

Atmos. Meas. Tech. Discuss., referee comment RC1
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Comment on amt-2020-497

Anonymous Referee #1

Referee comment on "Consistency of total column ozone measurements between the Brewer and Dobson spectroradiometers of the LKO Arosa and PMOD/WRC Davos" by Julian Gröbner et al., Atmos. Meas. Tech. Discuss., <https://doi.org/10.5194/amt-2020-497-RC1>, 2021

The paper presents a thorough comparison of total ozone measurements based on Dobson and Brewer spectrophotometers operating at the combined Arosa/Davos station. The paper shows how different ozone absorption cross sections can affect the data retrieved for each instrument, taking also into account the temperature dependence of the cross sections, the recalculated instrument-specific Rayleigh scattering coefficients, and the effective ozone height. This study contains very useful information, essential for assessing the accuracy of a combined total ozone time series for this station. As such I think it is appropriate for publication in AMT.

The only weaknesses of this study are related to the presentation quality. The language used in the paper is sometimes oversimplified introducing difficulties in understanding by non-expert readers. Some examples are given in the comments below (listed by line number) which aim mainly at improving the clarity of the paper.

Specific Comments:

21: Rephrase because as it written now it implies that all instruments (including Brewers) were installed in 1926!

24: In addition to horizontal, state the vertical displacement of the two stations.

27: In the abstract it is stated that there is a seasonal variability of 1.5%, while here that there a consistency of within 1%. Which of the two is more accurate? Furthermore, in line 87 this number is further reduced to 0.5%.

64: Aerosols and NO₂ also absorb in this range. Although for Davos and Arosa their effect should be negligible, these species should be mentioned for completeness.

68: Actually, $\alpha(\lambda)$ is the absorption coefficient and not the cross section

109: This sentence is unclear for non-experts, please rephrase: "...does not coincide with the emission lines of the spectral lamps, the line..."

212: The procedure for determining the error in the total ozone due to the use of different Rayleigh cross sections could be slightly expanded so that inexperienced readers can follow it better. Alternatively, a reference could be provided to improve understanding.

238: However, if new Rayleigh cross sections are used, then the calibration of the instrument would change so this offset of about 2.4 DU would be finally compensated.

248: The term "ozone airmass" cannot be understood by non-expert readers. Line 69 defines it as "effective airmass for ozone absorption" so the term could also be used here.

253: Please explain what is meant by 95% variability. Does it refer to the 95% of the data?

280: In addition to noise in the cross sections another reason could be the different wavelengths used in Brewers compared to Dobsons in conjunctions with the spectral variability of the cross sections.

307: The average deviation for IUP_ATMOS is the same (though of opposite sign) with the Operational settings. However, the spread becomes smaller amplitude 0.09 vs 0.75 and this should be mentioned.

315: ECMWF does not provide the effective temperature but the temperature profiles from which the effective temperature can be calculated. Moreover the ozone profiles that are needed for the calculation of T_{eff} are available from other sources which should be mentioned.

332: Since a supplement already exists, I suggest to include this figure in the supplement, to demonstrate the difference of the stray-light effect of the single Brewers.

335: The conclusions section starts very abruptly. Please start by at least identifying the instrument's location.

343-345: I think this sentence is somewhat misleading. It is not clear what is meant by "precludes their use as common ozone absorption cross-sections". If I understand correctly, the same cross-section can be used in both types of instruments as long as their temperature sensitivity is taken into account for each instrument.

Finally, Please make sure that the captions of all Figures are placed below the figure.

Technical comments:

61: Replace slant pass with slant path (also in the caption of Figure 7 and at lines 325, 327, 331)

72: Please add after "...attenuate" "for each pair"

90: Replace "consist of" with "are"

99: Replace Bewer by Brewer

113: Please make clear that the tuneable portable source is the TuPS device already mentioned above.

114: Please state the name of the project.

119: Replace cross-sections with coefficients

266: "the variability of the effective ozone temperature"

325: Caption of Figure 7, third line: Replace "airmasses" with "ozone slant path"

337: Replace "effective ozone coefficient" with "ozone absorption coefficient"

342: Add also the original IUP cross section dataset

360: Replace "a series of" with "three"