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Atmospheric Measurement Techniques Discussions

Interactive comment on "Long-term aerosol optical depth datasets over China retrieved from satellite data" *by* Y. Xue et al.

Anonymous Referee #2

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The manuscript "Long-term aerosol optical depth datasets over China retrieved from satellite data" by Xu et al. introduces nine years dataset (Aug. 2002- Aug. 2011) of aerosol optical depth over China retrieved with the Synergetic Retrieval of Aerosol Properties (SRAP) method. The SRAP algorithm uses Moderate Resolution Imaging Spectroradiometer (MODIS, both Terra and Aqua) L1 calibrated radiances to retrieve the AOD using an atmospheric radiative transfer equation. The retrieved AODs are validated against AERONET observations. Results show that 63% of the retrieved AODs are within 15% of the AERONET AOD, and 70% falls within 20% of the AERONET values. In the AOD distributions over the whole China little difference is seen between the years. Seasonally the highest AODs are observed during the spring. Over Beijing authors report decreasing trend in AOD between 2006 and 2011.

Comments: This paper introduces a new nine year AOD dataset over China retrieved with a novel SRAP method. However, because the way of presenting the results, and lack of discussion I can not yet recommend this article for publication. The main point of this paper remained rather unclear. If it is to introduce the new AOD dataset, it should have been be compared not only with AERONET, but also to other available satellite retrieved AOD datasets, which are many. Also, the authors do not clearly state what is the benefit for using specifically this approach over China, e.g. instead of the standard MODIS AOD product.

The SRAP-method itself was poorly described. For example, it remained very unclear, what happens to the retrieval if you are not having Terra and Aqua observation for a certain location for the same day, e.g. because of changing cloudiness? Could you see e.g. from the AERONET observations, that your assumption about constant aerosol types and properties in between Terra and Aqua overpasses is valid? Also the different sources of uncertainties in the retrieval were not discussed at all. What do you mean by "mutually cloudfree"? How do you make the comparison with the AERONET measurements, which temporal and spatial averages are used?

The results were introduced very extensively, but the discussion and conclusions after remained rather weak. Defining trends from the satellite data is always very challenging task. I would suggest to study the extensive ground based data that you have used in you study and look if they show similar AOD variation over the years and seasons. What about other satellite instruments? Do you think that the observed instrument degradation in MODIS Terra can affect your results? When making conclusions about the decreasing AOD trend over Beijing, did you take into account the number of available observations/year and month? The haze is certainly an issue over China, but the case study is a bit away from the main focus of the results. Also for the dust case, more testing than the one case should be included. In fact, how exactly are the dust-type AODs obtained from the SRAP-data?

I would also suggest to pay attention to the language and overall presenting things

in a more concise way when resubmitting this manuscript. In the equations some of the parameters were not explained, e.g. what is "theta" in Eq. 1, solar zenith angle? Why the backscattering coefficient is typically 0.1 (do you use this value in all of your retrievals)? In addition the number of figures is too high, and the information content in some figures, e.g. Fig.3, is rather low and hence it could be easily left out. Also the clarity of the figures, labels, and the information in the captions should be improved. E.g. in Fig. 9 it is very hard to distinguish the dust AOD and the API (which is not explained in the caption) over e.g. the East coast. In the scatter/bar plots error bars could be shown.

Interactive comment on Atmos. Meas. Tech. Discuss., 4, 6643, 2011.