

(On behalf of)
GAW

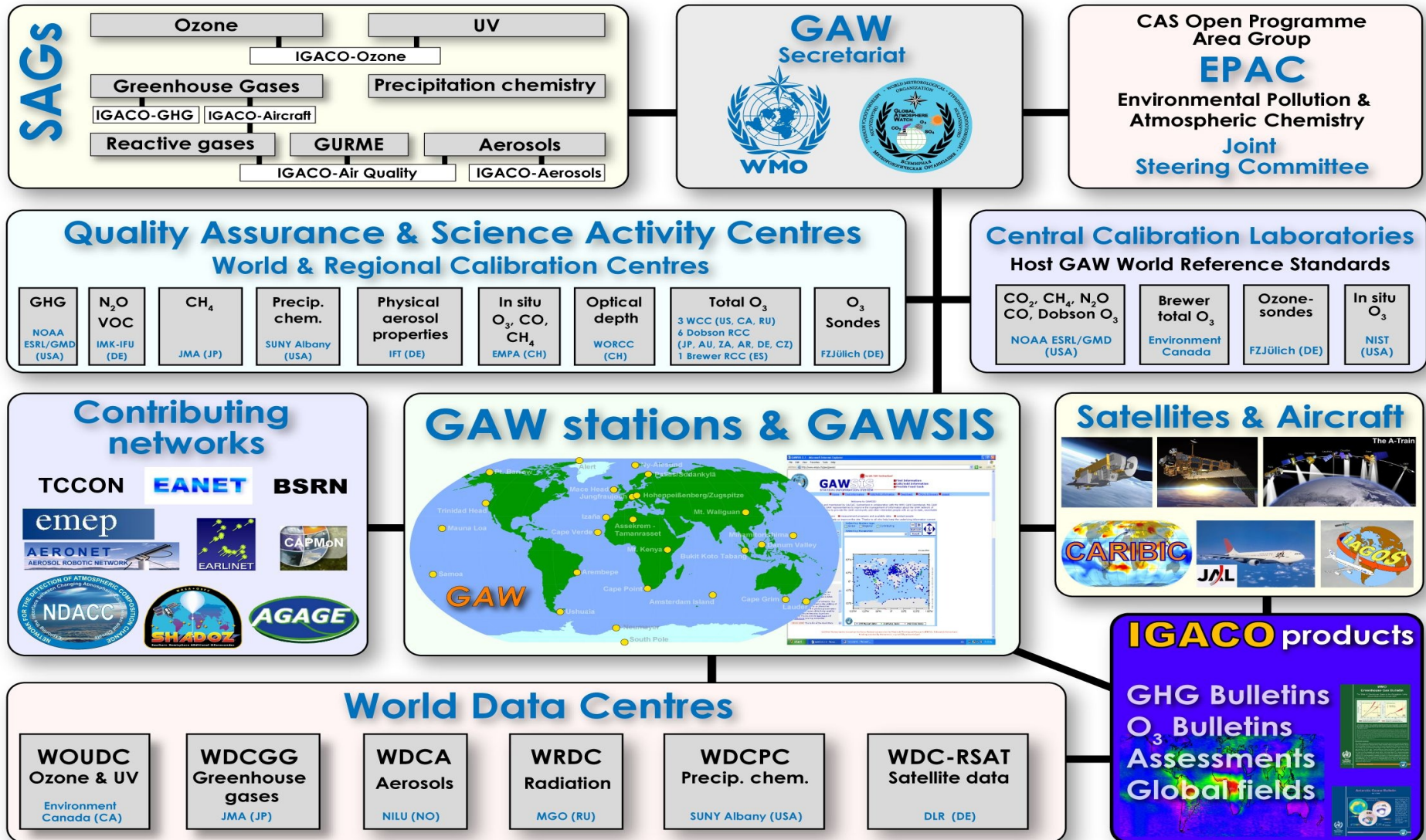
Johannes Staehelin
(chair person of SAG-ozone)
Institute for Atmospheric and
Climate Science, ETHZ

Presentation

1. Terms of Reference SAG-ozone
2. Short history
3. Ozone and climate
4. Ozonesondes
5. (Personal) concluding remarks

1. Global Atmosphere Watch

(courtesy Geir Braathen)



Scientific Advisory Group for ozone **Group (SAG-ozone): members**

Ex officio members: Geir Braathen (WMO)

Johanna Tamminen (IGACO-O₃/UV)

Frank Baier, Jack Fishman, Sophie Godin-Beekmann, Robert Evans, Ulf Koehler, Takashi Koide, Ed Hare, Tom McElroy, Alberto Redondas, Herman Smit, Rene Stübi, Johannes Staehelin *, Richard Stolarski, Ronald van der A, Karel Vanicek, Mark Weber

* Chair person

Terms of Reference SAG-ozone (annual meetings)

- Calibration of ozone spectrophotometers (Dobson and Brewer instruments)
 - primary instruments calibr. by Langley plot method
 - calibration of station instruments by side by side comparison
- Ozone profile measurements (ozonesondes and Umkehr measurements)
- Ozonesondes: Simulation chamber JOSIE (Ozone Sonde Intercomparsion Experiment)
- (Cooperation with) IGACO-Ozone/UV
- NRT delivery of ozone data and WIS

New task: IGACO-O3/UV coordinator: J ohanna Tamminen, FMI

WORLD METEOROLOGICAL ORGANIZATION
GLOBAL ATMOSPHERE WATCH



IGACO-Ozone and UV Radiation Implementation Plan

Authors:

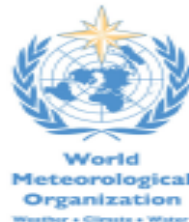
G. Braathen, WMO, AER, Research Department

A. Mäkki, FMI

J. Staehelin, ETH Zürich, GAW O₃ SAG Chair

J. Tamminen, FMI, Coordinator IGACO-O₃/UV

A. Webb, Univ. Manchester, GAW UV SAG Chair



Comparison
Ground-based,
Aircraft,
Satellite
Ozone
measurements

GAW Report No. 182, 2009

2. *Short history*

- 1970: *Johnston and Crutzen*: O₃ depletion by NO_x from SST
- 1974: *Stolarksi and Cicerone*: O₃ depletion by ClO_x
- 1974: *Molina and Rowland*: **O₃ depletion by anthropogenic CFCs**

Requirement of reliable measurements (GO₃OS)

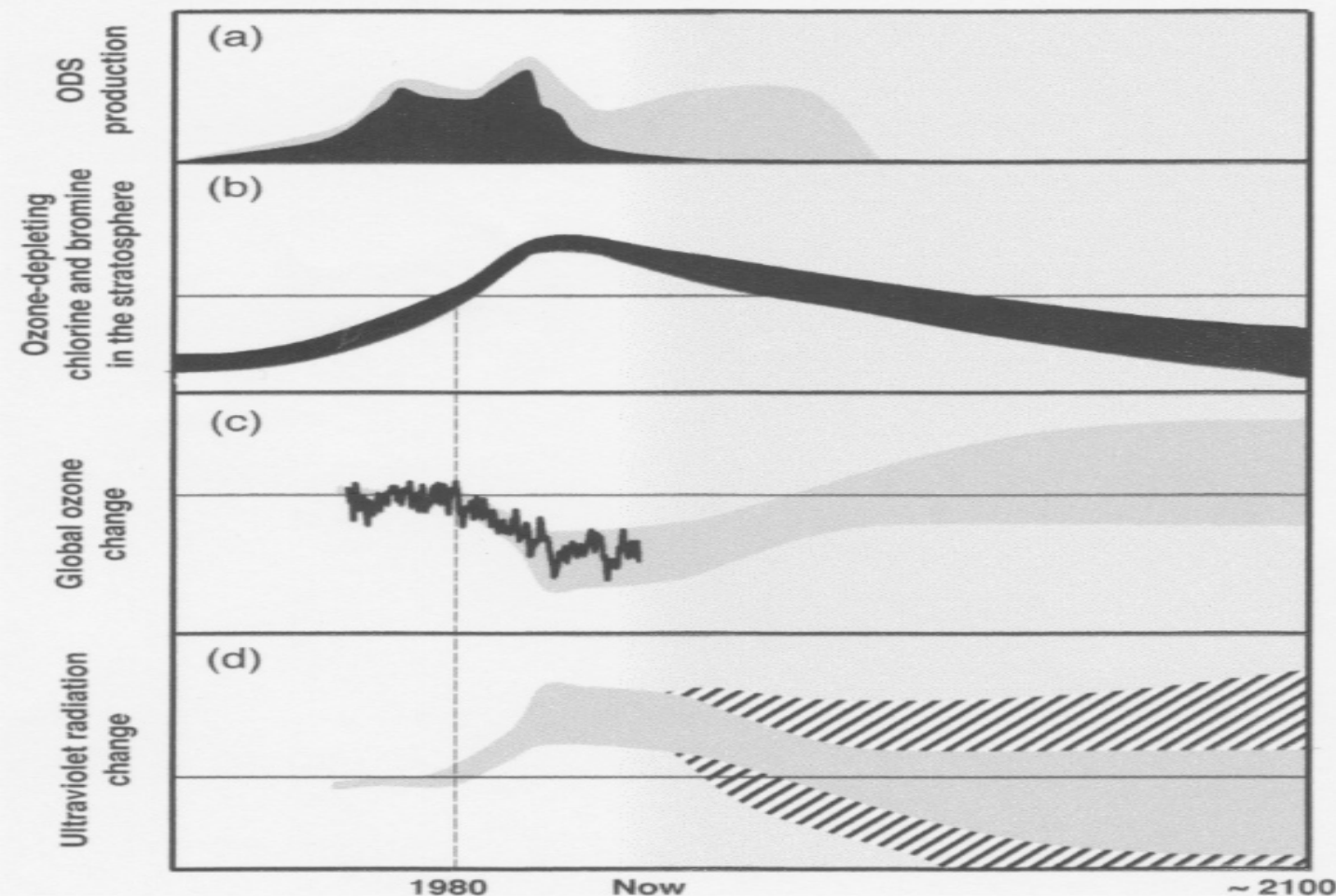
- 1979: *Start of (quasi) continuous and quasi global O₃ observations by satellites (TOMS, SBUV, SAGE, GOME)*
- 1985: *Farman et al.*: Large losses of total ozone in Antarctica reveal seasonal ClO_x/NO_x interaction: **Antarctic ozone hole**

Large discrepancy in O₃ trends from satellite and ground-based measurements

1988: *International Ozone Trend Panel Report*: Ground-based measurements more reliable (development of vs. 7 TOMS data (2004: vs. 8))

Montreal Protocol (1987)

Stratospheric ozone depletion by Ozone Depleting Substances (ODS: CFCs and halons): *Recovery ??*

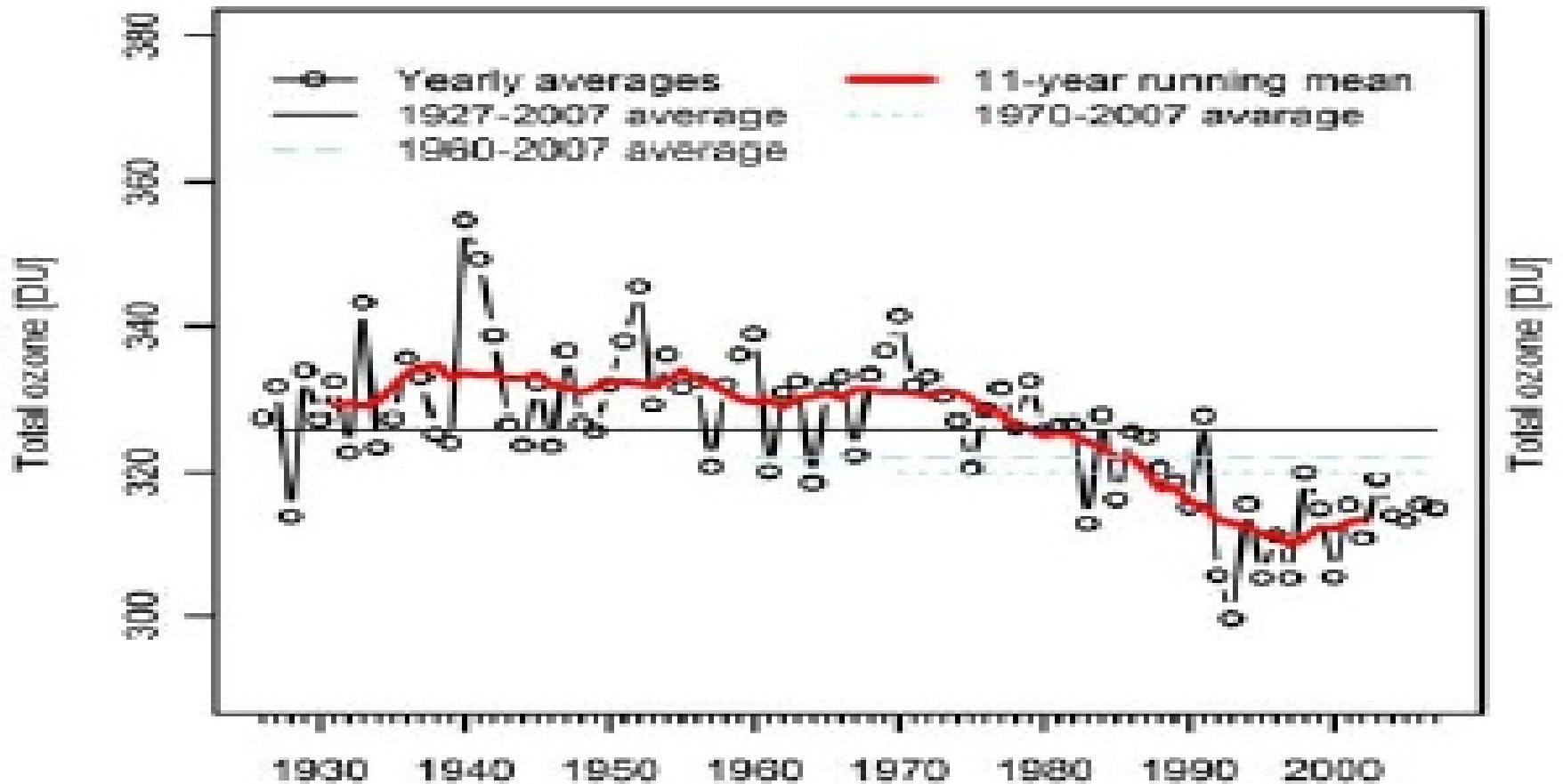


Emissions of
Ozone Depleting
Substances (ODS)
black: CFCs;
grey: HCFCs

Chemical
Ozone
Depletion (by
ODS)

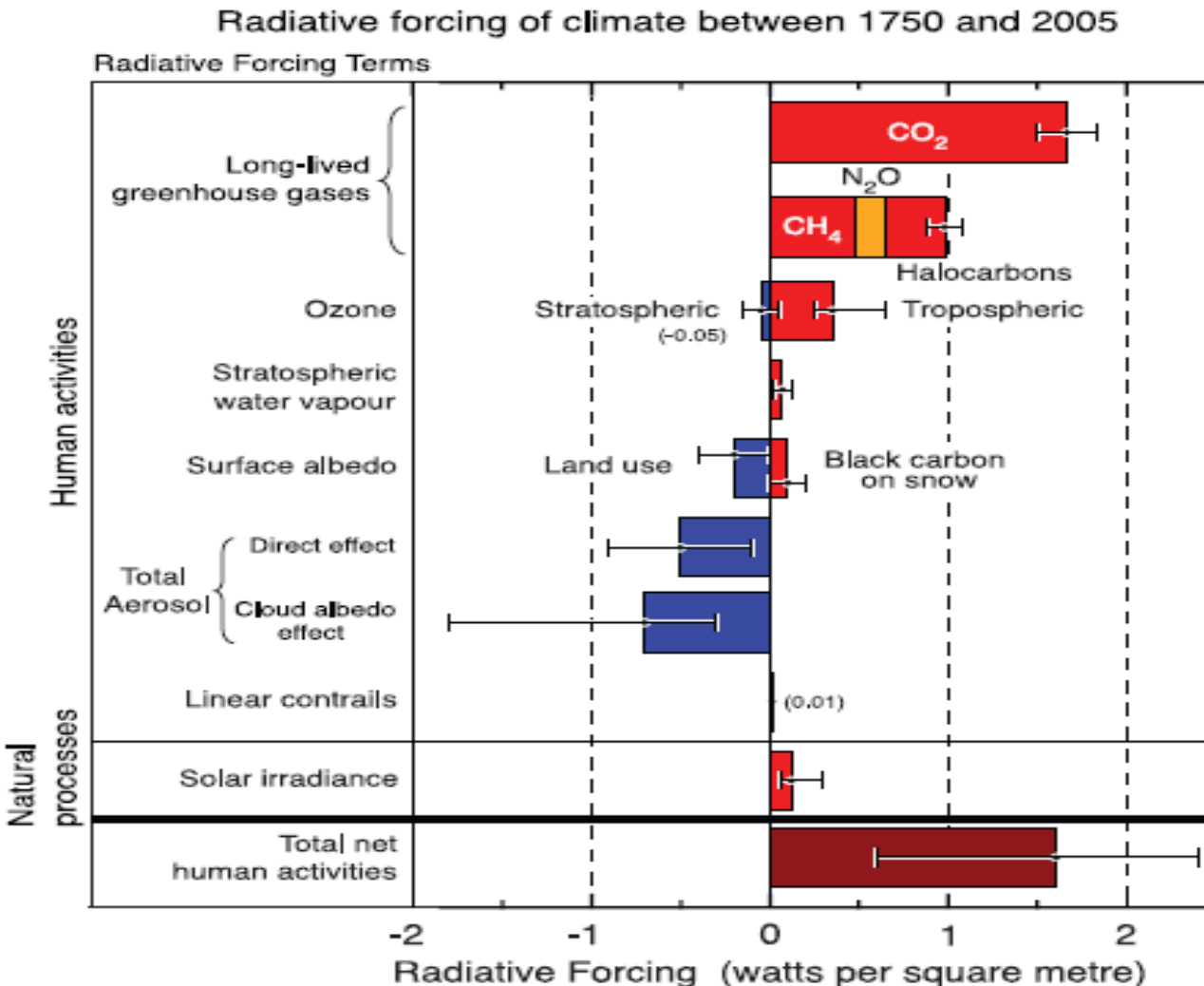
Ozone layer:
Black: Measurements
(60°S-60°N)
Grey: Numerical
simulations

Total ozone series of Arosa (longest series of the World, continued by MeteoSwiss since 1988) *Attribution ozone trends: ODS/climate change ?*



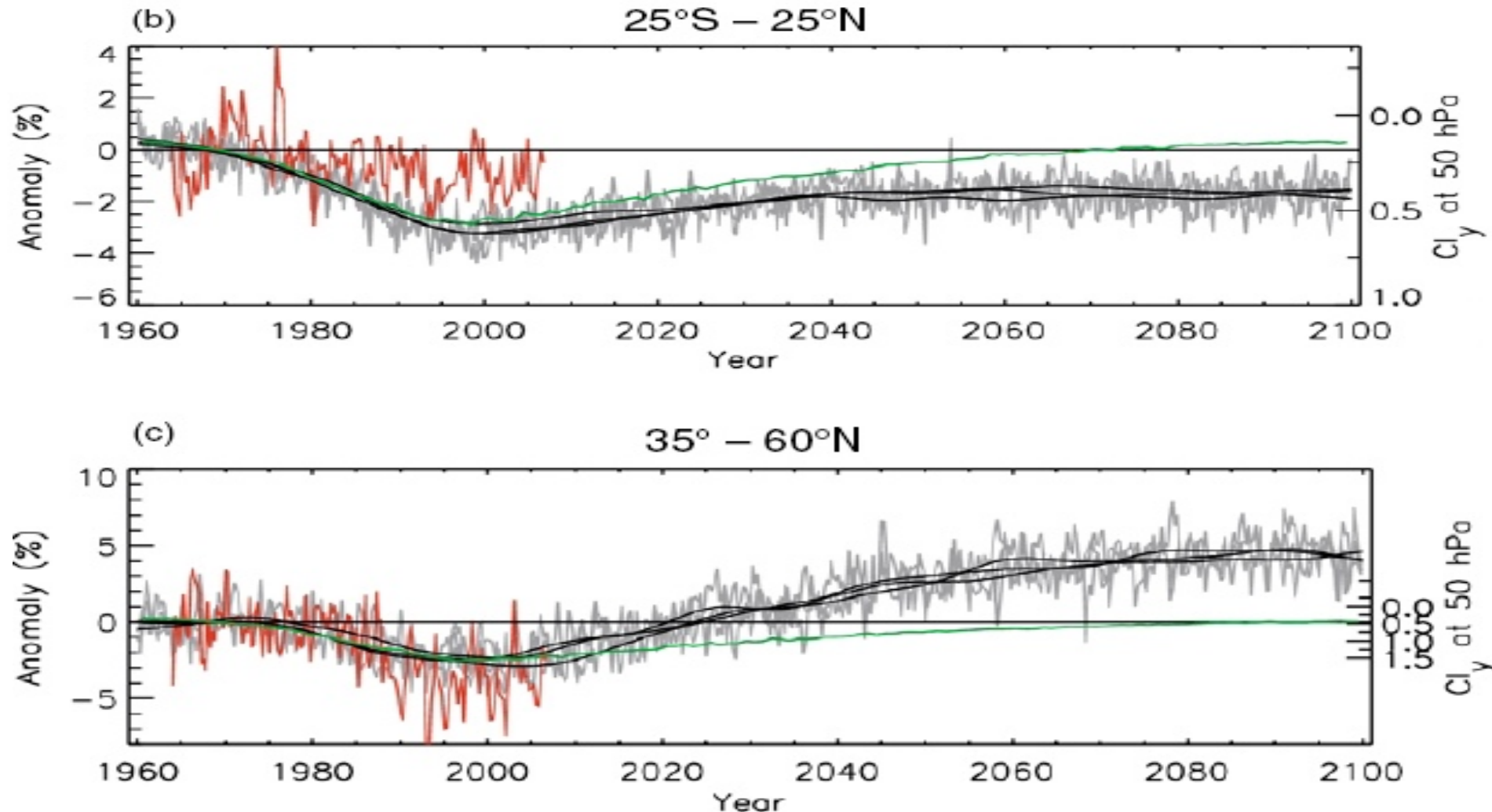
3. Ozone and Climate

Radiative forcing of ozone



Ozone:
Essential Climate
Variable:
GCOS
Second Report
on Adequacy
of Global
Observing
Systems for
Climate in
Support of UNFCCC
April 2003

Ozone anomalies from *model CMAM* and *measurements*; *Cly* (Shepherd, 2008) Present debate:
Enhancement Brewer/Dobson circulation ?
new (additional) climate problem ?



Ozone in the free troposphere (greenhouse gas)

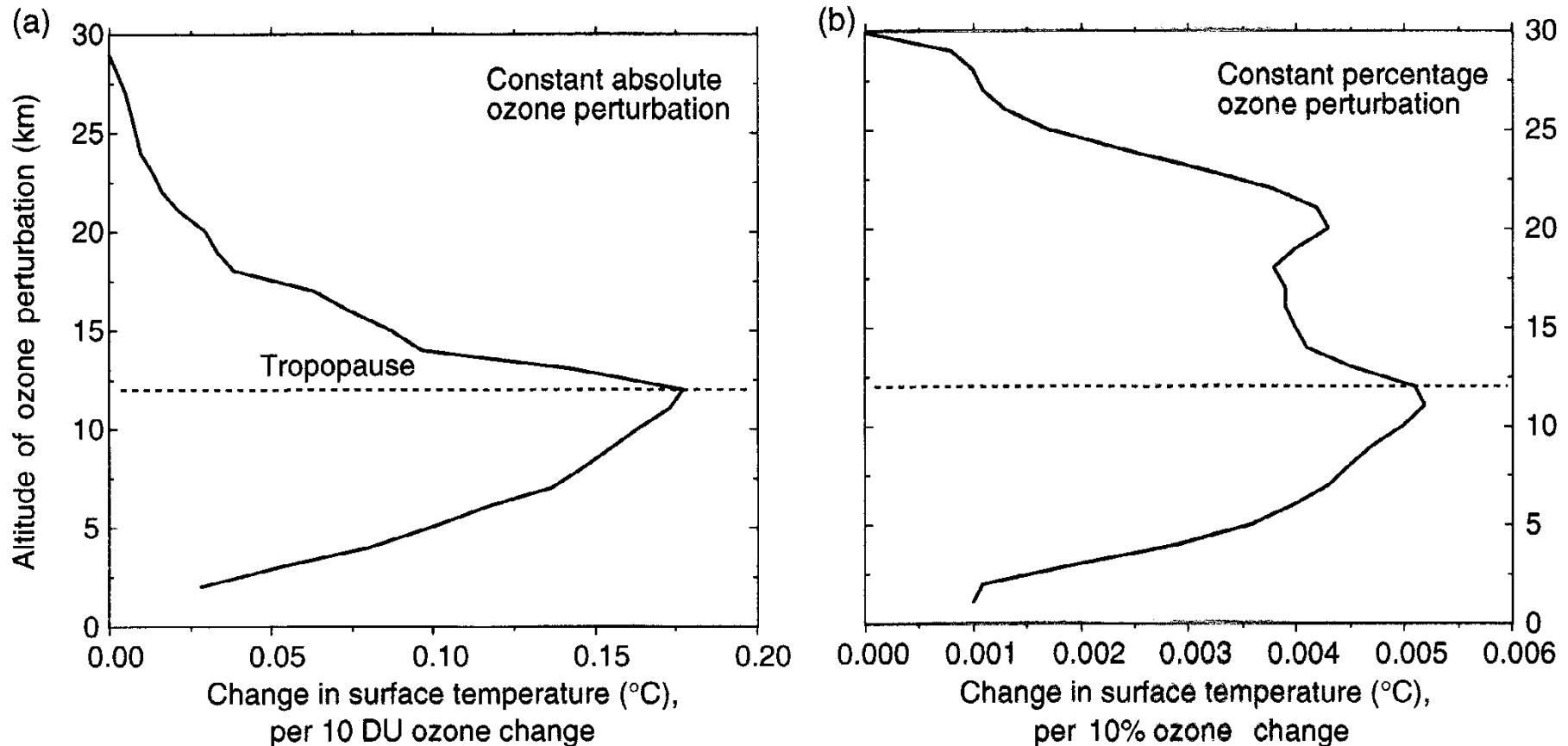
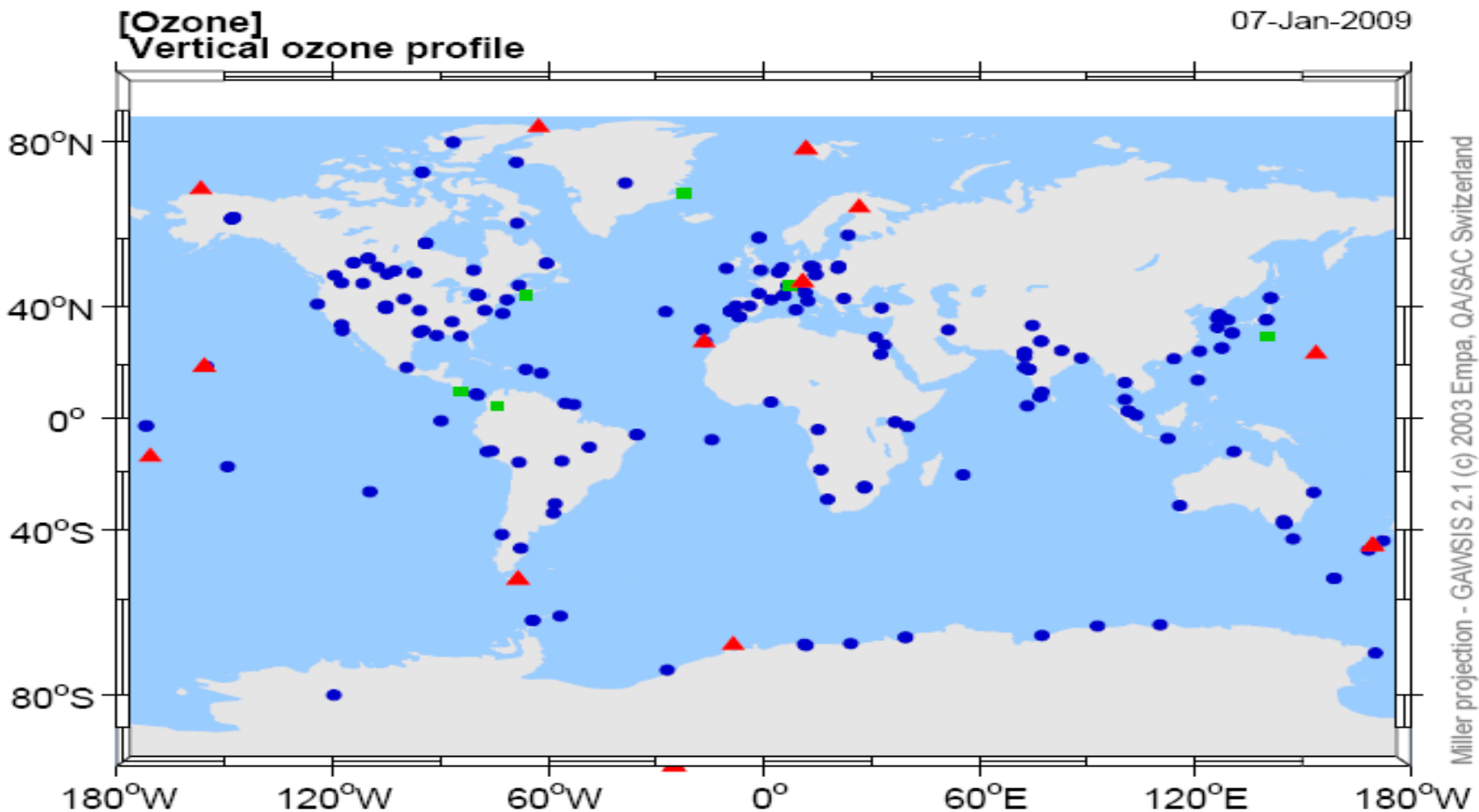


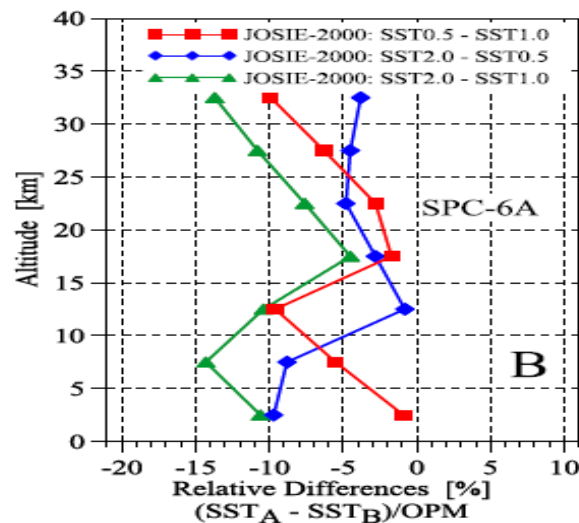
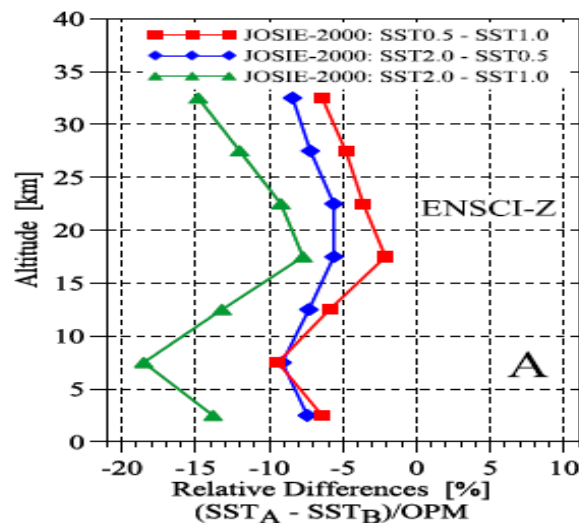
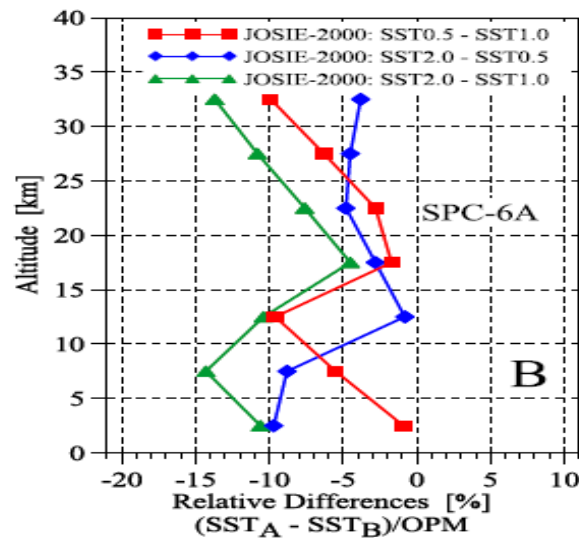
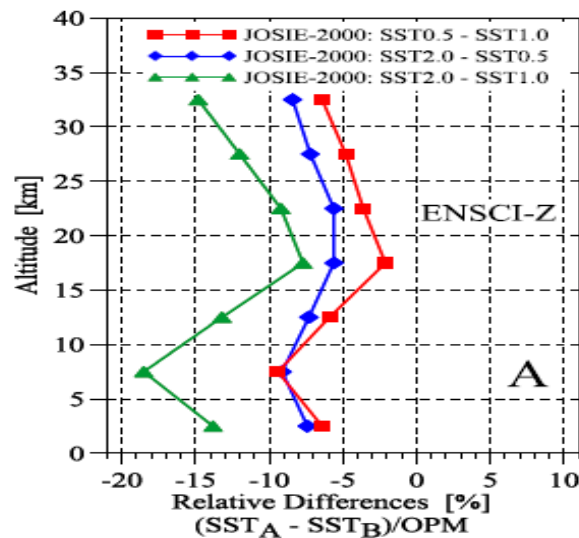
Figure 6.1: Dependence of the surface temperature response on the height and type of O_3 perturbation; (a) shows the sensitivity to a constant absolute change (10 DU), while (b) shows the sensitivity to a constant percentage change (10%). The model tropopause is at 12 km. From Forster and Shine (1997).

4. *Ozonesondes*

GAW, NDACC, SHADOZ



Effects of different configurations of ECC sonde measurements on ozone concentrations (derived from the simulation chamber in Jülich, Smit et al., 2007).



T. Desher, et al.:
Atmospheric comparison
of electrochemical cell
ozonesondes from different
manufacturers,
and with different cathode
solution strengths:
The Balloon Experiment on
Standards for
Ozonesondes,
J. Geophys. Res., 2008.

R. Stübi, et al.:
In-flight comparison of
Brewer-Mast and
electrochemical
cell ozonesondes, *J.
Geophys. Res.*, 2008.

5. (Personal) concluding remarks

- Measurements of high data quality crucial (ozone trend analysis and climate science) !
- Increasing demand high quality ground based ozone measurem.: merged ozone satellite series (satellite instruments: limited lifetimes, changes small)
- Funding for monitoring ?
- Close cooperation with scientists beneficial
- Pragmatic step by step approach (often) useful (many sites have different histories and strengths)
- Homogeneity of series needs attention