Atmos. Chem. Phys. Discuss.,
https://doi.org/10.5194/acp-2017-941-RC3, 2017

Atmospheric Chemistry and Physics Discussions

Interactive comment on "In situ measurements of angular dependent light scattering by aerosols over the contiguous United States" *by* W. Reed Espinosa et al.

Anonymous Referee #3

Received and published: 15 December 2017

Comments for manuscript "In situ measurements of angular dependent light scattering by aerosols over the contiguous United States" by W. Reed Espinosa et all.

The manuscript describes classification of the measurements of scattering and polarized phase functions from airborne Polarized Imaging Nephelometer (PIN). The approach consist of several steps. 1. Averaging of PIN measurements over time periods suitable to reduce the effect of random noise and exclude measurements samples with very low scattering. 2. Use ancillary data to assign certain aerosol type to the given averaged sample. The ancillary data include chemical composition, aerodynamic size distribution and trace gases measurements. 3. Average measurement samples for

Printer-friendly version

Discussion paper

each aerosol type and analyze corresponding optical properties. 4. Apply Principle Component Analysis to all averaged measurement samples. PCA resulted in strong clustering of points corresponding to different aerosol types in score PCA space, which considered as the evidence of the potential of PIN observation to differentiated different aerosol types without employing of ancillary data. 5. The level of clustering by aerosol types in PCA score space is quantifies by using PCA scores only to predict the results of ancillary data classification employed two different approaches: Mahalanobis distance and dividing plane. In both schemes individual scattering measurements were assign to correct aerosol type with high recall. 6. The overall conclusion presented by authors is the PIN ability to distinguish common aerosol types without additional information. I believe that the manuscript is well in scope of ACP and can be published if below comments will be answered. 1. As seen from Fig. 6, PCA provides very good separation of dust from other aerosol types which obviously due to difference in forward scattering between coarse and fine aerosol. However, separation between fine mode aerosol types is much less distinct especially between BB and Biogenic. My guess is that the main difference between these aerosols is the different absorption level. What is the potential of PIN measurements in separating aerosols with similar particle sizes but different absorption? And if the potential is high what is the physical reason for that (PIN measures only scattering)? 2. On page 7 nm units are used along with microns. I think it is better to use the same units throughout the manuscript. 3. On Fig. 3 degree of linear polarization for SEACRS dust is much noisier than for other aerosol types. What do you think is the reason for that? 4. I am wandering if analysis in Section 4 can be supplemented with Mie or T-matrix calculations of scattering phase function and degree of linear polarization for typical (maybe AERONET based) size distributions.

Interactive comment on Atmos. Chem. Phys. Discuss., https://doi.org/10.5194/acp-2017-941, 2017.