**Atmospheric
Chemistry
and Physics
Discussions**

Interactive comment on "Seasonal cycle, size dependencies, and source analyses of aerosol optical properties at the SMEAR II measurement station in Hyytiälä, Finland" *by* A. Virkkula et al.

Anonymous Referee #2

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General comments

The discussion paper gives a good overview of the situation at the SMEAR II station and a comprehensive discussion of the aerosol optical properties. The authors give a good introduction in the measurements and data processing. The following data evaluation and interpretation is sound. The method for identifying source regions is convincing.

Specific comments

Page 29998, line 17: Scattering size distribution is a not often used term, and non experts don't know the meaning of it. I would avoid mentioning it in the abstract.

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Interactive Discussion

Discussion Paper

Page 3002, line 14: In Anderson& Ogren (1998) truncation corrections are given for sub-μm and no-cut. Why have you chosen the correction for no-cut? Related to this question, is there a similar correction for backscattering?

Page 30002, line 19: In the aethalometer manual a wavelength of 950 nm is given and not 980 nm.

Page 30003, line 17: The publication year of Arnott et al. is 2005. The authors explain why they have chosen the Arnott algorithm. Is there an estimate, if absorption coefficients derived with the Arnott et al. (2005) algorithm are larger or smaller than absorption coefficients derived with other corrections, e.g. Weingartner et al (2003), Collaud-Coen et al. (2010).

Page 30004, line 21 and page 30005, line7: Do the authors mean aerodynamic diameter for the APS size range?

Page 30005, line 19: Was the particle density derived for this study to be 1.5 g/cm3 or was that value taken from Saarikoski et al. (2005) and Kannosto et al. (2008).

Page 30007 line 10: words twice "by"

Page 30009, line 7: From figures 6 and 7 I conclude that you mean diurnal cycles and not seasonal cycles for the four seasons. Did I misunderstood that paragraph?

Page 300010, lines 8 to 21: Intensive and extensive properties were measured at low humidities. An estimation of the radiative forcing efficiency requires aerosol properties at ambient humidities. How reliable is the forcing efficiency when estimated from optical properties at low humidities.

Page 30011, line 15: Why is the particle density different to the value given on page 3005 line 18?

Page 30011, line 16: The error of the mass scattering efficiency is rather small. What is the uncertainty of assuming the density. Was the uncertainty of the density included

in the error of the mass scattering coefficient?

Page 30012, line 22: Why was the imaginary part of the refractive index not shown? The imaginary part of refractive index is highly variable compared to the real part of refractive index. I think it would be interesting to have a statistical overview on the imaginary part.

Equation 8: I think it is confusing to use sigma_sp for scattering coefficient as well as for scattering size distribution.

30013 section 3.3.3: The reviewer is missing the motivation for showing a correlation between particle scattering and condensation sink. Why is the condensation sink important in the context of this paper?

30017 line 19-20: I don't understand that. In the first sentence you say that the large variation is most probably due to noise of aethalometer data. In the second sentence you state that it is not only noise of the aethalometer.

Figures 8 and 9: In both figures the correlation between two extensive properties is show. Different functions were fitted to get a functional dependence. What does it mean if a fit function is not forced through the origin? For Fig 8 it means that at low volume concentration the scattering can be zero or even negative. Because of the no physical behaviour at low concentrations such functions should be used with care.

Page 30025 line 25, words twice 'as a'

Subscripts are sometimes in upper case (equation 6) and sometimes in lower case (equation 7).

Interactive comment on Atmos. Chem. Phys. Discuss., 10, 29997, 2010.