Atmos. Chem. Phys. Discuss.,
https://doi.org/10.5194/acp-2017-941-RC1, 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 #2

Received and published: 5 December 2017

The manuscript extensively describes the analysis of the data obtained by the Polarized Imaging Nephelometer (PI-Neph) during the Clouds and Climate Coupling by Regional Surveys (SEAC4RS) and the Deep Convection Clouds and Chemistry (DC3) field campaigns. This work can be divided in two well-differentiated blocks. Firstly, PI-Neph measured phase functions and degrees of linear polarization are combined with independent ancillary data classification for establishing the link between the measured scattering patterns and aerosol types classification. Secondly, it is tested whether PI-Neph light scattering data alone are sufficient for obtaining reliable aerosol types classification. It is highly appreciated the honest discussion not only of the advantages and uniqueness of the PI-Neph data but also on the systematic artifacts produced by

Printer-friendly version

Discussion paper

the instrument and potential errors in the interpretation. In total around fifty thousand raw measurements obtained during about 250 flight hours are analyzed. The paper is very well written presenting a detailed and rigorous description of the instrument, data acquisition, measurements conditions and subsequent data analysis.

I recommend publication of this paper in Atmospheric Chemistry and Physics. There are some minor issues that I would like the authors to address.

- As mentioned in Section 2.1, data corresponding to the DC3 campaign are obtained at one single wavelength (532 nm) adding to more wavelengths (473 nm and 671 nm) during the SEAC4RS campaign. By analyzing the wavelength dependence of the -F_{12}/F_{11} ratio much information can be retrieved on the aerosols optical properties. However, all data presented in the paper are performed at 532 nm. There is no information/discussion on the wavelength dependence of the measured data during SEAC4RS campaign. What is the reason for that? They were finally discarded? If so, what is the reason for that?

- Section 4, third paragraph: There is a discussion about the implications on aerosols size based on the measured phase functions at back-scattering region. However, the measured phase functions are arbitrarily normalized to unity at 30 degrees. If they would be normalized to e.g. 120 degrees the AL would show the strongest back-scattering intensity. In this case it would be best to talk in terms e.g. of steepness of the phase function (measured maximum value divided by the measured minimum). Still as mentioned, the maximum of the -F_{12}/F_{11} ratio is a better diagnostic tool for aerosol size specially in the fine mode peak. As stated at the end of the third paragraph the effect of particle size on the maxima of the -F_{12}/F_{11} ratios is moderated by differences in the refractive index. Multiwavelength measurements of the -F_{12}/F_{11} would help in disentangling both effects (size and refractive index).

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