

Interactive comment on “Adaption of an array spectroradiometer for total ozone column retrieval using direct solar irradiance measurements in the UV spectral range” by Ralf Zuber et al.

Anonymous Referee #1

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General comments

The paper shows promising results of a newly developed instrument measuring direct irradiance in the UV range to retrieve total ozone columns. There are several interesting features in the instrument, like stray light reduction through sets of filters in the system, seemingly extremely good linearity and radiometric stability. However the paper nearly entirely lacks basic technical description of the covered subjects (instrument description, calibration, algorithm description) and mostly does not even give references (see specific comments 1, 3, 4, 5, 6, 10, 12, 16, 17). For some cases, where references are given, important numbers should be given in the paper itself (see specific comments 9

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and 19). Due to the large quantity of missing technical information, I do not consider this paper worth of being published in AMT in its current form. I would recommend the authors to address the comments and resubmit it in a greatly modified version.

Specific comments

1. Section 2 (S2): Give some CCD detector characteristics, e.g. how many pixels does it have, does it have an electronic shutter, or give a reference.
2. S2: “This detector can be spectral mismatch-corrected ...”: does this refer to a comparison of the measured data with the solar Fraunhofer structure as it is mentioned later in the paper? If yes, what does this have to do with the detector? It can always be done.
3. S2: Define the expression “BiTec sensor system”, describe it and/or give reference.
4. S2: What set of optical filters is in the system. Exactly the same ones as described in Shaw et al., 2008?
5. S2: Give a reference for the statement that the stray light correction method based on the LSF improves the measurement threshold by 2 orders of magnitude.
6. S2: How long does it take to get one spectra with this instrument?
7. S3: “After an initial settlement ... ”: does “initial settlement refer to temperature stabilization?
8. S3: “After an initial settlement ... accuracy was found to be better than 0.1 nm”: what does this mean? The dispersion could not be determined better than 0.1 nm?
9. S3: “ ... the wavelength scale was adapted with high accuracy ...”: give a value for the accuracy even if it may be listed in the referenced paper Egli et al., 2014.
10. S3: “ ... linearity with a deviation smaller than 1% in the full dynamic range ...”: this is a very small value. There should be an explanation why this is so good. Is this

detector so great or is the “full dynamic range” not starting with very low counts? A figure could be added. Or give a reference.

11. S4.1: “... the entrance optic is kept clean with a constantly heated dry airflow.”: describe this more in detail or give a reference. How does the air flow inside the entrance optic tube, with which the instrument was equipped for the measurements at Izana?

12. S4.1: Describe the tracker, which was used or give a reference.

13. S4.1: Do you mean 0.01° pointing accuracy or precision or resolution (step)? If you mean accuracy, explain why the accuracy is that good or give a reference. Does it have a quadrant detector or similar system included?

14. S4.1: What is the difference between the gray and green line in figure 4?

15. S4.1: For the (excellent) comparison with Qasume (figure 4): was the radiometric calibration for BTS done in the laboratory and not repeated in the field? In this case the instrument seems to be very robust with respect to transport, which should definitely be mentioned as a strength in the paper.

16. S4.2: The ozone algorithm is based on Masserot et al., which is an algorithm for global measurements (not direct sun data). How was the algorithm modified?

17. S4.2: What effective ozone temperature is used in the algorithm?

18. S4.2: Table 1: the value of 270 DU for OMI seems to be a typo (based on figure 8 it should be around 275 DU).

19. S4.2: “A first analysis of the TOC determination uncertainty ...”: although a reference is given, the authors should still give a number for the uncertainty determined in Vaskuri et al. at this place, so that the reader does not have to look it up himself.

20. S4.2: “... At air masses larger than 4 ... the signal to noise ratio decreases ... becomes less reliable.” Are the data just getting more noisy or are there systematic

effects happening?

21. S4.2: Figure 8: why are there several gray dots at the same time?

22. S4.2: Figure 8: how do the authors explain the decreasing TOC from BTS between 16:00 and 18:00 UT? A residuals stray light effect? An algorithm issue?

23. S4.2: It is somewhat surprising to me that the Qasume and BTS spectra are nearly identical (figure 4), but there is a systematic TOC bias. The authors should elaborate on this, which might need more description of the algorithm.

24. It seems that the Ozone algorithm is purely based on lab-calibration. If this is true, the authors should mention this positively in the paper.

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