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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Assessment of the MODIS Collections C005 and C004 aerosol optical depth products over the Mediterranean basin" *by* C. D. Papadimas et al.

Anonymous Referee #2

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Review of the paper: Assessment of the MODIS Collections C005 and C004 aerosol optical depth products over the Mediterranean basin, by C. D. Papadimas, N. Hatzianastassiou, N. Mihalopoulos, M. Kanakidou, B. D. Katsoulis, I. Vardavas

Authors of the present manuscript have presented a very interesting work comparing the MODIS C005 and C004 aerosol optical depth with the ground-based AERONET measurements for the greater Mediterranean basin. The results show the improvement of the latest MODIS collection and they are consistent with other publications showing these findings. The work is properly structured. Following there are some important issues that have to be considered before publishing these results.

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Interactive Discussion
Discussion Paper

The paper is approaching the new MODIS collection assessment by:

a. comparing collections 4 and 5

b. comparing both collections with AERONET ground based data

Concerning the first approach:

1. Using the 1 by 1 degree MODIS Level-3 data a number of pixels is a mix of data retrieved over land and over ocean. This have to be taken into account in the discussion provided accompanying mostly figures 4 (a,b,c).

2. Second paragraph of page 2 includes a reference on the changes included in the new MODIS collection compared with the previous one. A short summary of the main of these changes would be helpful for a future reader of this paper. Most important, discussion on figure 1b has to be linked with these changes. Also, the seasonal difference of the two collections presented in figure 2a has to be discussed linked to the above collection improvements. (e.g. how this surface reflectance issue could provide seasonal differences)

3. Grids that at least 50% of data are available are presented in all figures (1-4). A part of the area that the authors investigate is the northern African part. Since the area is of great interest in terms of aerosol effects it would be very interesting to add a similar like figure 2b plot including all area under investigation and commenting on the data availability limitations, if possible.

Concerning the second approach

The use of the 1 by 1 grid MODIS data compared with daily averaged CIMEL data can mix up statistics due to the fact that large spatial and temporal variability of aerosols has not taken into account. More specific:

1. References provided in the first paragraph of section 2 are all using smaller MODIS resolution when comparing with AERONET stations. More specific:

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Chu et al., 2002 write: -In order to take into account both spatial and temporal variabilities of aerosol distribution, the MODIS retrievals at 10 by 10 km resolution and the AERONET direct Sun measurements at 15-minute intervals need to be co-located in space and time. We require at least 2 out of possible 5 AERONET measurements within +/-30 min of MODIS overpasses and at least 5 out of possible 25 MODIS retrievals in a square box of 50 km by 50 km centered over AERONET sites. The mean values of the collocated spatial and temporal ensemble are then used in linear regression analysis and in calculating RMS errors.-

Levy et al 2005 -Sun-photometer measurements between +/-30 min of overpass are compared with MODIS measurements between +/-25 km of the sun-photometer site.-

Remer et al., 2005 refer to Ichocu et al., 2002 methodology when attempting comparison with AERONET data.

2. Urban locations included in the AERONET stations used in this work would tend to an underestimation of MODIS results due compared to ground based stations to the 100 by 100 Km grid used. This is because of the city induced boundary layer aerosol load.

3. Temporal variability. Smirnov et al (geophysical research letters, 2002), investigate thoroughly the daily aerosol variability from AERONET measurements. They conclude that: -Analysis of the diurnal cycle over most major urban/industrial areas within the network showed a prevailing trend of optical depth increase by 10-40% depending on the site during the day-. They provide also very interesting results for other type of areas also. So if using daily average AERONET aerosol optical depth data the above variability have to be taken into account.

Summarizing, for the first approach (direct collection comparison) I think that the recommendations given above can provide more solid conclusions from the very interesting results presented here.

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Interactive Comment

The AERONET-MODIS comparison as shown here shows some indication of improvement for the last MODIS collection against ground based data. The effect of the spatial (mainly) and temporal aerosol variability (over 1 by 1 degree around the station and over a day compared with the MODIS overpass time) are not quantified when the final statistics are presented.

References in page 3 (first 2 lines) are not all using MODIS AOD products. For example Kazadzis et al., 2007 reference is only based on ground based data.

Last paragraph of page 6: - other datasets (e.g. total ozone.., AVHRR or ground based)- . Ground based have to be added.

Interactive comment on Atmos. Chem. Phys. Discuss., 8, 16891, 2008.