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Interactive Comment

Interactive comment on "Contributions of dust and biomass-burning to aerosols at a Colorado mountain-top site" *by* A. G. Hallar et al.

Anonymous Referee #1

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Measurements at Storm Peak Laboratory (SPL; 3320 m) are used to characterize in-situ and column-above aerosol optical properties. Measurements of the aerosol optical depth (AOD) and Ångström exponent in the column above SPL were made with a Visible Multifilter Rotating Shadowband Radiometer (MFRSR). In-situ measurements of light scattering (from all particles <10 um) and the Ångström exponent were made with a TSI 3563 integrating nephelometer. The MFRSR measurements cover 1999-2013 with some data missing around 2012. The nephelometer data cover the period 2011-2013. The complete dataset is examined relative to selected dust and fire events known to have influenced SPL. Events associated with fires are characterized by higher values of the Ångström exponent as well as AOD/scattering whereas the dust events are characterized by lower values of the Ångström exponent and higher

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Interactive Discussion
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AOD/scattering. Although the differences in the means/medians are smaller, the highest individual AOD/scattering was associated with fire events. Overall, the paper is well written and the observations are carefully handled. I think this is a useful summary of a large collection of observations that emphasizes the important contributions to aerosol direct radiative forcing from dust and fire events, which may increase in significance in the future.

I have the following minor comments:

1. Page 21310, lines 13-17 – The Leaitch et al reference discusses measurements made at Whistler Peak and from a smaller aircraft (Cessna 207) in the vicinity of Whistler Peak. There was a Hi-Res ToF AMS at Whistler Peak, and there was a quadrapole AMS on the Cessna 207. Leaitch et al discusses the measurements from the Cessna and some of the Whistler Peak observations. The HRToFAMS data at Whistler Peak are discussed by Sun et al. (ACP, 9, 3095-3111, 2009). The C-130 conducted only a couple of flights near Whistler, and the overall C-130 results are discussed by Dunlea et al (ACP). This should be corrected.

2. Page 21312, lines 18-19 – Do you mean NPF in general or NPF during the dust and fire events? Please clarify.

3. Page 21312, lines 24-25 – Please explain the uncertainty values on these two lines. On page 21307, there is reference to an AOD uncertainty of 0.01, which is significantly higher than the values here, and from Figure 3 it looks as if the standard deviations are also higher.

4. Page 21313, line 6 – What do you mean by "further"?

5. Page 21313, lines 22-24 – You might add that here the point that neph is an in-situ measurement whereas the MFRSR is an integration of the column above.

6. Page 21314, lines 3-7 – The month offset in the decline in the Angstrom exponent between the two measurements is interesting. Any suggestions as to why? Could it be

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that transport is lower earlier?

7. Page 21316, lines 5-6 – Before this, you mention that the measured regional dust episodes have a mean size of about 1 um. Asian dust may have larger mean diameters (e.g. Lee, Y.-G. and Cho, C. H.: Characteristics of aerosol size distribution for a severe Asian dust event observed at Anmyeon, Korea in April 2006, J. Korean Meteor. Soc., 43, 87–96, 2007 – also, Fig. 11 of Leaitch et al.).

8. Page 21316, lines 17-18 and Figure 4 - The differences seem to be mostly at lower AODs and scattering values. Does the nephelometer measurement have greater sensitivity to smaller particles than the MFRSR? Any idea how to interpret the gray dots in Fig. 4a?

Interactive comment on Atmos. Chem. Phys. Discuss., 15, 21299, 2015.

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