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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Evaluation of spatio-temporal variability of Hamburg Aerosol Climatology against aerosol datasets from MODIS and CALIOP" *by* V. Pappas et al.

Anonymous Referee #1

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Review of the manuscript "Evaluation of spatio-temporal variability of Hamburg Aerosol Climatology against aerosol dataset from MODIS and CALIOP", by Pappas et al.

The manuscript compares the AOD from HAC with AOD from MODIS, the vertical AOD distribution from HAC with CALIOP, and the spectral variability of AOD from HAC with AERONET and MODIS. Information on spatial and temporal (seasonal and monthly) variability is given. The manuscript presents an interesting and comprehensive analysis of the Hamburg Aerosol Climatology and it merits publication after minor revisions.

General comments:

1) English should be checked by a native speaker;

2) More information on HAC are needed in the Paragraph 2.1;

3) Please, provide more discussion throughout the paper on the reasons for the observed differences between HAC and MODIS/CALIOP/AERONET. Sometimes reasons are not given. See some examples below;

4) It would be very nice to compare also the temporal series of the AOD data from HAC and MODIS at selected locations (for example in the Mediterranean region, or in one or more of the 5 selected sites used in Fig. 8); Is any trend observed? Is any difference between HAC and MODIS at specific times observed? Is there any event which is worth to consider over the years? The analysis of the temporal series may add important/interesting information.

5) This is just a suggestion: Why do not dedicate a paragraph to the Mediterranean Basin, given its peculiar characteristics in terms of AOD and composition? The authors take as an example the Mediterranean when comparing HAC with CALIOP, but it would be also interesting to see how AOD behaves in the Mediterranean with respect to MODIS (AOD spatial distribution) and AERONET (spectral dependence).

6) Spectral variability: To my opinion the authors should describe the differences directly in terms of Angstrom coefficient rather than presenting the wavelength dependence of AOD values. Text (and Figures also) should refer to the Angstrom coefficient calculated from AOD data.

Fig. 1: Enhance the size of the figures; also it would be interesting to add three more figures with different scales (and not from 1 to 1) to appreciate AOD distribution: for example for the anthropogenic map the scale does not allow appreciating differences. Write in the caption the measurement period used.

Fig. 2: Write in the caption the period considered.

Pag. 5128, Line 12: The polluted area is big and includes Shanghai as well not only the area "around Beijing".

Pag. 5129, Lines 8-9: ". . ...and clear inter-hemispherical asymmetry of AOD with larger values in NH than in SH". It is better to comment this when describing Figure 1.

Pag. 5129, lines 9-11: Why is the spectral dependence for natural aerosols lower than for anthropogenic aerosols? There are no comments on this.

Pag. 5130, lines 11-14: move this comment to the paragraph 3.2 and give more details about the reasons for the presence of missing grid cells.

Pag. 5132, line 25: How much is the value provided by Levy et al. (2010)?

Pag. 5132, lines 16-22: I would say that the biases in NH (-16.2%) and in SH (-17.1%) are similar within the error. So it seems that the biases are independent on aerosol load. Elucidate this point.

Pag. 5133, line 6-10: If land dominates the NH and oceans dominate the SH and if MODIS biases high low AOD values and biases low high AOD values, why are the differences for annual NH (-16.2%) and SH (-17.1) between HAC and MODIS similar? Figure 2: Add a map for the annual mean in the Figure.

Pag. 5134, end: It seems from Table 2 that the differences as a function of the seasons are for global and not for NH as stated in the text. Please, clarify this point.

Pag. 5135, lines 1-12: Why the authors describe the seasonal differences for the Amazon Basin only? Are there other regions where seasonal cycle was observed? If yes, please comment.

Pag. 5135, line 1: Why during JJA the HAC-MODIS difference drops to -13.8%?

Pag. 5135, lines 16-17: The difference between HAC NH in spring (0.137) and HAC NH in summer (0.144) is only 5%, so it seems like there is a similar bias between HAC and MODIS during these seasons. It seems more interesting to comment why the GLOBE-HAC has a relative minimum in May. Do the authors have any explanation for this low value in May?

Fig. 3: Why is the SH-DIFF positive in summer? Is biomass responsible for this positive bias?

Pag. 5135, line 20. Please clarify if it is "summer (JJA)" or "winter (DJF)". It cannot be "summer (DJF)".

Pag. 5138, line 9: Replace "Figure 8c", with "Figure 6c".

Figure 7 c-ii and c-iii: What's the reason for the different behaviour of natural and anthropogenic aerosols in the free troposphere above 4 km? Fine aerosols cumulative fractions in SH is lower than in NH, whereas coarse aerosols cumulative fraction in SH is higher than in NH.

Interactive comment on Atmos. Chem. Phys. Discuss., 13, 5123, 2013.