Response to Reviewer #1

Many thanks for the helpful work of Referee #1 on our manuscript. Below you can find our specific answers to the comments in blue. We have also revised the manuscript according to the suggestions by both Reviewers. The changes are marked with track changes in the word document. For extended changes we have indicated the line-number of the revised manuscript. We have acknowledged the two anonymous reviewers in the acknowledgements.

General Comments

The manuscript "Total Column Ozone Retrieval from Novel Array Spectroradiometer" published by Egli et al., presents a study on the use of a relatively new array spectroradiometer for ground-based measurements of total ozone column in the atmosphere. The new array spectroradiometer has the potential to provide more accurate and precise measurements compared to traditional methods such as those using Dobson instruments, grating spectrophotometers, etc. The study also provides a comparison of total column ozone retrievals between the proposed method and established methods. This helps to demonstrate the potential of the new system and the associated retrieval technique.

One of the strengths of this study is that it presents an approach for measuring total column ozone that is new, fast and automated, while utilizing available, easy to acquire software packages and hardware. The study also leverages on the established instrumentation and expertise at PMOD for standard calibrations.

However, I believe that this manuscript would still benefit from a chapter on error analysis containing a detailed error budget. I understand that some of the aspects of the methodology have already been done elsewhere, nevertheless it would be useful and important to include such a chapter. For example, I would be interested in knowing the signal to noise ratios of the spectra, typical wavelength shifts, how the uncertainty in the LSQ retrieval is calculated, and so on, without much digging through literature.

We have included a paragraph with an overall uncertainty budget for both, the LSF retrieval and the CDR retrieval. With this paragraph we believe that the reader can follow how we have achieved that overall uncertainty budget. Lines 426 – 440 in the revised manuscript.

In conclusion, this manuscript fits well within the scope of AMT. Therefore, I recommend its publication after addressing the general comments and some of the comments and corrections below.

We thank the reviewer for this assessment of our publication.

Specific Comments

The authors refer to the “low cost” of the Koherent system but do not provide any estimates of the costs involved and how they compare to available systems like the Brewer, BTS-Solar, etc.

Koherent was first built as a research instrument and become later an operational instrument. The cost of the entire system was around 40’000 Euros. However, PMOD/WRC does not commercialise

this instrument. We refer to the commercial product from Gigahertz Optics GmbH, which provides the product "BTS-Solar". This instrument includes the same array spectroradiometer as in Koherent. We cannot state any prices from an external company, but the costs are a small fraction of a new Brewer.

Can the authors please comment on any effects of UV radiation on the degradation of the optical fiber and if this would have noticeable effects over time?

We agree that the degradation of the optical fiber could be a problem from a very long-term perspective. However, we have shown, that the system was stable over two years with only one calibration. We will further monitor the stability of the system to assess the long-term stability of the filters and the fiber. For operational use we recommend calibrating the system on a two years schedule. We have stated the two years stability in line 379 of the original manuscript.

Why use an optical fiber instead of adopting a similar design to the BTS-Solar?

We agree that this is a weak point of our system. Koherent was first built as a research instrument. The configuration with the optical fiber was chosen to test several additional filters with an in-line filter wheel and to test telescopes with different field of views. However, with the today's knowledge and for more simplicity, we would chose the more simple design with the collimation tube in front of the diffusor as it is provided by the commercial BTS-Solar. We have stated this in line 97 - 101 of the revised manuscript.

BTS2048-UV-S-F array spectroradiometer: According to specifications, this spectroradiometer has a calibrated measurement range of 200 nm to 430 nm. Why do the authors truncate the upper wavelength range to 345 nm? Would it not be useful to include the maximum range covering the Fraunhofer lines at around 393 nm? I think this will make it easier to determine any wavelength shifts, will it not?

Yes, for the wavelength shift a broader range of wavelength is better. For the wavelength shift we have selected the wavelength range from 295 nm to 370 nm. The range until 345 nm is for the ozone retrieval, because the ozone absorption is negligible above 345 nm (Figure 2).

Two-point calibration: I don't quite understand the rationale of changing the absorption coefficients in addition to adjusting the ETC. It seems to me that the absorption coefficient is simply used as a "tuning parameter" in this case. Aren't the slit functions well determined, as well as the ozone cross sections? How would the authors explain the need to change the absorption coefficient?

Indeed, that is a good point. In principle, Koherent does not require the adjustment of the absorption coefficient since this is calculated with the slit function and the ozone absorption cross section. In this paragraph, we wanted just to state that also a two-point calibration is possible, as it was used for Brewers in the past. We have removed this statement in the revised manuscript.

The authors refer to minimal least squares, what do they mean by "minimal". A sentence or two explaining this would be sufficient.

Minimal least squares means to minimize the sum of the squares of the offset to the fit (residuals). We agree that the word "minimal" is already included in "least". We have clarified this in the revised manuscript (line 188) and removed the word "minimal".

Technical Corrections and Suggestions:

P.1, Line 24: “within less than 0.7%” --> within 0.7%

Done

P.2, Line 45: “In the Dobson instruments, prisms are selecting ...” --> In the Dobson instruments, prisms are used to select ...

Done

P2, Line 46: “Most of the Dobsons are manually operated and require therefore …” --> Most of the Dobsons are manually operated and therefore require …

Done

P2, Line 52: “contrary to single ...” --> in contrast to single …

Done

P2, Line 52 and 69: “suffer from stray light …” --> suffer from the effects of stray light …

Done

P2, Line 53: “The Brewers were formed to a network of automatic stations, which required few ...” --> The Brewers were used to form a network of automated stations, which required less …

Done

P2, Line 53: “best consistency …” --> greatest consistency

Done

P2, Line 60: “irradiance ratio at the top of the atmosphere” : irradiance ratio of what?

Done

P2, Line 76: “Similarly as Pandora …” --> Similar to the Pandora …

Done

P2, Line 83: “Contrary to the …” --> In contrast to the …

Done

P2, Line 83: “fiber coupled” --> fiber-coupled

Done

P9, Line 363: “clears sky” --> clear sky

Done

P9, Line 369: ”The two-years ...” --> The two-year …

Done

Fig. 1. Caption: “… spectra on morning of 15 September …” --> spectra on the morning of 15 September *Done*