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Atmospheric Measurement Techniques Discussions

Interactive comment on "The design and development of a tuneable and portable radiation source for in situ spectrometer characterisation" *by* Marek Šmíd et al.

Anonymous Referee #1

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The work describes a portable tunable radiation source for characterization of a UV spectrometer (Dobson and Brewer types) in the field. The operation range is from 300 nm to 350 nm and the claimed uncertainties for the centroid wavelength and spectral bandwidth (FWHM) of the emitted radiation are 0.02 nm and 0.1 nm, respectively. The feasibility of its in-field performance was tested by comparison with the laboratory-based measurement and the temporal stability of the source was verified based on the periodic re-calibrations.

This work provides a practical solution to increase the accuracy of the UV spectrometer network monitoring total column ozone and the achieved performance is satisfactory.

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Therefore, I would like to recommend the publication of this work in AMT as soon as the following comments are considered or clarified:

1. More detailed information in the device design is wished. The design of the developed source is described in Chapter 2 with Fig. 1 and Fig. 2. The authors explained the components of the device but the information is not sufficient to estimate the expected performance. In particular: focal length of the off-axis parabolic mirrors PM1 and PM2, dimension of the grating, f/# or beam divergence, and the specification of the discharge lamp used (lamp type? power?).

2. The uncertainty of the wavelength scale is claimed to be better than 0.02 nm (k = 1 or k = 2 ?) It is however difficult to understand how it was evaluated. In Section 3.1, it states that (page 4, line 106) "the residual differences ... doesn't exceed the value of 0.01 nm over whole spectral range of interest." In addition, repeatability of the wavelength setting is reported to be 0.006 nm (k = 1) and the temperature sensitivity to be 0.007 nm/degC (k = 1). How did these components combined to the final uncertainty of 0.02 nm? When the temperature sensitivity was considerered as an uncertainty component, what was the allowed operation range for the device temperature?

3. The spectral bandwidth of the source is claimed to be "smaller than" 0.1 nm FHMW. However, the measured FWHM in Section 3.2 ranges from 0.12 nm at 305 nm to 0.13 nm at 350 nm, which are all close to but larger than 0.1 nm.

4. From Fig. 6 and Fig. 10, I presume that the source contains some out-of-band stray components. How big is the spectral purity of the developed source? Is it not an relevant specification for testing UV spectrometers?

5. From the result of the temporal stability in Fig. 11, I would say that the change of the scale in a time scale from 8/2017 to 11/2018 is larger than 0.04 nm. This is much larger than the claimed uncertainty of 0.02 nm. Should the long-term instability (including changes due to shipping and in-field environmental conditions) be included in the uncertainty evaluation?

In addition, a few technical corrections are required: - Decimal separator should be consistent. At the current version, points and commas are mixed. - (page 3, line 91) the wavelength range should be from 300 nm to 350 nm instead of 330 nm? - (page 4, line 118) the last paragraph of Section 3.1 is duplicated.

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