

# Wavelength calibration of Brewer spectrophotometer using a tunable pulsed laser and implications to the Brewer ozone retrieval

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We thank the referee for their detailed comments on our manuscript. In the attached document we address their questions and suggestions.

## Comments by Reviewer #2

### 1 General comment

- 5 The paper describes an experiment of a spectral characterization of a meteorological instrument: The Brewer (principally used for UV radiation and total ozone column monitoring). This experimentation has been done in a laboratory of a metrological institution (the German PTB in Braunschweig) with the help of one of the most modern and precise material: A tunable laser. The originality of this experiment (part of the EMRP/ATMOZ project), is that scientific teams of the meteorological community worked together with metrology specialists, what is a unique gain for the quality management of the meteorological
- 10 measurements. The spectral characterization that has been done is necessary for the determination of the total ozone column from the UV irradiance measured with the instrument Brewer. The results of the experiment allow a high quality validation of the standard procedures of spectral characterization used in the Brewer community, and allow defining quantitatively the limits of these standard procedures and of their assumptions. The results are well presented in this article, and the discussion is of high scientific quality and will be useful for the Brewer community.
- 15 Apart from minor (but many) typology and grammatical errors, that should be corrected (I have listed a part of them at the end of this report), the manuscript is well written pleasant to read and well understandable. I have a few (5) comments/questions which I would the authors to answer, pending those I support the publication of the manuscript. Technical comments ("x-y = page x, Line y):

5 Comments/questions about the content:

1) In the beginning of the background paragraph, when you mention the slits of the "slit mask" (2-1), it would be welcome to have a brief description of the brewer's slits, and to what they are useful. Maybe you should introduce a table of them and refer to the table in the text.

A table with the slits (Number and its wavelength) and a description has been added in the text.

2) (in 1. Background), lines 2-10 to 2-15, you mention some assumptions about the slit functions (2-14). It would be nice to explain before or in a table, what are the most important assumptions that are done.

The assumptions are described later, we add a reference to the section on the text.

3) In the description of the experiment (Background from 2-19 to 2-28):

3a) I guess the use of the tunable laser is useful for point 2, not point 3. So the mention "using the tunable laser" (2-24) should go in the title of point 2 (2-20). yes 3b) In point 3, you mention that the Brewer scans  $\pm 2\text{nm}$  around a fixed wavelength of the laser. Further in Point 3, you mention that the Brewer can scan with 5nm increment between 290 nm and 365 nm. You need to precise how you can scan with a lower step than the increment.

5

Yes is an error, the experiment were performed with the laser emitting from 290 to 355 every 5 nm whereas the brewer is scanning every 5 steps.

4) In the alpha-formula (4-24) you write the ozone cross-section with  $\alpha(\lambda)$  and then in the text, you mention sigma for it.

Corrected

5) In the discussion, it would be welcome to explain how the different Brewer users can use these results to optimize the TOC retrieval with their own Brewer. Can these results be generalized to all Brewers? To all Mk-III Brewers? Or should every Brewer go to a laboratory with a tunable laser to characterize its slits? Do you have assumption concerning the age stability of this slit characterization? Is it expected to change with the time? If yes why?

10

The work validate the method currently in use with the brewer network, the limitations of the quadratic dispersion is an issue on MK-III and MK-IV brewer and the new operating software recently introduce the cubic dispersion. We don't think necessary the characterization with the laser of network brewer.

We introduce this on the discussion.

## 5 **Grammar and typos**

You use sometimes "tuneable", sometimes "tunable", please choose one terminology, and I guess "tunable" is the correct one.  
-> So please correct in title, in 1-5 (Abstract), in 2-9, 2-13 and 2-16 (Chapter 1), in 7-22 and 8-1 (Chapter 3) **Done**

### **Abstract**

1-9: "a underestimation" -> an underestimation **Done**

## 10 **1. Background**

1-13: "total column ozone (TOC)" -> total ozone column (TOC) 2-9 "the use of the use of" -> the use of 2-9 "allow us" -> allows us **Done**

2-10 "coefcients" -> coefficients **Done**

2-14 "the need for the assumptions" -> the need of assumption **Done**

## 15 **2. Calibration of the Brewer spectrophotometer** 3-7 "weighting coefficients w" -> "weighting coefficients wi" **Done**

5-11 "referered" -> referred **Done**

5-12 "double Brewer ," -> double Brewer, (without space before the ",") **Done**

6-1 "one of the six exit slit" -> one of the six exit slits **Done**

6-7 "0.7 A" -> 0.7 Å (A with "o" on the top for Ångström) **Done**

## 20 7-1 "The cubic approximation method. . . use knowledge" -> ". . . uses . . ." **Done**

### **3. Pulsed laser-based measurements**

8-10 and 8-11 "counts/seconds" (3 times) -> counts/second **Done**

9-7 "parametrised" -> parametrized **Done**

9-8 "( Orphal et al. (2016)." -> ", Orphal et al. (2016)." or (Orphal et al. (2016)) **Done**

## References