

Interactive comment on “Stability of the Regional Brewer Calibration Center for Europe Triad during the period 2005–2016” by Sergio Fabián León-Luis et al.

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We would like to thank Tom McElroy for all his constructive suggestions and comments. They have been quite useful to improve the paper. We include as additional information in a zip file which contains:

- 1) Answer-Tom McElroy: Pdf file with the answers to your questions/suggestions.(We also show them here).
- 2) Stability-diff: Pdf file where all changes are highlighted. Note that it also contains the changes of the other referees.

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- 3) Manuscript-final: Pdf file with all changes introduced (not highlighted)
- 4) Figures have been modified in the manuscript, we included its last version (.eps).

1 General Comments

2 Figures

In all the figures a colour legend has been introduced. For this reason, these are slightly different to the previous version of the article submitted.

3 Section 2 "Theoretical approach"

All referees have indicated that the section 2 is confused. Therefore, it has been rewritten taking into account all suggestions indicated by the referees. Also, a new figure has been introduced.

4 Grammatical errors

The authors appreciate the grammatical corrections indicated which have been introduced in the text. A co-worker, who is a native English speaker, has helped us with the use of language. In the new version, some paragraphs and sentences were modified to get a more fluid text.

We have used both "behavior" and "behaviour". In order to have a more consistent article we have replaced the word "behavior" by "behaviour" in the text.

-Similarly, "tractability" by "traceability". -Similarly, "centre" by "center".

Page 1 Line 1 "Total ozone column measurements can be made using ..." **The text was modified**

Page 1 Line 2 "In 2003, ..." **The text was modified**

Page 1 Line 3 "... and since 2011 it has transferred ..." **The text was modified**

Page 1 Line 4 "... calibration, mainly to other European Brewers, using Brewer #185 ..." **The text was modified**

Page 1 Line 5 "... annually, alternating ..." **The text was modified**

Page 1 Line 6 "... focused on reporting on the stability..." **The text was modified**

Page 1 Line 10 "... to the data from the Izana triad allows the comparison of the ..." **The text was modified**

Page 1 Line 13 "... standard deviation of the mean equal ..." **The text was modified**

"In opposite, using..." Suggest "... Alternatively, using the procedure used to analyze the data from the Arosa Triad ..." **The text was modified**

Page 1 Line 14 "... presents a relative standard deviation of about ..." **The text was modified**

Page 1 Line 15 "... method used for the data from the World Triad Reference ..." **The text was modified**

Page 1 Line 16 "... gives monthly values of 0.3% ..." **The text was modified**

Page 1 Line 17 "... datasets were analyzed ..." "... second only included..." **The text was modified**

Page 1 Line 18 "Furthermore, this paper also describes the Langley method used to determine the Extra-Terrestrial Constants (ETC) for the RBCC-E Triad, the necessary

first step toward accurate ozone measurement.”**The text was modified**

Page 2 Line 2 “Until a few decades ago, it was thought that the ozone concentration was constant in the stratosphere. However, after the discovery of the hole in the ozone layer in the mid-1980s, this idea was discarded (Farman et al., 1985)”. This is a problematic statement. Ozone is variable, it has annual cycles - and longer-term cycles - and a non-uniform global distribution. It is not clear how to accurately express the simple thought the authors are searching for. Perhaps something like “Historical measurement s - pre 1980 - indicated that the morphology of ozone was not changing significantly with time. However, the Antarctic measurements of Farman et al., published in 1985, changed that view....” **The text was modified**

Page 2 Line 4 “Concerns related to the negative effects that UV radiation can have on terrestrial life ...”**The text was modified**

Page 2 Line 6 “... agents that led to this decrease ...” **The text was modified**

Page 2 Line 8 “.. total ozone column abundance ...” **The text was modified**

Page 2 Line 9 “... Fioletov et al., 2005.” And reference: Fioletov, V. E.; J. B. Kerr, C.T. McElroy, D.I. Wardle, V. Savastouk, and T.S. Grajnar, The Brewer reference triad, Geophys. Res. Lett., 32, 10.1029, 2005. **The reference was modified**

Page 2 Line 12 Fioletov, V. E.: Comparison of Brewer ultraviolet irradiance measurements with total ozone mapping spectrometer satellite retrievals, Optical Engineering, 41, 3051, <https://doi.org/10.1117/1.1516818>, <http://opticalengineering.spiedigitallibrary.org/article.aspx?doi=10.1117/1.1516818>, 2002. This is not a good reference for Brewer aerosol measurements. It is, however, appropriate for UV Irradiance measurements. Suggest that the references be segregated and repeated if necessary to make this clear. **The reference was relocated**

Page 2 Line 14 “... wavelenght separation... ” Spelling: “... wavelength separation... ” **The text was modified**

Page 2 Line 16 “Although the prototype Brewer was developed in the early 1970s ...”
“... has had on-going technical improvements to improve its accuracy...” **The text was modified**

Page 2 Line 20 Delete “concentration” **The text was modified**

Page 2 Line 21 Capitalize “Brewers present this ...” **The text was modified**

Page 2 Line 24 “... consisting of. ...” **The text was modified**

Page 2 Line 26 “... (Fioletov et al., 2005) ...” **The text was modified**

Page 2 Line 27 “... parallel with the World Triad Reference ...” **The text was modified**

Page 2 Line 30 “... are calibrated by comparison with the travelling ...” **The text was modified**

Page 3 Line 9 “... Observatory is located on the island of Tenerife ...” **The text was modified**

Page 3 Line 15 “... campaigns through the travelling...” **The text was modified**

Page 3 Line 16 “These values were calculated using measurements in a range where
Brewer #017 measurements are not strongly affected by stray light ...” **The text was modified**

Page 3 Line 23 “... each Brewer at its local station ...” **The text was modified**

Page 3 Line 32 “... which will allow the calculation of the TOC in near real time ...” **The text was modified**

Page 4 Line 1 “Currently, approximately 40 Brewers ...” **The text was modified**

Page 4 Line 9 “Also in this section the results of a study on the behavior of the RBCC-E Triad as a function of SZA range at which the measurements were performed.” **The text was modified**

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Page 4 Line 13 "... four spectral bands which ..." **The text was modified**

Page 4 Line 14 "... with local maximum and minimum ozone absorption cross-sections." **The text was modified**

Page 4 Line 16 "... the contribution of Rayleigh ..." **The text was modified**

Page 4 Line 17 "... more than one band is ..." This is not the main reason. The ratio technique eliminates the dependence of the absorption function on absolute intensity signal and the right wavelength weighting stops aerosol from interfering." 17 and 18 need a little more work. A fifth wavelength is included to measure SO₂ **This section was modified**

Page 4 Line 19 Suggest: "The Beer-Lambert law ..." **The text was modified**

Page 4 Line 22 "where J is the gas concentration ..." 1. J is used in the literature for optical depth, 2. X is normally used for ozone amount, not in concentration (molecules/cm³) but in cm (or other length units) to go along with " in cm⁻¹. The airmass for ozone is usually written as : to distinguish it from the airmass for Rayleigh scattering, m. **The section 2 was modified and your suggestions were added**

Page 4 Line 29 The equations in the PDF did not fare well. **The section 2 was modified and your suggestions were added**

Page 4 Line 15 Measurements on slits 2 to 6 are used for SO₂ and ozone. **The section 2 was modified and your suggestions were added**

Page 4 Line 24 See earlier notes on variable names. **The section 2 was modified and your suggestions were added**

Please also note the supplement to this comment:

<https://www.atmos-meas-tech-discuss.net/amt-2017-460/amt-2017-460-AC2-supplement.zip>

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