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Liaison with the World Meteorological Organization (WMO)

Isabelle Rüedi

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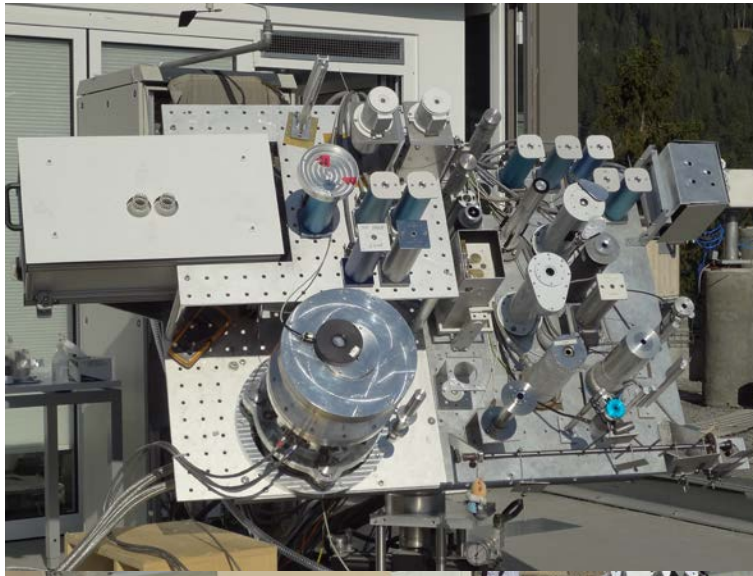
12th International Pyrheliometer Comparison

- Took place at PMOD/WRC from 28 Sept. – 12 Oct. 2015
- Participants: 33 countries, 134 pyrheliometers
- Confirmed stability of WRR since last IPC
- Served as EURAMET supplementary comparison (EURAMET.PR-S6)
  - METAS (Switzerland)
  - NPL (United Kingdom)
  - VNIIOFI (Russian Federation)
  - NIMO (China)
- Short film to promote IPC and traceability of radiation measurements in meteorological community: https://vimeo.com/164968933
- Short version for general public in preparation



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WRR-SI Comparison

- CSAR/MITRA preliminary results confirm *scale offset* of ~0.3% between WRR and SI base units
- Enhancements to MITRA reduced the absolute uncertainty of CSAR/MITRA data to ~200 ppm
- Improved thermal control and window cleaning procedure allowed for a reduced absolute uncertainty
- Largest contribution to uncertainty from unknown zero offset due to residual themperature drifts will be eliminated in a new MITRA prototype with a third (dark) cavity

2nd International Pyrgeometer Comp.

Comparison of WISG with:

- 33 pyrgeometers from 18 countries
- 4 IRIS & 2 ACP
- Discrepancies (4-5 W/m2)between WISG and IRIS/ACR observed by clear conditions, better agreement in cloudy conditions

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CIMO Task Team on Radiation References (TT-RadRef)

Role: address implications of proposed changes to the solar and terrestrial radiation references (WRR and WISG) by:

- Assessing potential impact and consequences of a change in solar/terrestrial reference scales for stakeholders WRR and WISG introduced by WMO
- Making recommendation on requirements and timeliness for a modification of the current references, and if required develop an implementation plan for the change (including proposing how to deal with old data and timelines for its introduction)

Timelines:

- TT-RadRef will carry out its work in the coming 2 years.
- Relevant recommendations will be submitted to CIMO (2018) for approval.

Toward a change of references or not?

- WMO's concerns and considerations:
  - Committed to traceability to SI
  - In case of a change of reference, difficulties in applying it to historical measurement databases
- Concerns:
  - Discrepancies between WRR/WISG and SI are based on one (two) instrument(s) / instrument type(s)
  - How well are these instruments characterized?
  - Risk associated with a new reference based on 1 instrument / instrument type.
- Close collaboration with CCPR and NMIs to:
  - Assess the characterization of the new instruments and their uncertainty budgets
  - Assess the traceability of these instruments
  - Encourage the development of other similar instruments




Status of the ACSO Activity

(Absorption Cross-Sections of Ozone led by J. Orphal)

Isabelle Rüedi & Geir Braathen

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Introduction

- Atmospheric ozone is measured from the ground and from space, usually making use of the interaction of the solar radiation with ozone in different wavelength ranges
- Satellite measurements provide global coverage
- Ground-based measurements essential to validate satellite ozone measurements
- To ensure long-term stability, it is desirable to use the same laboratory spectroscopic data for ground-based and satellite measurements to minimize errors.
- Temperature dependence of the cross-sections are important , due to the variable vertical distribution of ozone and temperature in the atmosphere.

Background

Motivation:

Different sets of absorption cross-sections of ozone are available and lead to significant differences in atmospheric ozone concentrations from ground-based (Dobson, Brewer, Umkehr, DOAS, LIDAR), air-borne and satellite-based instruments and networks.

Approach:

Community-based initiative from 2008 to 2015, mandated by the International Ozone Commission (IO_3C), the World Meteorological Organisation (WMO) and the IGACO (Integrated Global Atmospheric Chemistry Observations) O_3/UV Subgroup, to investigate the impact of different sets of absorption cross-sections of ozone and make recommendations.

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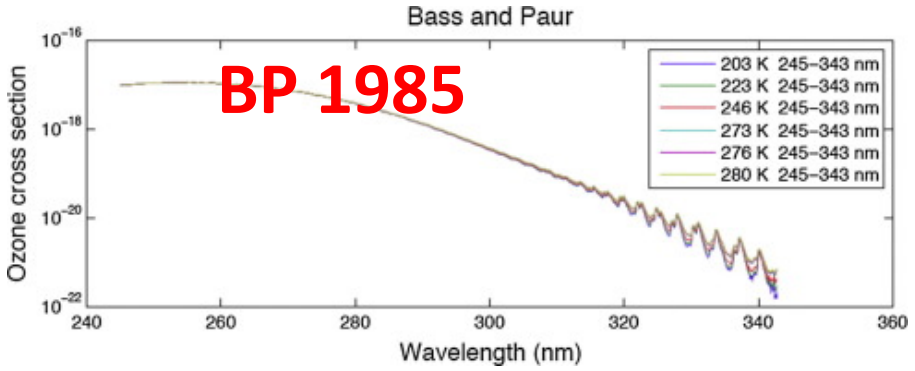
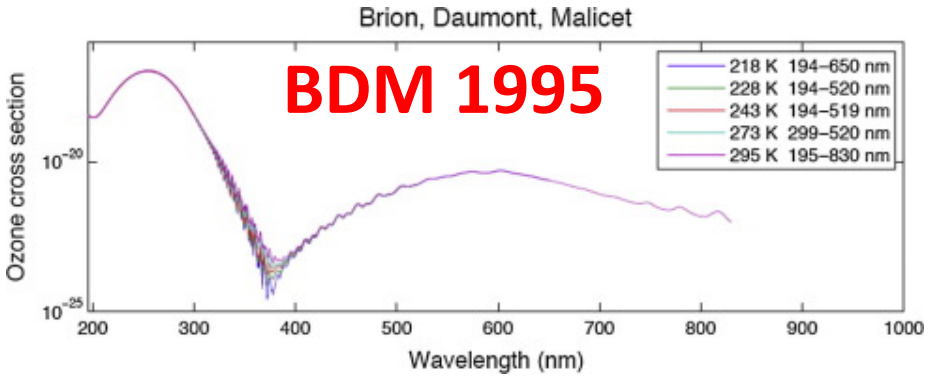
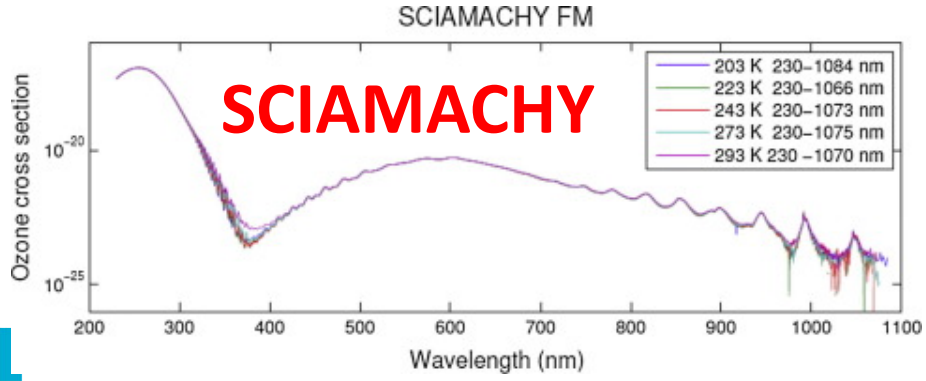
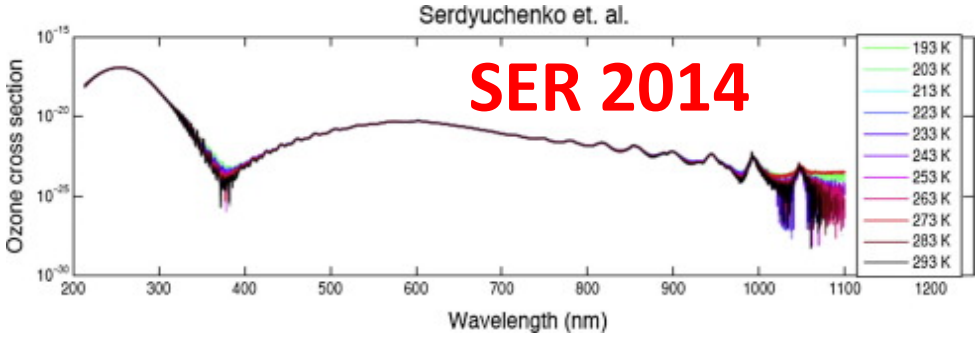
Selected different sets of absorption cross sections









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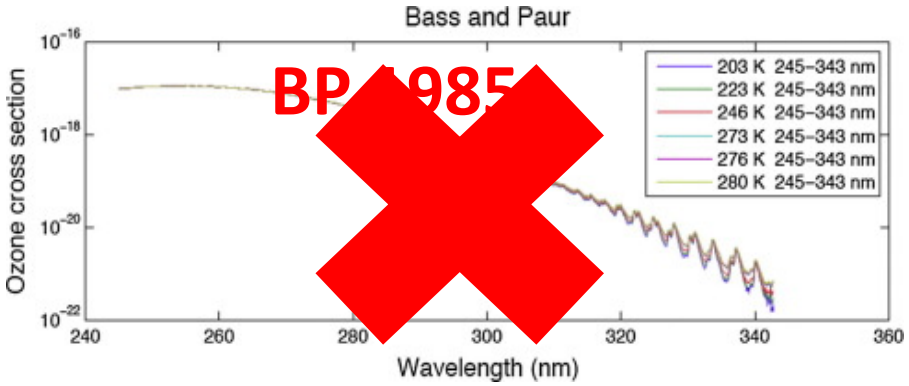
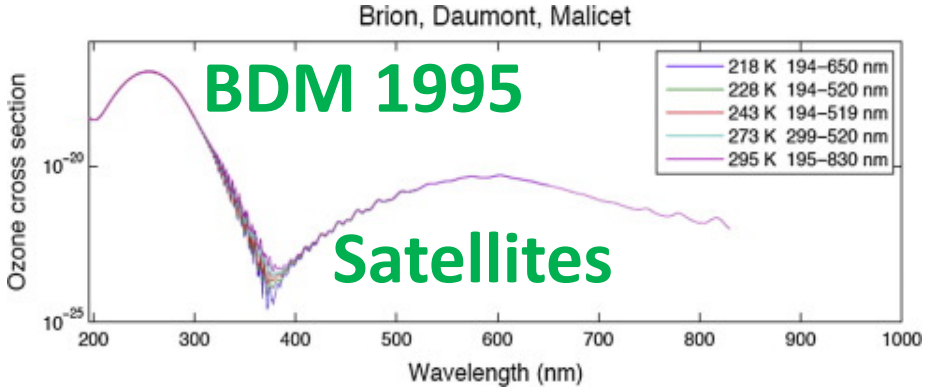
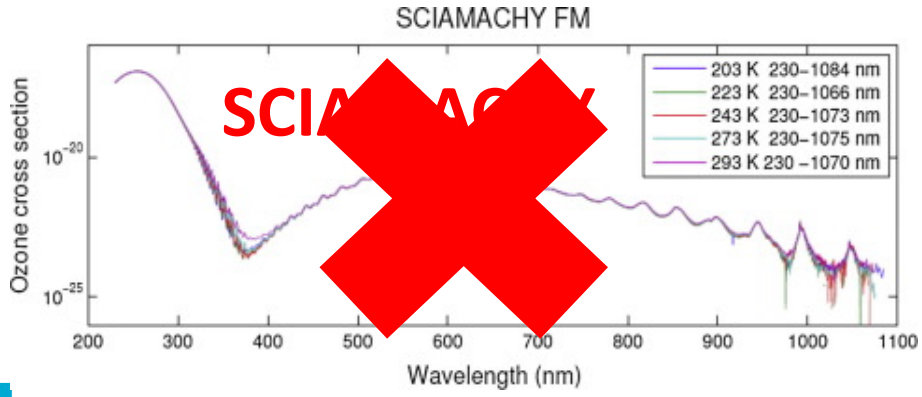
Recommendations from the ACSO group

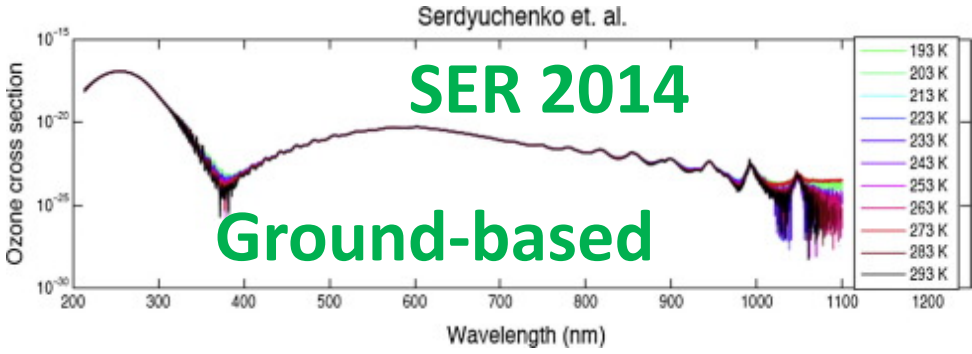
(a) The spectroscopic data of Bass and Paur (BP, 1985) should no longer be used for retrieval of atmospheric ozone measurements.
(b) For retrieval of ground-based instruments of total ozone and ozone profile measurements by the Umkehr method performed by Brewer and Dobson instruments data of Serduyuchenko et al. (SER, 2014) are recommended to be used. When SER (2014) is used, the differences between total ozone measurements of Brewer and Dobson instruments are very small and the differences between Dobson measurements at AD and CD wavelength pairs are diminished.
(c) For ground-based Light Detection and Ranging (LIDAR) measurements the use of Brion, Daumont, Malicet (BDM, 1995) or SER (2014) is recommended.
(d) For satellite retrieval the presently widely used data of BDM (1995) should be used because SER (2014) seems less suitable for retrievals that use wavelengths close to 300 nm due to a deficiency in the signal-to-noise ratio in the SER (2014) dataset.

Recommended sets of absorption cross sections









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Recommendations from IO_3C

- Dobson and Brewer spectrophotometers should use the new cross sections from the Univ. of Bremen (SER 2014) both for total ozone and Umkehr retrievals
- The actual temperature in the stratosphere at the moment of the measurement should be used instead of a fixed temperature (-46°C).
- The WMO/GAW Scientific Advisory Group for Ozone (SAG-O_3) has the task to implement this.
- This should be implemented across the global ozone observing network.

The work of ACSO also showed:

- The need to continue laboratory cross-section measurements of ozone of highest quality. The importance of careful characterization of the uncertainties of the laboratory measurements.
- The need to extend the scope of such studies to other wavelength ranges (particularly to cover not only the Huggins band but also the comparison with the mid-infrared region).
- The need for regular cooperation of experts in spectral laboratory measurements and specialists in atmospheric (ozone) measurements.

References:

J. Orphal et al., Journal of Molecular Spectroscopy, 327, 105-121, 2016;
WMO – GAW Report No. 218 (www.wmo.int/gaw)

Journal of Molecular Spectroscopy 327 (2016) 105–121

Contents lists available at ScienceDirect

Journal of Molecular Spectroscopy

journal homepage: www.elsevier.com/locate/jms

Absorption cross-sections of ozone in the ultraviolet and visible spectral regions: Status report 2015

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ABSTRACT

The activity "Absorption Cross-Sections of Ozone" (ACSO) started in 2008 as a joint initiative of the International Ozone Commission (IO3C), the World Meteorological Organization (WMO) and the IGACO ("Integrated Global Atmospheric Chemistry Observations") O_3/UV subgroup to study, evaluate, and recommend the most suitable ozone absorption cross-section laboratory data to be used in atmospheric ozone measurements. The evaluation was basically restricted to ozone absorption

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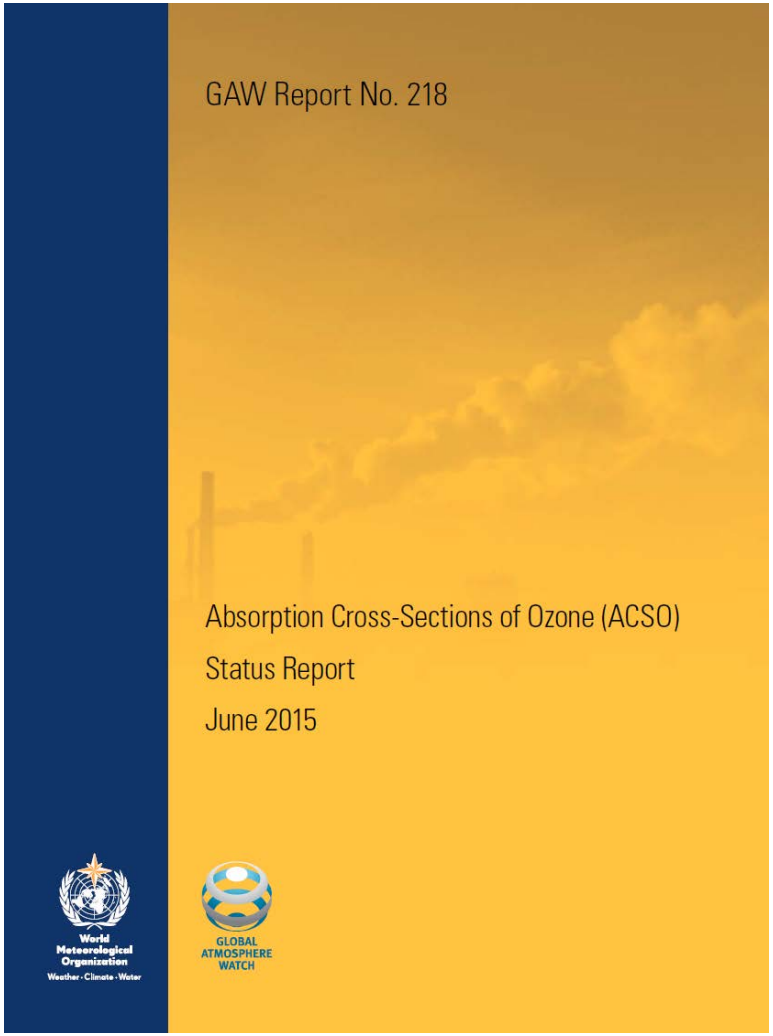
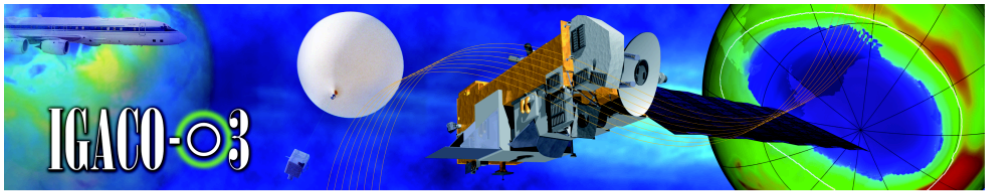


ACSO resource web site at FMI

http://igaco-o3.fmi.fi/ACSO



- Ozone cross sections:
  - **BP, BDM**
  - **Bogumil et al. v3 (SCIA)**
  - **Burrows et al. (GOME)**
  - **Serdyuchenko et al.**
  - **Updated SCIA FM (Bogumil v 4, Chehade 2013)**
- References
- Presentations at ACSO workshops

Home

Workshop 2013

Ozone Theme Meeting 2010

Ozone Theme Meeting 2009

Ozone Cross Sections

Members of Expert Team

Working Groups

IGACO-O3/UV

Cross sections

Bass-Paur	bp_203clc.dat bp_223clc.dat bp_246clc.dat bp_273clc.dat bp_276clc.dat bp_280clc.dat bp.par bpconv.f90
Brion-Daumont-Malicet	O3_CRS_BDM_218K.dat O3_CRS_BDM_228K.dat O3_CRS_BDM_243K.dat O3_CRS_BDM_273K.dat O3_CRS_BDM_295K.dat
FTS-Voigt	o3_203h.dat o3_203l.dat o3_223h.dat o3_223l.dat o3_246h.dat o3_246l.dat o3_280h.dat o3_280l.dat o3_293h.dat o3_293l.dat
GOME-Burrows	202air.dat 202vac.dat221air.dat 221vac.dat 241air.dat 241vac.dat 273air.dat 273vac.dat 293air.dat 293vac.dat
SCIAMACHY-Bogumil	O3_203K_V3_0.dat O3_223K_V3_0.dat O3_243K_V3_0.dat O3_273K_V3_0.dat O3_293K_V3_0.dat
Revised SCIAMACHY (Chehade *et al.*, 2013)	SCIA_O3_Temp_cross-section_V4.1.DAT
Serdyuchenko *et al.* (2012)	Serdyuchenko_O3_temp.dat SerdyuchenkoGorshelev5digits.dat

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Thank you!
Merci!
Gracias!
Спасибо!

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