

Interactive comment on “The Effect of Instrumental Stray Light on Brewer and Dobson Total Ozone Measurements” by Omid Moeini et al.

A. Redondas (Referee)

aredondasm@aemet.es

Received and published: 19 May 2018

1 General comments

The article is interesting as the effect of the stray light on the ozone cross section calculation were not studied on the past. I have a few comments which I would the authors to answer, pending those I support the publication of the manuscript.

The principal comment i repeat from my first evaluation is why they don't use the (Serdyuchenko 2014) cross section in his calculations , when is now the recommended ozone cross section for Brewer and Dobson. Moreover some of the discussions of the paper like the AD/CD ozone difference in the Dobson measurements and the

Printer-friendly version

Discussion paper



Brewer/Dobson differences are also affected with the change of cross section (Redondas 2014). The discussion (Section 3.1) is still difficult to follow especially the Dobson section (see specific comments).

The second point to mention is the ETC calculation in section 3.2, is not clear how is calculated, in particular how is related from Chance and Kurucz (table 2).

As suggested by the referee Julian Groebner on the discussion on the paper also part of this special number (Redondas 2018). The difference between the use of trapezoid slit and a triangular slit is about 0.7% in a double brewer. I think is usefull to include this case in your calculation.

The error introduced by the assumption of the fixed air-mass is also showed but could be more illustrative to show the difference in ozone rather than in airmass. The effect on the Dobson record at South Pole was also studied by (?) a comparison with his results could be also illustrative.

2 Specific comments

Page 2, 30: A basic description of the method is worthwhile, the method is based on the characterization of the instrument and need both the spectral response and the Laser measurements of the slit rather than the dispersion information. A comparison between the Kiedrom/Karppinen model ant this work will be illustrative.

Page 3, 7: A reference of the false positive trend due different stray light is advisable.

Page 4: There is no explanation of the calibration of the Dobson as is done with the Brewer

Page 5: There is some confusion on the nomenclature of the formulas: please unify B or ETC, F or I.

[Printer-friendly version](#)[Discussion paper](#)

Page 5,29 : A reference of the application of the Barnes correction to the Brewer network will be advisable.

Page 6,1 : There are several files available at IGACO, which ones are used in this study?.

Page 6,20 Could clarify the relation between equations 11, 15,17 and 18. (se allso 9,1).

Page 7.15: A mention of a other sources of stray light could be mention, see for example Josefsson and discussed.

Page 9,1: There is a confusing use of $\overline{\alpha}_i$ vs α_i^{approx} where are talking about $\Delta\alpha$. The same issue for table 3.

Page 9,5: Is surprising that the calculation of the operational values agree with yours calculations. In this work you are using a different cross section temperature, brewer uses -45 C but you are using -46.3 C (Table 2). The same nominal wavelengths (Table 1) for both brewers whereas brewer operative wavelengths are slightly different for every instrument, and the same FWHM for all the slits. Can be also useful to have the brewer ozone absorption coefficient for for every wavelength ($\overline{\alpha}_i$ vs α_i^{approx}) and not only the effective $\Delta\alpha$.

Page 10,5: An explanation why the calibration method reduces the the discrepancy to 0.7% independent of the level of stray light of the instruments and can be illustrated for example in figure 5.

Page 10,15: Please describe the calculation of the ETC, how is compared with the calculation of Kiedrom and (Karppinen 2015).

Page 10.25: Consider also to discuss the case of early spring at high latitudes, with low sun and high ozone content.

Page 11.15: Consider to plot corrected /uncorrected South Pole Brewer to illustrate the

[Printer-friendly version](#)[Discussion paper](#)

error due air mass calculation.

Page 12: A better description of the data-set might be provided or referenced: number of simultaneous measurement, if the data are available at WOUDC/NDACC databases, the QA/QC results of calibrations and how stable are in time the comparison between Dodson instruments, and brewer-dobson will help to interpret the comparison.

Page 12.15: Concerning the analysis, the intervals with a reduced number of observations should be removed, this discard for example most of the Dobson #80 observation for high ozone slant column. Consider to use the same order of the Dobson instruments in plots and enumerations.

Page 13,5 : In the conclusions refers that you are using the measured slit but in reality the central part of the slit is not measured, and are also model as trapezoid.

3 References

Bernhard, G., Evans, R. D., Labow, G. J., and Oltmans, S. J.: Bias in Dobson total ozone measurements at high latitudes due to approximations in calculations of ozone absorption coefficients and air mass, 110, <https://doi.org/doi:10.1029/2004JD005559>,

Josefsson, W.: Focused sun observations using a Brewer ozone spectrophotometer, 97, 15 813–15 817, <https://doi.org/10.1029/92JD01030>, <https://agupubs.onlinelibrary.wiley.com/doi/abs/10.1029/92JD01030.5>

Karppinen, T., Redondas, A., García, R. D., Lakkala, K., McElroy, C., and Kyrö, E.: Compensating for the effects of stray light in single-monochromator Brewer spectrophotometer ozone retrieval, *Atmosphere-Ocean*, 53, 66–73, 2015.

Redondas, A., Evans, R., Stuebi, R., Köhler, U., and Weber, M.: Evaluation of the use of five laboratory-determined ozone absorption crosssections in Brewer and Dobson

Printer-friendly version

Discussion paper



retrieval algorithms, *Atmospheric Chemistry and Physics*, 14, 1635–1648, 2014.

Redondas, A., Nevas, S., Berjón, A., Sildoja, M.-M., León-Luis, S. F., Carreño, V., and Santana, D.: Wavelength calibration of Brewer10spectrophotometer using a tuneable pulsed laser and implications to the Brewer ozone retrieval, *Atmos. Meas. Tech. Discuss.*, 2018, 1–16, <https://doi.org/10.5194/amt-2017-459>, <https://www.atmos-meas-tech-discuss.net/amt-2017-459/>, 2018.

Serdyuchenko, A., Gorshchev, V., Weber, M., Chehade, W., and Burrows, J.: High spectral resolution ozone absorption cross-sections—Part2: Temperature dependence, *Atmospheric Measurement Techniques*, 7, 625–636, 2014.

Please also note the supplement to this comment:

<https://www.atmos-meas-tech-discuss.net/amt-2018-2/amt-2018-2-RC2-supplement.pdf>

Interactive comment on *Atmos. Meas. Tech. Discuss.*, doi:10.5194/amt-2018-2, 2018.

Printer-friendly version

Discussion paper

