**Atmospheric
Measurement
Techniques**
Discussions

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Interactive comment on "Airborne multiwavelength High Spectral Resolution Lidar (HSRL-2) observations during TCAP 2012: vertical profiles of optical and microphysical properties of a smoke/urban haze plume over the northeastern coast of the US" *by* D. Müller et al.

Anonymous Referee #2

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This is an interesting paper were the authors report on results from the first airborne "3 backscatter +2 extinction " multiwavelength High Spectral Resolution Lidar (HSRL-2). The results are very welcome to be presented since this is top research and they are nicely comparable with the in-situ. The only confusion is the fact that the automated software, the instrument itself, the uncertainties and sensitivity studies are not presented nor referenced.

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Interactive Discussion

Discussion Paper

Page 1061 line 1- The authors state:"... measurements acquired by the world's first airborne multiwavelength High Spectral Resolution Lidar (HSRL-2)" I am not sure if in here the word "first" is related to the airborne or HSRL; probably neither since there is also a HSRL-1 ; actually the "first" measurements are presented so the authors should rephrase

Page 1061 line 9 –The authors probably meant "retrieved" instead of "retrieves"

\The introduction is really short. It should include a short discussion on the needs with respect to in situ observations and occurrence, improving and extending what has been done already, as well as need for modelling/understanding interactions and radiative forcing. It may be appropriate also to include in this section some background on what is done now as retrieval algorithms for microphysical properties from multiwavelength lidar data. Also some references related to the use of the two aircrafts in research flights related to the paper main objectives.

\\Page 1062 line 10- you should probably put a reference with a detailed description of the HSRL1

\\So there are few thinks that can be noted after the first reading of the paper- Description of the instrument, data analysis algorithm (the prototype software), sensitivity studies, uncertainties studies will be presented in future studies (so not here!), but I think in several places more details should be given as for e.g.: \\Page 1062 line 21-22 since there is no reference and no demonstration of this statement we have to just believe that uncertainties for optical data are in the order of 0.1–3 % .

\\page 1062 line 24 I could not find in Ansmann and Müller, 2005 "the requirement set out for trustworthy microphysical retrievals" so please be more specific

\\page 1063 line 5- you mention in here the aerosol typing algorithm of Burton et al. 2012 but you haven't use it to assess the aerosols types in your measured data sets- which could be a good asset

\\page 1063 line 8- in the paper bu Ansmann and Muller 2005 there are several types of algorithms described. I think it will be helpful to be more specific in here; a bigger paragraph on the algorithm please; description along with other references where the algorithm is specifically described would be nice

\\page 1063line 15-please insert references to prove the higher SNR

\\No information is given on the range of the measurements. I would guess 0 to 4 km from the curtains representation but it should be mentioned in the text

\\Related to Results and discussions It will really help the reader to understand your results if you present a map with the aircrafts tracks and highlight the measurements you considered for your inversion algorithm

\\Page 1066 lines -51 Please provide backward trajectories and fire map to convince the reader your assumption (regarding the type of aerosols)is correct

\\Page 1066 lines 6-13 Only 7 lines regarding the automated algorithm; very difficult to understand exactly how this automated actually works. You divide in 150m arbitrary layers? Are you sure there is aerosol in these layers? Do you set any thresholds for SNR in each of these layers that I understand they become "data sets" input in the automated software? This is the first time I see that this algorithm is used for arbitrary layers. Can you point out any references where this has been done before? If not than the results of the simulations should be at least mentioned here.

\\Page 1068 line 25 you haven't provide any proof(references) in the paper to support your statement" Ångström exponents are in agreement with literature values of urban haze and/or biomass-burning smoke". Also the paper by Muller et al. 2007 presents the effective radius for biomass burning events and combined with your observed " lidar ratio at 355 nm was similar or slightly lower to the one at 532 nm" could lead to decision that your measurements are related to biomass burning event. Why not?

\\Page 1069 line 4 –In this paper "the curtains" presented are not related to the micro-

physical parameters as you state (see Figure1)-please clarify this

\\Page 1069 lines 7-10 you should provide references for this statement

Interactive comment on Atmos. Meas. Tech. Discuss., 7, 1059, 2014.

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