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Discussions

Interactive comment on "A new method to determine the aerosol optical properties from multiple wavelength O_4 absorptions by MAX-DOAS observation" *by* Chengzhi Xing et al.

Anonymous Referee #2

Received and published: 6 March 2019

This paper presents a comparative analysis of O4 absorptions from MAX-DOAS observations and aerosol optical properties from a ground-based sun photometer and in-situ measurements. Then, the co-variation between the O4 absorption and aerosol properties was used to determine the aerosol conditions (clear, non-haze, haze, heavy-haze, etc). This work addresses an interesting topic. But, the concept of this study has some major flaws as I listed below. I don't recommend for publication before those major concerns are addressed.

Major criticism:

1. The approach to infer aerosol loading condition from the O4 absorptions is too

far from quantitive, although authors mentioned to develop a lookup table to retrieve aerosol optical properties in the future. Aerosol loading information in the level of conditions defined in this study (clear, non-haze, haze, heavy-haze, etc) can be easily told from human eyes. Therefore, the aerosol information inferred from the method of this study has no scientific value.

2. Physically, the study methodology is not as much as sound. The O4 absorption derived from the MAX-DOAS observations are indeed contaminated by aerosols. So in their method, authors intend to use an aerosol-impacted O4 absorption data to infer the aerosol properties. I think a better way to get information from the MAX-DOAS observation is to retrieve aerosol information (if there is aerosol information) along with the O4 absorption. Or from another perspective, to study the impact of aerosols to the retrieval accuracy in the O4 absorption.

3. I am not convinced with the use of change speed, acceleration, and change rate of the acceleration of diurnal scattering coefficient (equations 2-4) for describing the aerosol property change. These variables only make the trivial diurnal analysis more complicated.

4. The presentation quality needs improvement. This paper has many grammar issues. I try to catch them in the technical comments below.

Specific comments:

1. It seems different datasets have different sampling times. It is not clear based on what time length the data are aggregated and compared. Please clarify this.

2. Line 160-165: the weather conditions are called clear DAYS, . . . Rainy DAYS. Does it mean that all the data are analysis with on a daily basis? If yes, it may be not appropriate, because different weather conditions can happen within a day. If no, these categories should not be called xx Days.

3. I would suggest change "non-haze" into "light-haze", as "non-haze" means clear.

And this condition has an average AOD of 0.35; calling light-haze is more proper.

4. Why the elevation angle = 1 degree is chosen for O4 DSCD used in this study? Please clarify it in the article.

Technical corrections:

Line 24: I don't understand the meaning of "O4 Differential Slant Column Densities (DSCDs) at UV and visible bands varied in the order of …..". Do you mean the magnitude of their correlation coefficients decrease in the order of …?

40: aerosols and Aerosol Optical -> aerosol loading and Aerosol Optical

40-41: Different aerosols behave -> Different aerosol types behave

43: heat the air contributing to -> heat the air, and contributes to

44: profile causing -> profile, causing

48: Please note that AE often refers to Angstrom Exponent.

49: Angstrom -> Angstrom Exponent

51: atmosphere in vertical. -> atmosphere.

52: SSA could represent -> SSA is defined as

55: the four general aerosol types of biomass burning aerosol, urban-industrial aerosol, dust aerosol and aerosol of marine origin are exhibiting -> different aerosol types (such as biomass burning, urban-industrial, dust, and sea-salt aerosols) exhibit

63: pronounced SSA -> SSA

71: with maxima at -> around

73: O4 absorptions can be yielded by the DOAS method and further the aerosol vertical profiles at four different wavelength bands (xx). -> O4 absorptions in four bands (xx, xx, xx, and xxmm) can be estimated, and aerosol vertical profiles can be further derived.

C3

90: Science (CAMS -> Science building (CAMS

95: were used to cover -> are used to cover

93: was equipped with -> is equipped with

106: in UV -> in the UV; in visible spectral interval -> in the visible

113: filtered -> filtered out; measurements remains for the further discussion. -> measurements remained.

Table 1: The second line is confusing; No asterisk mark can be found for the table footnote.

124: several times only during the daytime and only works on non-rainy days-> about every 15 minutes during non-rainy daytime.

133: Please indicate the distance between Beijing Airport and your site.

141: always appeared when PM2.5 concentrations increased obviously, and the corresponding AOD also have a significant growth. -> coincided with significantly high PM25 concentration and high AOD.

143: have a significant growth -> increases dramatically

143: gray area -> gray areas

143: particles pollution -> particulate pollution

150: decreased faster and declined to -> decreased sharply to

150: during a shorter while -> within a shorter period

153: are up to -> are

154: greater than -> over; all the wintertime -> the entire wintertime

176: decreased about -> decreased by about

C4

189: at UV -> in the UV

Figure 3: please indicate the time is Beijing Time (UTC+8)

248: weather types -> weather conditions

255: on the O4 -> for the O4

255: at UV band -> in the UV band; at visible -> in the visible

306: weather type -> condition

325: table. to retrieve -> table to retrieve

330: at UV and visible wavelength bands -> in the UV and visible bands

335: heavy-haze days to. -> heavy-haze condition.

341: correlation slope -> linear-regression slope