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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.

A. Arola et al.

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We would like to thank the reviewer for his/her constructive comments. Below are included all the review comments that required a response.

The title does not include "long-range" anymore.

Balis et al. 2004 is included in the revised manuscript.

The reviewer mentioned in several occasions of the review different uncertainties involved. His/her comments in this respect can be summarized as follows: uncertainties exist related to the use of constant AOD, SSA and Ångström α that do not take into account the diurnal variability. He/she also stressed that the use of Ångström α deter-

mined at visible, may introduce an error, when used to estimate AOD at UV. He/she also emphasized that the aerosol induced attenuation depends on the solar zenith angle. We consider this latter point related as well, and therefore we argue that the following explanation justifies our analysis (the revised text also includes similar statements to better explain our analysis).

In our study, we focused on the aerosol-induced decrease in radiation at noon, because our analysis was based on MODIS AOD data available for times near local noon. We agree that it would be interesting to analyze also the diurnal variability of the aerosol effect. There are two factors contributing to the diurnal variability: (i) the solar zenith angle which modifies the optical path through the atmosphere, and (ii) variations in the aerosol conditions within a day.

Of course, we can look at the diurnal variability by examining the ratios of Brewer (and global radiation) measurement to clear-sky model run. For instance, on April 27, when the reduction at noon was 35/40/the aerosol attenuation was decreasing compared to noon conditions. In this case, the AOD was likely decreasing, but unfortunately we do not have good quality measurements available for diurnal AOD variability. Thus it is not straight-forward to separate the effects of sza from those induced by within-day AOD variability.

The uncertainty introduced by Ångström α from visible wavelengths to estimate AOD at UV is also now discussed in the revised manuscript.

In the revised manuscript the pyranometer wavelength range and type is given instead of the reference.

Figures 3 and 7 are modified as suggested.

We want to also stress that indeed the polluted model run was mainly used for the verification purpose, while the measurements were used to assess the UV attenuation. With the polluted model run, we primarily wanted to ensure that the radiative transfer

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modeling really is able to capture and explain the measured UV variability. Indeed there was a remarkable correspondence, if one compares blue line and circles in the figure 8. The good agreement between polluted model run and measurements also suggests that the AOD used for UV wavelengths in our radiative transfer calculations is representative for the real conditions, although it has been extrapolated from the visible band. The fact that day-to-day AOD variability is well captured is elaborated in the revised manuscript.

The caption of Figure 1 is corrected.

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