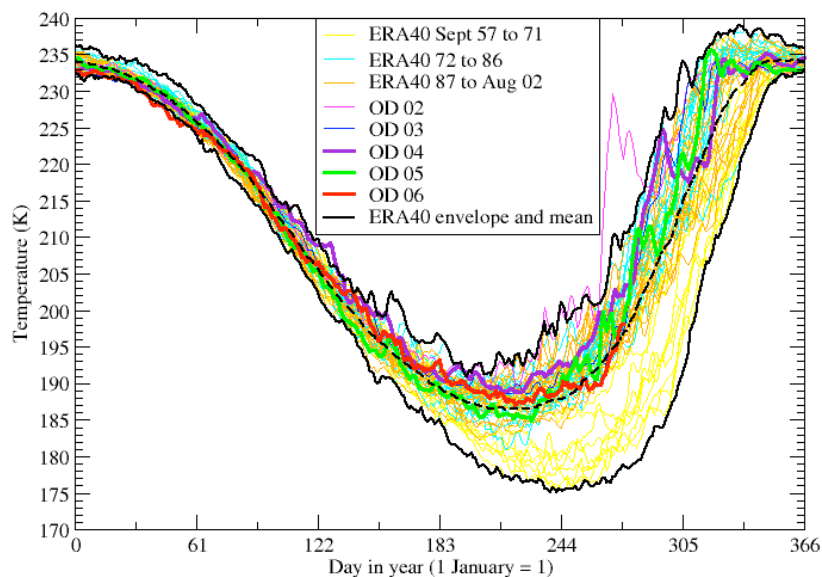


Meteorological data

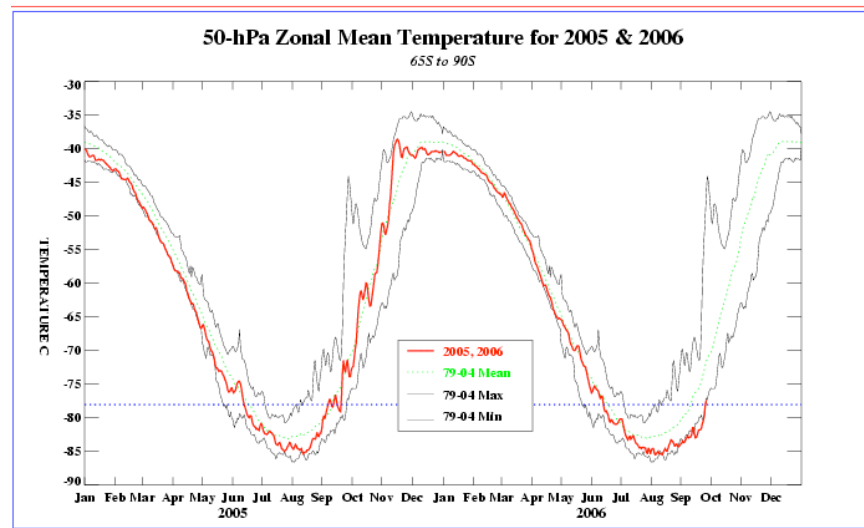


ECMWF

Daily mean temperature 90 S- 65 S at 50 hPa

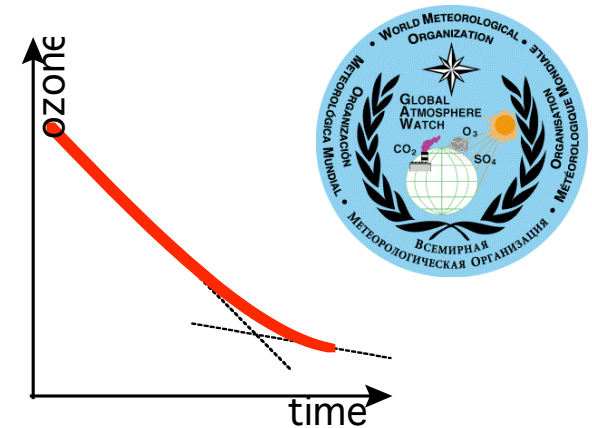


NOAA/CPC

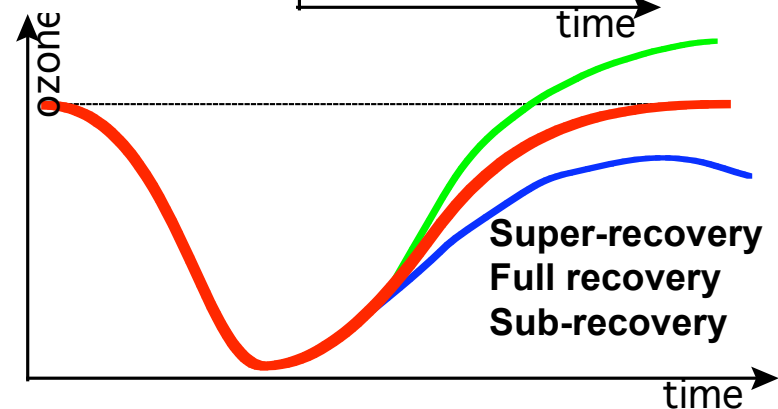
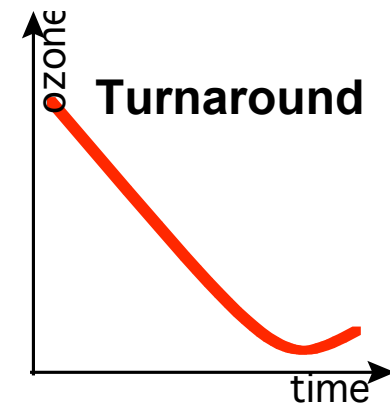


Ozone recovery

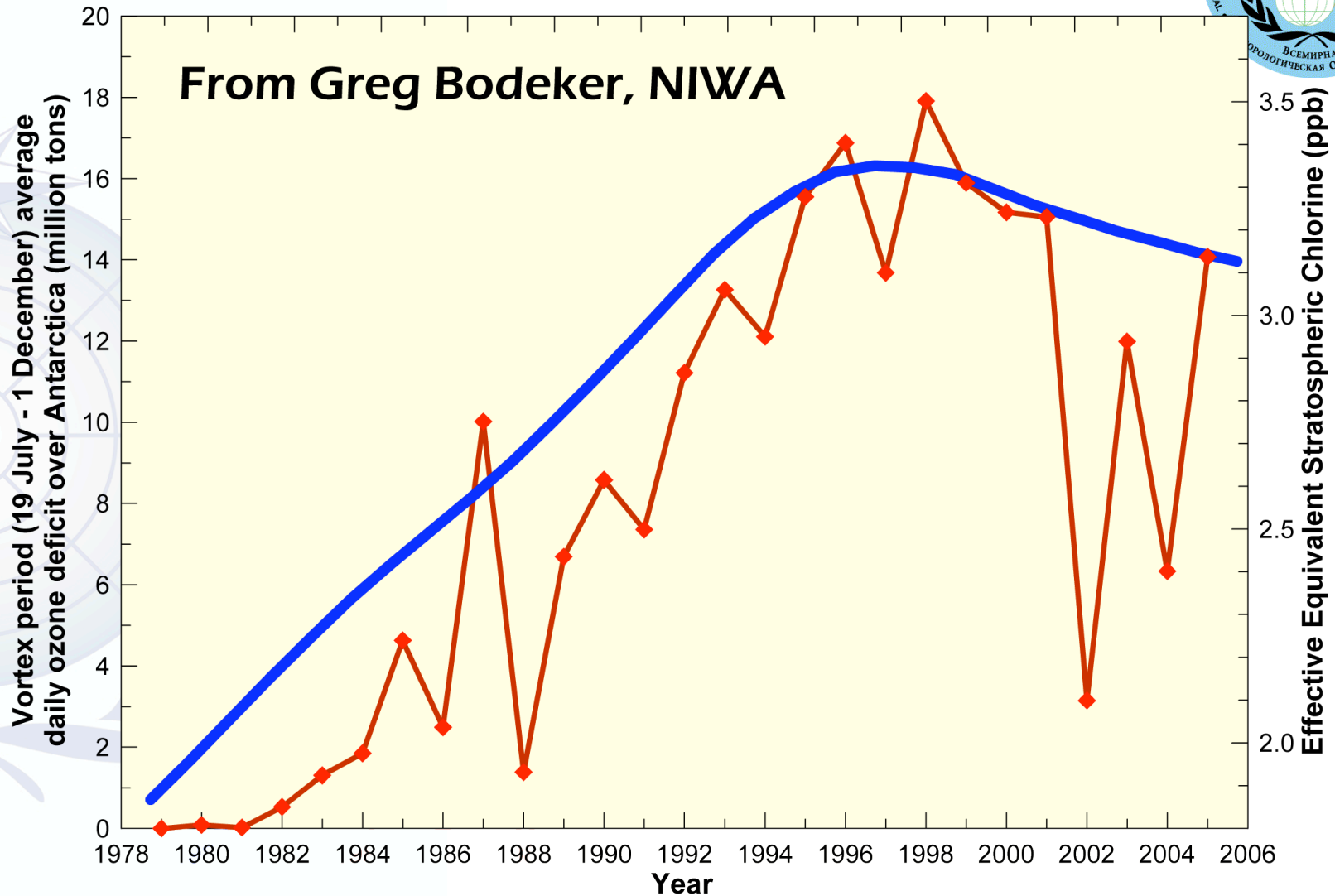
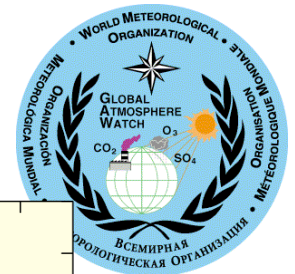
- ♣ How can we measure it?
- ♣ Where can we measure it?
- ♣ What are the criteria?
 - How can we be sure that a change in ozone is due to reduced EESC?
- ♣ How does Δ GHGs & climate change affect recovery?
- ♣ Modelling is needed for attribution.
- ♣ Can we define a global annual ozone index?



Onset of recovery

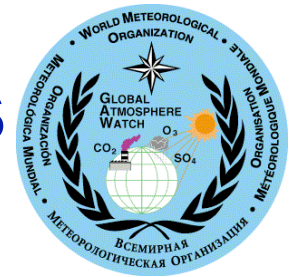


Is this ozone recovery?



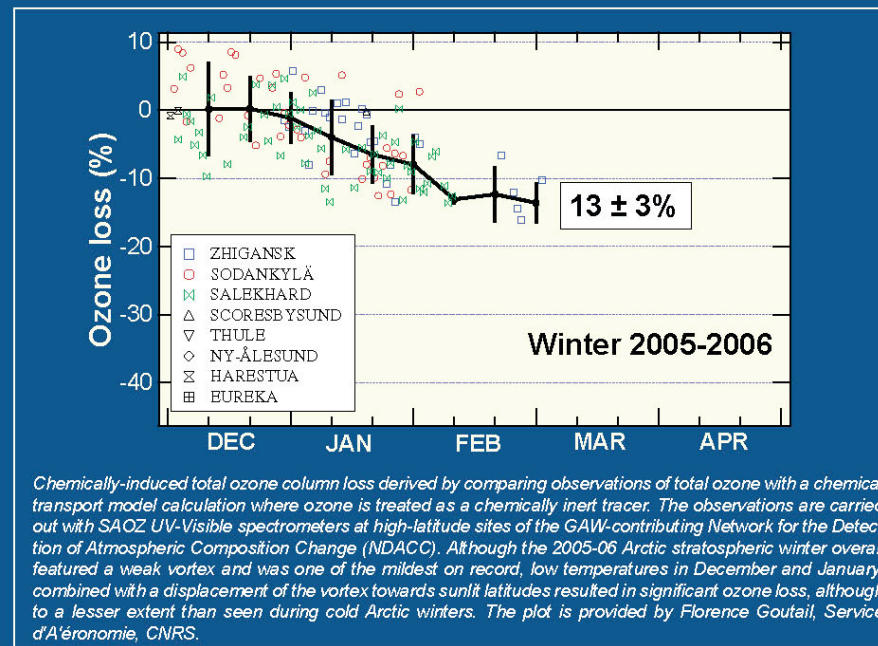
WMO/EC Arctic Ozone Bulletins

An example of a need for meaningful diagnostics/metrics



Joint WMO/EC SCOUT-O3 Arctic Ozone Bulletin

No 1/2006
Winter/spring summary



SCOUT-O3



World Meteorological Organization
Weather • Climate • Water

15 September 2006

Global Atmosphere Watch



WMO
OMM

SPARC-DA: Workshop at ESTEC 2-4 Oct 2006

Vortex averaged PV

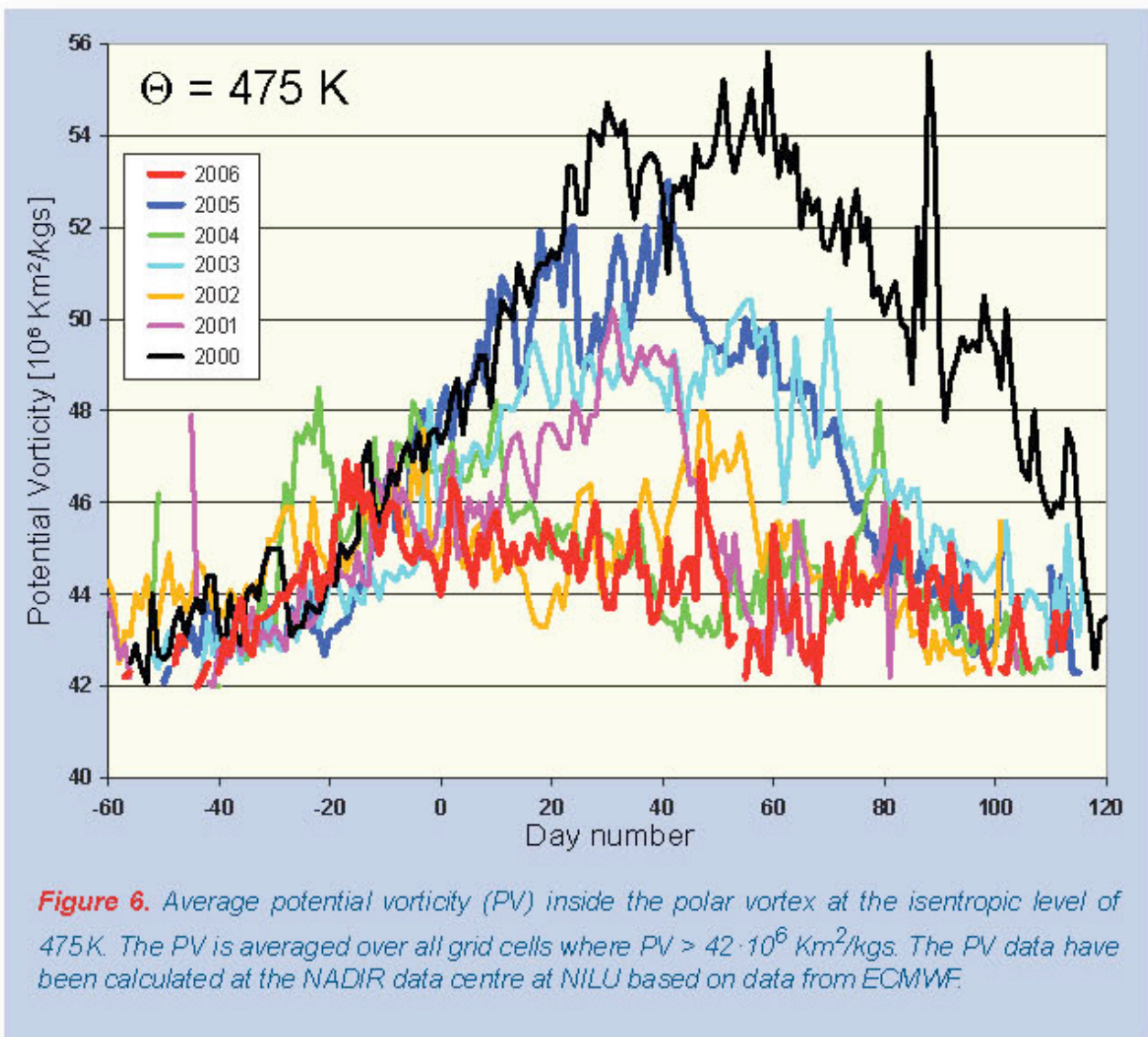
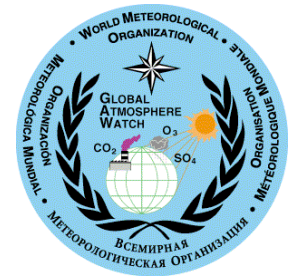
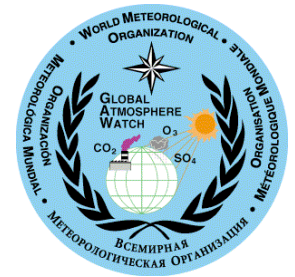


Figure 6. Average potential vorticity (PV) inside the polar vortex at the isentropic level of 475K. The PV is averaged over all grid cells where $PV > 42 \cdot 10^6 \text{ Km}^2/\text{kgs}$. The PV data have been calculated at the NADIR data centre at NILU based on data from ECMWF.

Useful products/services Wishlist



- ♣ Relational data base with all Dobson, Brewer and ozonesonde data.
 - Easy extraction of time series, long term means, extremes
 - Easy plotting
 - One could make a trial product covering a limited period of time
- ♣ Easy access to meteorological data
 - ECMWF, NCEP,
 - Temperature, PV
 - High level products: Vortex area, PSC area...
 - Climatology, long-term means, extremes
 - 2-D maps
 - Animations



Wishlist contd.

♣ One stop portal for access to all atmospheric chemistry satellite data and assimilation products

- A lot of data and products are “out there”, but there is no overview/catalogue of all available products
- Overview should also contain links to satellite-based high-level and assimilation products

♣ Long term products/trends

- Convention support (Vienna Convention & Montreal Protocol)
- Ozone trends
- Trends in source gases and reservoirs
- Annual updates + support for the ozone assessment

WMO



THANK YOU

