**Atmospheric
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Discussions

Interactive comment on "Characterization of forest fire smoke event near Washington, DC in Summer 2013 with multi-wavelength lidar" *by* I. Veselovskii et al.

Anonymous Referee #2

Received and published: 20 November 2014

The paper mentioned above deals with the investigation of smoke events in the US by means of multi-wavelength Raman lidar. The authors study the optical and microphysical properties of the smoke aerosol in comparison to the PBL aerosol. The paper is of scientific relevance and generally well written. The content is clear structured and the methodologies are well presented. I recommend the paper for publication after some minor revisions.

General issues which need to be clarified:

-How do the authors calibrate the backscatter coefficient? They cite Ansmann et al.,

1992, for that purpose; however there is always a need to find a reference height and value for each individual backscatter profile. It should be stated how the authors do that for their high resolution profiles, i.e., do they assume the same value and height interval for every single 2-min profile and if yes which one.

- I do not agree with the comment "The quality of the input data can be characterized by the discrepancy r," (page 26869 ,line 17). In my opinion the discrepancy is a measure how well the inversion could perform for the specific input data set, i.e. how accurate it can reproduce these data. The error of the input data set itself cannot be directly estimated by this parameter. Therefore I would like to know and it should be stated how the error of the input parameter can influence the inversion. Later it was briefly stated that the error of the extinction coeff. at 532 nm leads to oscillations in effective radius. However, the order of magnitude is not stated. This should be done to estimate the uncertainty of the effective radius retrieval at high temporal resolution.

- In addition with respect to this topic, the authors assume the uncertainties in the input data as independent but also mention the influence of the overlap function on the retrieval (page 26870, top). The influence of the overlap function however influences all input data similarly and thus the uncertainty with respect to the overlap is not independent, right? Is the made assumption thus still valid?

- I would be very happy to see also high-temporal resolution panels of lidar ratio and Angström exponent as they are more or less used for the inversion, too.

Specific comments:

26866, 16 "values" at wrong location in sentence?

Figure 2: Again, overlying borders would help a lot to understand the images.

Figure 8: Are there also error bars for the lidar ratio at 532 nm?

Figure 9: Please explain in caption which Angström exponent is shown.

Figure 20: A brief description of different states in caption would be desirable (e.g., 1 PBL, 2 Smoke)