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Atmospheric Chemistry and Physics Discussions

Interactive comment on "A global aerosol classification algorithm incorporating multiple satellite data sets of aerosol and trace gas abundances" *by* M. J. M. Penning de Vries et al.

Anonymous Referee #2

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The paper of M.J.M. Penning de Vries et. al discuss a new algorithm for the classification of aerosols on a seasonal basis. The algorithm combines aerosol optical depth and angstrom exponent (AE) from MODIS, the UV absorbing index from GOME and trace gas retrievals from GOME and MOPITT. In a first step, aerosols are classified with respect to particle size and absorption using the AE and the UV absorbing index. In a second step, information on the source of the aerosol is obtained from GOME and MOPITT trace gas retrievals. Both steps together allow the classification of different aerosol types on a global scale. Information on the aerosol type is an important task. Aerosol information is limited for areas far from AERONET stations. The retrieval of

aerosol parameters from satellite in addition to aerosol optical depth is important, but also a difficult task. The required accuracy of the measured reflectance is usually close to the instrumental limits. The combination of different kind of satellite observations is an interesting complementary alternative to a model-based approach. The paper is well-written and shows promising results and some interesting discussions. I think the paper is already in a very good state and can be recommended for ACP. I have a few minor comments:

- What happens, if both the MODIS deep blue algorithm and the MODIS dark target algorithm provide an AOD (Collection 5.1, not combined in the MODIS product)? Does GACA average both values or use the deep blue values to fill gaps of the dark target algorithm?

- How different is the angstrom exponent in the MODIS product from the angstrom exponent calculated for GACA?

- Which datasets are used to estimate the thresholds in Table 3?

- Which criteria are used to screen out sun-glint conditions? Is the sun glint filter applied to all instruments separately? The authors correctly identify a wind-speed related problem in the MODIS data. This is caused by the wind-speed dependence of the glint effects. I would guess that for SZA<50 between 30% and 50% of the MODIS swath are potentially ill-posed for the retrieval of the AE.

- The high UV index at 60 degree south could be caused by geometric limitations dependent on the scattering angle (Is the scattering angle close to 90 degree or lower?).

- The authors mention that GACA underestimate the amount of desert dust compared to a model. It would be interesting to see if the results change if the GOME UV aerosol index is replaced by the correspondent index from OMI or the GOME PMD. However, this is probably out of the scope of this paper.

Specific comments:

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p. 13558: Maybe it would be helpful to add a few sentences on the basic methods used for the trace gas retrievals instead of just giving a reference.

p. 13559 line 14: analyses

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