

Interactive comment on “Aerosol optical characteristics in the urban area of Rome, Italy, and their impact on the UV index” by Monica Campanelli et al.

Anonymous Referee #3

Received and published: 30 October 2019

General comments:

The manuscript describes the aerosol optical characteristics in the urban area of Rome for the time period 2010-2016. The impact of aerosol single scattering albedo, aerosol optical depth and Ångström component on the UV index are analyzed. Chemical characterization of urban PM₁₀ samples from a field campaign was performed, and the contribution of main macro-sources was evaluated. The data set is analyzed for the first time and this kind of analyses of aerosol optical characteristics in the urban area of Rome is novel.

Specific comments:

C1

Major comments: You write in the abstract that “PM macro-components were grouped in order to evaluate the contribution of the main macro-sources (SOIL, SEA, SECONDARY INORGANIC, ORGANICS and TRAFFIC) and the analysis of the modulation of their concentration was found to strongly affects the absorption capability of the atmosphere over Rome.” However, I don’t find clearly explained in the Results Chapter of the manuscript the statement “the analysis of the modulation of their concentration was found to strongly affects the absorption capability of the atmosphere over Rome.” Please explain more clearly the connection between the PM macro-components and the absorption capability of the atmosphere over Rome. From the Results I mostly understand from page 10, lines 285-286, that “Scatter plot of SSA₄₀₀ versus the SOIL component (Figure 4) shows a slight negative correlation ($R = -0.54$), whereas no other correlation is visible for the other components and other optical and physical parameters. “ In case it is related to the theoretical calculations of page 8, lines 260-265, please explain in more details in Methodology how you have used the model.

Add to the methodology the use of Lidar for detection of Sahara dust events.

Minor comments: Abstract Page 1 L28: “...is the primary parameter affecting the surface irradiance...”. Please specify that it is for clear sky at Rome. In some other sites, total ozone can be the primary parameter for clear skies. And if not clear skies, then cloudiness has an important role.

Page 1, line 38. Can you specify why the aerosol influence on UV is still uncertain.

Page 4, lines 108-111, Why is this mentioned here, if UVI used in the study is calculated using SHICRIVM? I suggest to remove those lines.

Page 5, lines 142-148, for people who are not familiar with cloud screening of aerosol measurements, the explanation is not clear. Please reformulate the reason for rejecting SSAs lower than 0.70.

Page 5, line 158, Which are the highest UVI values (give some numbers).

C2

Page 5, line 159, How the clear sky spectra were selected?

Page 7, lines 224-225. It would be good to show the AERONET data also for the other years. Then it would be easier to the agreement/disagreement between the two instruments.

Page 7, lines 225-226, Please move the AERONET explanation into the Section Methodology. Including the use of different wavelengths than for POM.

Page 7, line 230, How did you defined that agreement is significant?

Page 7, line 235, Monthly averages of the total ozone content values and . . .

Page 8, line 236, Please explain which kind of seasonal variability (higher in spring. . .) and give the highest values.

Page 8, line 238, I don't see the cumulated precipitation and pressure in the Figure.

Page 8, line 239, only the SSA400 and UVI is plotted in Figure 2. Not the AOD or Ang.

Page 8, line 245, I don't understand the explanation, as aren't the UVI measurements performed under clear skies?

Page 9, Figure 1 caption, Explain the red point also in the Figure caption. Add "monthly means" and for UVI → local noon.

Page 10, Figure 2, local noon UVI under clear sky? Page 12, lines 314 and 315: Why not to try to analyse the aerosol absorption optical depth AAOD $(1-SSA)*AOD$?

Page 12, lines 316-319: What was the criteria for the chosen values to be used to make the division into subgroups?

Page 12, line 337: How did you calculate the corresponding change of UVI* to be about 2?

Page 13, line 345: Can you give any reasons why your results differ from those of Anton et al. 2011?

C3

Page 13, line 354: There is a missing verb in the sentence + add at 30 degree, if so.

Figures 8 and 9, Move the heading of the color panels on the top of the color panel.

Page 16, line 398, Where did you show results of analysis using AOD at 500 nm?

Page 16, line 401-403, Here again, why not to study the AAOD?

Page 16, lines 413-415. What supports your assumption that the five macro – sources have not changed in the last years? And as I wrote in the General Comment, I don't understand what supports the sentence "the variations in the absorption capability of the atmosphere over Rome were attributed to the different absorption characteristics of the macro-components and their modulation of concentration in the atmospheric mixture."

Technical corrections:

In general the text contains long sentences, which are difficult to follow. Paragraph breaks are missing, e.g. in the section Results.

Page 5, New paragraph cut between lines 152 and 153. Same for line 158 before Spectral UV...

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C4