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Atmospheric Chemistry and Physics Discussions

Interactive comment on "A case study on long-range transported aerosols of biomass burning: effects on aerosol optical properties and surface radiation levels" *by* A. Arola et al.

Anonymous Referee #2

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The manuscript discusses a specific biomass burning event which occurred in spring 2006. Aerosols were transported from the burning sites to Finland. Available measurements include Radiation measurements in Finland in combination with aerosol information close to the source in Estonia and from the MODIS-satellite sensor. The consequence of this aerosol event on UV and shortwave radiation measured at Jokioinen was investigated by a comparison with a radiative transfer model relative to clear sky measurements which also occurred during this period. As a side product the MODIS aerosol retrieval was compared with the Aeronet data of Estonia as a validation.

The manuscript discusses a very interesting and timely topic, since the quantification

of the aerosol influence on surface radiation is still not fully known and requires additional research such as the one presented in this manuscript. The combination of measurements and their assimilation with model calculations allowed to quantify the effect of biomass burning aerosols on UV and shortwave radiation.

The manuscript is clearly written and well structured. The figures are informative, but should receive more attention with regard to the axis legends. Figure 2 should mention that the quantities displayed on the X and Y axis are aerosol optical depth at 550 nm, and Figure 7 and 8 have no captions at all.

The references seem up to date and complete.

A general comment: One important merit of the manuscript is to include in the investigation the UV wavelength at 340 nm. The authors explicitly mention that they use this wavelength which is NOT influenced by ozone. On the contrary I would suggest that the authors explicitly use a UV wavelength influenced by ozone, especially as they have a MKIII Brewer which not only measures radiation but is also a reference instrument to measure the total column ozone. The inclusion of a UVB wavelength would significantly enhance the importance of the manuscript: Very few studies show the influence of aerosols on UVB wavelengths; The enhanced scattering expected from tropospheric aerosols as described here in combination with tropospheric ozone might lead to enhanced absorption quite different from what occurs at longer wavelengths (i.e. 340 nm); the model calculations should remain straightforward since the only additional parameter (total column ozone), should be known.

Notwithstanding the general comment above, the manuscript can be published, if the comments which are presented below are incorporated in the text:

1) The Angstroem formula (equation 1), is usually written with a negative exponent (i.e. aod=b lambdaˆ-a), so that the alpha exponent is itself a positive quantity. Since the authors themselves quote positive alpha exponents later on in the text, the equation should be changed accordingly.

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2) Section 3.1. comparison between MODIS and Aeronet is a substantial part of the manuscript, and mentioned in the conclusion. An additional comparison might be obtained from the PFR sunphotometer installed at Jokioinen itself, and thus the validation of the MODIS data could be performed directly at the measurement site instead of indirectly through a comparison at Toravere, Estonia.

3) The aod comparison in section 3.1 and shown in Figure 2 is done through the use of relative differences. However the recommendation of the WMO and usual practice is to compare absolute differences of aod. The reason is that the aod is an optical depth, and has an exponential influence on radiation. relative differences are therefore difficult to interpret, since the expected errors due to instrument drift or calibration errors result in air mass dependent absolute errors which are in principle independent on the magnitude of the aod itself. I would recommend to modify this part of the comparison and Figure 2 to show the differences and the statistics as absolute differences.

Interactive comment on Atmos. Chem. Phys. Discuss., 7, 6631, 2007.