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Interactive comment on "Aerosol optical depth determination in the UV using a four-channel precision filter radiometer" *by* Thomas Carlund et al.

Anonymous Referee #1

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This paper deals with the determination of the aerosol optical depth at four UV wavelengths using a UVPFR sunphotometer, a modified version of the Precision Filter Radiometer. Details concerning the instrument's characteristics, calibration and performance are presented and a deep analysis for the uncertainties in the AOD estimations takes place. The manuscript is well written with sufficient background literature. The used methodologies and analyses are appropriate, support the findings of the study and the presentation of the results is clear. Since aerosols are of great importance in various atmospheric issues, I think that the UVPRF instrument would be a valuable tool for the scientific community. I believe that the study fulfills the scope of ATM and I recommend to be published after minor revisions.

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Discussion paper

Comments/suggestions: A sensitivity analysis for SO2 and NO2 would be significant information about instrument's performance at polluted places.

Page 5, line 15-16: "On the other hand, based on numerical tests, V0 results using equation 3 were found less sensitive to errors in δo". Is there any explanation for this? Page 5, line 22: I suggest the results of V0s in 2016 to be added in Fig.1 using different symbols. Page 7, line 9: The average conditions should be reported. Page 8, line 1: Specify the Rayleigh scattering coefficients used for the ozone calculation. Page 8, line 10: The modifications on the cloud screening should be reported. Page 16, line 23: Reference for the traceability limits for absolute AOD differences should be given.

Technical comments Page 1, line 29: humans instead of Humans Page 2, line 17: Check the format of word Only Page 8, line 18: According to equation 6

Missing citations: Page 1, lines 29-30: Madronich et al., 2015; UNEP, 2010 Page 2, lines 1-2: Zerefos et al., 2012; De Bock et al., 2014 Page 2, line 11: Holben et al., 1998 Page 2, lines 22-23: Meleti et al., 2009; Kumharn et al., 2012 Page 4, line 32: Schmid and Wehrli, 1995 Page 7, line 4: McArthur et al., 2003 Page 12, line 4: Russel et al., 2004 Page 13, line 4: Zerefos et al., 2016

References not cited in the manuscript Page 19, lines 8-9: Cede, A., Labow, G., Kowalewski, M., and Herman, J.: The effect of polarization sensitivity of Brewer spectrometers on direct Sun measurements, in: Ultraviolet Ground- and Space-Based Measurements, Models, and Effects IV, Proc. SPIE Int. Soc. Opt. Eng., 5545, 131–137, 2004. Page 20, lines 11-13: Eck, T. F., Holben, B. N., Reid, J. S., Dubovik, O., Smirnov, A., O'Neill, N. T., Slutsker, I., and Kinne, S.: Wavelength dependence of the optical depth of biomass burning, urban and desert dust aerosols, J. Geophys. Res., 104, D24, 31333– 31349, 1999. Page 20, lines 19-20: Fioletov, V. E., Kerr, J. B., McElroy, C. T., Wardle, D. I., Savastiouk, V., and Grajnar, T. S.: The Brewer reference triad, Geophys. Res. Lett., 32, L20805, doi:10.1029/2005GL024244, 2005. Page 22, lines 21-22: McPeters, R.D. and Labow, G.J.: Climatology 2011: An MLS and sonde derived

ozone climatology for satellite retrieval algorithms, J. Geophysical Res., 117, D10303, doi:10.1029/2011JD017006, 2012. Page 23, lines 4-5: Nicolet, M.: On the molecular scattering in the terrestrial atmosphere: An empirical formula for its calculation in the homosphere. Planet. Space Sci., 32, 1467–1468, 1984. Page 23, lines 11-13: Redondas, A., Evans, R., Stuebi, R., Köhler, U., and Weber, M.: Evaluation of the use of five laboratory-determined ozone absorption cross sections in Brewer and Dobson retrieval algorithms, Atmos. Chem. Phys., 14, 1635-1648, doi:10.5194/acp14-1635-2014, 2014.

Figure 1: Use subscript character for 0 in the parameter V0 - Figure caption: Langley event instead of Langley episode Figure 2: Use the same Y-axes scale for the 4 graphs. I suggest the word the truth to be replaced on the legend. Figure 5: Use different symbols for the AOD at 332 nm (or at 305 nm).

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