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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Validation of an hourly resolved global aerosol model in answer to solar electricity generation information needs" *by* M. Schroedter-Homscheidt and A. Oumbe

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A notable increase in accuracy in the assessment of the surface solar irradiance and its direct component is necessary for a further development of the exploitation of solar energy by companies and states. A better knowledge of the aerosol properties has been identified by the community as one of the key domains to achieve this target. The work presented here is one of the few attempts to set up accurate data sets on aerosol properties and is of value for the community.

The authors perform a thorough assessment of the MATCH/DLR data set by comparing to AERONET data for many stations in Europe, Africa, Middle East, and Arabian Penin-

sula. A number of issues has been identified that are communicated to the research community with the aim of improving models and emission databases. Of particular concern is the case of dust events that occur frequently in Arabian Peninsula and that are not well modelled. The Arabian Peninsula is the seat of many large projects in solar energy to supply expected shortage of fossil fuels.

I really appreciate the work done and its achievements. It is innovative with respect to the time scales considered, the number of stations, and the geographic extension.

I have been striked by the fact that the correlation coefficients are low as a whole. Approximately less than 50% of the observed variance is explained. There is an improvement compared climatological databases such as GACP, but more is needed. There is no linear relationship between observations and MATCH estimates, except for AOD less than 0.4.

What is observed here on aerosol is fully consistent with similar recent works but performed on irradiance, especially on its direct component which is very sensitive to aerosols. New models have been developed for modelling the irradiance under clear-skies whose inputs are aerosols properties modelled by tools like MATCH/DLR. When dealing with the atmospheric transmittance, also called clearness index, which is the ratio of the surface irradiance to that at the top-of-atmosphere, approximately 50% of the observed variance of irradiance is explained. The present work shed light on the role of aerosols and indicates path for improvement.

I like the fact that the authors check that the MATCH/DLR highly resolved AOD bring benefit compared to the GACP climatology. It would have been easier to write that because of its high resolution, the MATCH/DLR data set brings benefit.

Figure 5. Shows the large improvement for stations in Arabian Peninsula.

Figure 6. Correlation coefficient is low. Only 10 (daily) sites above 0.7. Sometimes, it is negative. It may be fairly constant for two regions: Northern Central Europe (ex-

cluding IFT-Leipzig), North Africa (excluding Lampedusa). Otherwise, it varies notably. Arabian Peninsula exhibits large variations in bias and in correlation coefficients, with low correlation coefficients. This may translate the high spatial and temporal variations in AOD in this area.

Technical comments.

1. The use of Joliff et al. target graphs is appropriate. It calls upon a centred RMSE which is not a known quantity. Taylor defines it in, e.g. http://www-pcmdi.llnl.gov/about/staff/Taylor/CV/Taylor_diagram_primer.htm. Given a reference field r, and an estimated field f, the centered RMSE is defined as

(CRMSE)**2 = E[[(f-E(f)) - (r-E(r))]**2]

I may re-write it as

(CRMSE)**2 = E[[f - E(f) - r + E(r)]**2] = E[[(f-r) - E(f-r)]**2] = variance(f-r)

The CRMSE is the standard-deviation of the deviations between f and r. I suggest that the authors write this last sentence in their text to help the reader in understanding the CRMSE.

2. Figure 4. Not histograms, but scatterograms. There may be large deviations and a large overestimation of AOD above 0.4. Surprising is the fact that daily values exhibit more scatter than hourly values. Do the authors have an explanation?

Interactive comment on Atmos. Chem. Phys. Discuss., 12, 31917, 2012.