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Atmospheric Measurement Techniques Discussions

Interactive comment on "Comparison of ozone retrievals from the Pandora spectrometer system and Dobson spectrophotometer in Boulder, Colorado" *by* J. Herman et al.

Anonymous Referee #1

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The manuscript describes a comparison of total ozone column (TOC) measurements obtained from the World reference Dobson and a Pandora diode array spectroradiometer system. The procedure to retrieve the ozone from solar irradiance measurements is described and analysed with respect to the sensitivity to ozone temperature. A further comparison to satellite products from AURA/OMI and NPP/OMPS is provided.

The manuscript is well written and structured. The figures are helpful and illustrative. In general I think that this manuscript provides a good status of the TOC retrievals that are possible with a system such as Pandora, which comprises a small commercial array spectroradiometer to measure solar UV spectra. While the results look promising, a

thorough discussion of the possible parameters affecting the TOC retrieval are missing (only ozone temperature is discussed), as well as an uncertainty estimate for the TOC retrieval, which therefore stops short from being the expected reference paper which it could have become.

Specifically, I would have liked to see a more detailed metrological approach to the direct irradiance measurements, which can be expected from such a study: 1) Effect of applying (or not) a stray-light correction using for example a straylight matrix as from Zong et al, 2006, Y. Zong, S. W. Brown, B. C. Johnson, K. R. Lykke, and Y. Ohno,"Simple spectral stray light correction method for array pectroradiometers," Appl. Opt. 45, 1111–1119 (2006).

2) Nonlinearity, which is a significant factor for the Avantes array spectrometers used in the pandora systems,

Regarding the ozone retrieval, the use of different ozone cross section datasets for the Dobson and Pandora is inconsistent, and adds an unknown uncertainty to this comparison. As shown by Redondas et al., 2014, the dataset from Serdyuchenko et al., 2014 (Serdyuchenko, A., Gorshelev, V., Weber, M., Chehade, W., and Burrows, J. P.: High spectral resolution ozone absorption crosssections – Part 2: Temperature dependence, Atmos. Meas. Tech.Discuss., 6, 6613–6643, doi:10.5194/amtd-6-6613-2013, 2013.) gives the most consistent results between Dobson and brewers and has been recommended for use in the Ground-based Dobson and Brewer networks. I would have preferred therefore that Dobson and Pandora would use the same ozone-xsection, and preferably the recommended one.

The TOC comparison between Pandora and Dobson discussed on pages 6-10 and summarised in Figure 3 show nearly simultaneous values versus time. An interesting figure would have been to show the differences in TOC between the instruments against ozone airmass (airmass times ozone amount). Deviations at high ozone airmasses would be expected due to the internal light scattering of the Pan-

dora monochromator and could show to which level reliable TOC can be determined with this system. This is crucial at high latitudes, where large airmasses and high ozone amounts are typical for most of the year.

Some minor comments: Page 1: The affiliation of Cede (4) is missing

Page 3, line 54: Parentheses are missing in Equation 2

Page 4, line 83: Can the statement "$\sim$0.5% " be made more specific?

Page 4, line 104: Convolved, instead of convoluted. I miss a discussion of the wavelength to pixel relationship, and the methodology by which it is determined. I presume that the high resolution solar spectrum is used for that, and I would suggest adding a sentence to that effect.

Page 7, 8, Tables 1, 2,3: I was confused by the discussion on the ozone temperature climatology: Why should it depend on the total amount of ozone in the atmosphere? Shouldn't there be a better proxy for that? A better approach would have been to use measured ozone and temperature profiles instead of climatological values for the comparison of this specific measurement period in order to determine the effective ozone temperature or even better the effective ozone cross section based on the profile information.

Interactive comment on Atmos. Meas. Tech. Discuss., 8, 3049, 2015.