Reviewer #2

A) General comments.

The manuscript is a description of the analysis of atmospheric Aerosols and solar UV measurement in Rome, Italy. The targets are scientists interested in the both, the relation between aerosols and UV radiation and the measurement of the aerosols in the city of Rome itself. Next to the detailed explanation of the measurements, the data of the years 2010-2016 have been analyzed. Altogether this results in a high-quality analysis and a nice study of the relationship of aerosols and UV radiation in a city with significant pollution (aerosols) and high level of UV (Italy). The work is well presented and in good quality both in writing and presenting. However, the author tends to very long sentences which makes the reading and understanding more difficult.

B) Specific scientific comments.

All technical parts of the measurements and analysis are well described. The following additionally point should be discussed to enhance the quality of the manuscript:

1. Line 55: In the Introduction it was explicitly mentioned that "especially in Winter" a good relation between aerosols and UV was found. However, in this study only Spring and Summer month were used. The author should at least discuss why their data with SZA>40 is not usable.

For SZA>40, as in winter time, the uncertainty on the irradiances measured by the Brewer increase due to effects as straight light interference (Bais and Zerefos, 1996) and angular response error (Antòn et al., 2008). Therefore an enhancement of the estimated error of UV index, which is about 4-5%, (Schmalwieser et al., 2017) is also expected. This could affect the identification of its variation caused by aerosol effect, because the UV index is low at SZA>40 and shows a little range of variability during the day. We added this sentence in the introduction.

2. Line 97: The Uncertainty of the total ozone measurements is given with 1%. However, no estimate is given for the actual UV measurements. Especially a discussion of the uncertainty of the extrapolation in the UVA range (325nm-400nm) is missing (measurement only up to 325nm!).

The SHICrivm algorithm, used to obtain the biologically effective UV irradiance, as explained in the section 3, compensates for the missing contribution of wavelengths longer than 325 nm. Based on considerations for similar corrections in the Brewer operating software (Fioletov et al., 2004), we estimate an uncertainty <2% in the UV index value for solar zenith angles <70° due to this extrapolation. This sentence has been added in section 2.

3. Line 101: "In addition several tests are performed". Well, the IOS intercomparison is mainly used for the Brewer Ozone measurements. The traceability of the UV measurements is either calibrated using irradiance standards or obtained through intercomparisons to reference spectroradiometers. If any of those action are available for Brewer #067 it should be mentioned and referenced in the paper.

The performance of the Brewer instrument for UV measurements was controlled every two years until 2014 through intercomparisons to the traveling reference QASUME UV spectroradiometer operated by Physykalish Meteorologisches Observatorium Davos/ World Radiation Centre. The mean ratio of Brewer integrated solar UV irradiances to QASUME is within +3% (see https://www.pmodwrc.ch/en/world-radiation-center-2/wcc-uv/). After that, the UV calibration has been carried out by IOS using 1000W lamps, which are traceable to the QASUME reference spectroradiometer. Siani, A.M., Modesti, S., Casale, G.R., Diemoz, H., Colosimo, A. Biologically effective surface UV climatology at Rome and Aosta, Italy (2013) AIP Conference Proceedings, 1531, 903-906, DOI: 10.1063/1.4804917. Both this sentence and the Reference have been added in section2.

4. Line 218: “AERONET inversion” should be explained.

The following sentence has been added in section 4: The AERONET inversion, performed according to Dubovik and King (2000), is able to retrieve aerosol optical properties from Sun and sky radiance measurements. In this study, we used level 1.5 data and Version 3 inversion algorithm (Giles et al., 2019).

5. Line 241: “In these days a substantial decrease. . .” –Figure 3 shows sometimes a small decrease but also an increase of sea and soil (1 to 2 July). In the third event the soil components increased from 12 to 25 %!

We stated that during dust episodes “a substantial decrease of the contribution of SEA and an increase of SOIL components were observed, whereas the others remain quite stable”. This happens if we perform an average over all the days recognized as affected (or not) by dust following Lidar profiles.

It must be considered that in the days flagged as “dusty”, dust can remain at a higher level and not measurable at ground (this is the case of 3 and 18 July). Conversely, sometimes a lot of aerosol is visible at ground level but it was not possible discriminating the presence of desert dust from the local SOIL component (this is the case of July 2 and 17).

Therefore is order to avoid misunderstanding in the interpretation, we deleted the sentence, but we added the above considerations in section 4.

6. Figure 1: Errors bars indicate only the measurements uncertainty (?) but not the total expanded uncertainty of the measurements. See also comment 2.

Error bars in Figure 1 are the standard deviation related to the monthly average that are larger than the instrumental uncertainties. We improved in the caption the definition of the error bars

7. Normalization of UVI: RAF is according to the referenced paper (Di Sarra 2002) of high uncertainty (between 0.8 and 1.44. Taking 1.25 should be justified in more detail and added to the (missing) uncertainty budget.

di Sarra et al. 2002 (Figure 8) retrieved values of RAF after correcting for the influence of co-varying aerosol optical depth. They retrieved values between 1.0 and 1.2 at 30° and 40° solar zenith angle when considering all aerosol conditions. As discussed in the paper, these values are affected by different processes (the wavelength dependence of the aerosol sensitivity, the interdependence between ozone and aerosol, possibly through increased ozone absorption following enhanced scattering by aerosols, ozone and aerosol vertical distributions). The values of 1.25 was derived from UVSPEC radiative transfer model calculations where the aerosol amount was kept fixed. This value is also in agreement with various other determinations of the ozone RAF (e.g., De Luisi and Harris, 1983; McKenzie et al., 1991; Kerr and McElroy, 1993). However a sensitivity study of UVI* on RAF variation from 1 to 1.25 has been performed over all the dataset showing an average decreasing of UVI* of about 1.4% that is within the declared uncertainty of 4-5%, (Schmalwieser et al., 2017).

This has been added in the text

C.) Presentation

The manuscript is clearly structured. Minor modifications are recommended to improve the quality of the paper:

Line 166: Subscript 0 of Theta_0 is irritating. Removed the subscript

Line 194: “PM” -> probably “PM10” is correct at this position. Corrected

Line 226 – 228: Good example of a very confusing long sentence. The sentence has been changed in “ Scatter plots of monthly average AOD_{400}, SSA_{400}, Ang, and UVI versus monthly precipitation (Figure. 2) were performed in order to check if precipitation can affect on average the optical parameters”.

Figure 5: The two different bar-plots for SZA=30 deg and SZA=40 deg cannot be distinguished. The plots were separated

Line 409: “direct solar radiation”or “direct and diffuse solar radiation”? corrected

Figure 1 is overloaded. “n points” should be part of the uncertainty budget, “precipitation and pressure” is not used and these C2 graphs don’t add relevant information. We prefer n points visible inside the plot. We deleted pressure and precipitation

Units in the figure axis labels should be labeled as “/unit” to have a dimensionless number and not “(unit)”. We changed O3(DU) in O3/DU, since it is the only quantity having a unit

Figure is using a different labelling (% CONTRIBUTION”). We think the reviewer refers to Figure 3 where the concentration are plotted and not the contribution. We corrected the sentence in the test from “During June-July 2011 the chemical analysis of the collected PM10 (Figure 3) **showed** an average contribution” to “ During June-July 2011 the chemical analysis of the collected PM10 (Figure 3) **measured** an average contribution”

Typos: line 336: “whit” -> “with” corrected

line 348: (Table II): Theta=40 deg -> 40 in bold corrected