Atmos. Chem. Phys. Discuss., 13, C2985–C2991, 2013
www.atmos-chem-phys-discuss.net/13/C2985/2013/

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.

V. Pappas et al.

nhatzian@cc.uoi.gr

Received and published: 31 May 2013

We would like to thank the Reviewer for the useful comments that helped us to improve our manuscript. We tried to enhance our discussion and increase the information for the readers and users of HAC. Below are given point by point answers to the comments (also provided in Italics).

Major comments:

1. As a whole, there are lacks of discussions why HAC data are different from or coincident with MODIS and CALIOP from Chapters 3 to 5. In Chapter 5, for example,

discuss reasons for page 5141, lines 14-15; page 5142, lines 1-6, 8-14; pages 5142-5143, lines 27-2; page 5143, lines 3-6.

An effort was made to discuss reasons for differences between HAC and satellite MODIS and CALIOP data (see page 8, lines 1-4, 16-24). In Section 5 possible reasons for the differences have been reported. One of the most likely reasons is the overpass time of CALIOP that only captures a fraction of the whole day, as opposed to HAC, which has been based on AERONET data throughout the day. Specific reference has been made for each site, on page 15, lines 12-16, page 15, lines 21-23, page 16, lines 1-3, page 16, line 7.

2. In order to discuss quality of HAC, detailed explanation of HAC is mandatory. Indeed, we should read Kinne et al. (2008, 2013) to understand HAC. However the author should explain in Section 2.1 how to make the HAC dataset in more detail. Otherwise this paper is meaningless. For example, if the AOD spectrum is discussed in Chapter 4, the detailed explanation how the spectrum HAC AOD data were made is needed in Section 2.1.

Indeed, little information was initially added with regards to the way HAC has been created. This was made intentionally, as the actual process includes a number of steps and processes that, if explained in detail here, would make the paper very lengthy and would also be out of the scope of the paper. However, following the Reviewer's comment, some more essential information is now added in Section 2.1, page 4, 9-25.

3. In this manuscript, there are no general information on confidence level with numerical values of uncertainties for HAC. The authors write "The HAC AOD is very useful for distinguishing between natural and anthropogenic aerosols and provides high spectral resolution and vertically resolved information" in Abstract and "According to our analysis, the HAC data for aerosol optical depth (AOD) have proven to be accurate enough to be used for aerosol studies" in Conclusions, but they are too rough. On the other hand, it is meaningless to repeat trivial numbers described from Chapters 3 to

5 in Abstract and Conclusions. Readers need general information on confidence level (i.e., high, medium, and low) with numerical values of uncertainties (i.e., factor of 2, 0.1 of AOD) for regions, spectrum (UV, visible, and near-infrared), and altitude (boundary layer, middle troposphere and upper troposphere). They should be described in Abstract and Conclusions.

We agree that in the manuscript there were no numerical or qualitative values of uncertainties given for HAC. These are now added in the Abstract (lines 15-16, 19-25) and in the Conclusions (page 17, lines 5-6, 20-22).

4. English is poor as a whole. The manuscript must be checked by native speakers.

The English has been checked by a native speaker and improved.

5. page 5127, line 11 and page 5129, line 14: Why isn't MODIS data used for resent years after February 2007?

AERONET data used in HAC go from 1998 to 2007. In order to have overlapping periods with complete years, starting from March 2000, it was decided to use MODIS data until February 2007. However, we would like to note that even if more data was used, it would still be a comparison of ongoing (MODIS data) against 'climatology'. Moreover, our own analyses with MODIS data have shown that extending the temporal coverage of AOD data does not essentially change the spatial and temporal patterns of AOD distribution, but only affects tendencies and trends, which however are not examined in this study.

6. page 5137, lines 3-5: This is a very important point. Explain in detail.

As mentioned in Section 2.1 (added now, page 4, lines 12-17), HAC dataset has been based on statistics of AERONET observations apart from modeling. Therefore, it is fair to say that HAC and AERONET are not totally independent. However, depending on the AERONET site's ability to represent properties beyond the local grid region, one site's observations might have served as reference for neighboring grid points. This

has resulted in loss of local detail for individual sites. This has now been added in the manuscript, Section 4, page 11, lines 20-23.

7. page 5137, line 19: "except for UV". Discuss why.

The fine-mode aerosol is dominant in the UV (Kinne et al., 2012). It appears that fine-mode might be biased high in HAC, compared to AERONET observations. This has now been added in the manuscript, page 12, lines 3-5.

8. page 5138, lines 8-9: Discuss why.

At these wavelengths, the larger contribution comes from fine-mode particles. As seen also at the GSFC site, it appears that fine-mode particles are overestimated in HAC. This has now been added in the manuscript, page 12, lines 19-21.

9. page 5145, lines 17-18: "especially when it comes to locations, where neither ground-based or satellite data exist". The HAC data where neither ground-based (AERONET) or satellite (MODIS and CALIOP) data exist are not examined in this study. Therefore this sentence is out of this study and then should be deleted.

Whilst there is no specific investigation on the areas where neither ground-based or satellite data exist, it has been indirectly shown – by considering individual sites and the whole of Mediterranean region – that the agreement between HAC and AERONET, MODIS, CALIOP is not random. Therefore, HAC can be used with confidence over areas with no other option. However, due to the lack of specific investigation, the sentence has been deleted.

Minor comments

- page 5124, line 14: Change "UV" to "ultra violet (UV)".

This has been corrected, page 1, line 21.

- page 5125, line 7: "Air pollution" is not a source of aerosols but a phenomenon. It should be changed to "fossil fuel consumption" etc.

We agree with the comment and we corrected the relevant text (page 2, lines 8-10).

- page 5125-5126, lines 26-1: Cite representative papers on aerosol products for AERONET and each satellite sensor.

Representative papers have now been added for AERONET, MODIS, MISR, TOMS and AVHRR, in page 2, lines 22-26.

- page 5127, lines 1-2: Change "pre-industrial" to "natural".

This has been corrected, page 3, line 18.

- page 5127, lines 7-8: This sentence is not correct. Only one year data is used for MODIS, but Kinne et al. (2006) used data from several satellite sensors with various periods.

We agree with the Reviewer's comment. The paper has now been corrected accordingly, in page 3, line 20-24.

- page 5128, line 12: Change "South East Asia" to "East Asia".

This has been corrected, page 4, line 30.

- page 5128, line 12: Typo. "Beijing".

The word has been deleted.

- page 5128, line 17: Change "North Hemisphere" to "NH".

This has been corrected, page 5, line 3.

- page 5129, line 13: Add the primary references of MODIS Collection 5.

Done, page 5, line 24-25.

- page 5131, lines 11-13: Is this sentence correct?.

The sentence indeed contained an inaccuracy with regards to the reason of the differ-

ences observed by Mona et al. (2009). This has been corrected in the manuscript, in page 6, line 32 through to page 7, line 4.

- page 5131, line 14: What is "airborne"? Aircraft measurements?

Yes, the text has been corrected (page 7, line 3).

- page 5131, line 21: Add ", Japan" after "National Institute for Environmental Studies".

Added, page 7, lines 10-11.

- page 5132, line 24: Delete "Our". MODIS data are not yours.

This has been corrected, page 8, line 6.

- page 5134, line 7: Add ", and East Asia" after "United States".

This has been corrected, page 8, line 33.

- page 5138, line 8: Change "Figure 8c" to "Figure 6c".

This has been corrected, page 12, line 18.

- page 5140, line 7: Change "confined" to "concentrated".

This has been corrected, page 13, line 31.

- page 5140, lines 7-8: "up to 3-4km". The boundary layer is not so deep.

The relevant text has been corrected, page 13, line 31.

- page 5142, line 7: What is "mixed"?

The relevant text has been re-written, page 15, line 17-23.

- page 5142, lines 20-22: Atmospheric environment in India (polluted region) is much different from that in Dalanzadgad (dust region), so this sentence is nonsense and misleading.

The text has been corrected and now reads: “For both months, desert dust that is lifted higher than the other types of aerosols is most likely the reason for HAC placing aerosols above 3 km.”, in page 15, lines 28-29.

- page 5143, line 24: Change "2008" to "2007" (according to Chapters 1 and 2).

This has been corrected, page 16, line 22.

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