Atmospheric Measurement Techniques Discussions

Interactive comment on "Smoke aerosol and its radiative effects during extreme fire event over Central Russia in summer 2010" *by* N. Chubarova et al.

Anonymous Referee #1

Received and published: 16 November 2011

This paper discusses the analysis of aerosol photometric measurements taken during the severe fires in summer 2010 over Central Russia using ground at two AERONET sites in Moscow and Zvenigorod (Moscow suburb) and radiative measurements in Moscow. Such aerosol optical and climatic properties as size distribution, single scattering albedo, complex index of refraction and radiative forcing are discussed in details and compared with those observed for other smoke events in Moscow and worldwide. The paper is clear and well written. The results are well explained and coherently aligned with the finding from other known publications discussing the properties of biomass burning smoke. The paper discusses simultaneous observations of two types:

photometric (AEORNET) and radiative (solar irradiance attenuations), this certainly makes the results more convincing. At the same time, I have found that the authors can benefit more from the availability of these two types of observations simultaneously. Therefore, I recommend this paper in Atmospheric Measurement Techniques for "publication after a minor revision". I have outlined below the comments for the authors consideration.

Comments: 1). The authors provide very interesting observation of aerosol absorption spectral dependence from UV to visible. However, these properties were derived differently: in visible from AERONET, in UV from matching irradiance measurements. In principle, one can imply that the observed differences in aerosol properties can be caused by differences in type of observations. At the same time, the authors show some irradiance measurements were available in visible too. I would suggest to the author considering to check the consistency of these two types of observation. For example, by trying to model irradiances in visible using AERONET retrieved properties. The authors also could outline more clearly if spectral trends observed in AERONET data agree with the observation of increased aerosol absorption in UV. (it seems they well agree?)

2). Figure 11 shows the dependence of aerosol radiative forcing as a function of aerosol optical thickness. It seems that the authors did not account for the fact that aerosol radiative forcing depends on solar zenith angle because since direct solar flux at the surface naturally depends on solar zenith angle. For example, the author case see illustrations of this effect in both measured fluxes and modeled from AERONET in the paper by Derimian et al. 2008. I believe if the authors account for the dependence of the forcing on solar zenith angle, the spread in Fig. 11 will decrease and the regression trends will improve. Full reference: Derimian, Y., J. -F. Leon, O. Dubovik, I. Chiapello, D. Tanré, A. Sinyuk, F. Auriol, T. Podvin, G. Brogniez, and B. N. Holben, "Radiative properties of aerosol mixture observed during the dry season 2006 over M'Bour, Senegal (African Monsoon Multidisciplinary Analysis campaign)", J. Geophys.

Res., 113, D00C09, doi:10.1029/2008JD009904, 2008.

3). Figure 6 shows the errors bars for the retrieved size distribution. Those errors bars are not very realistic for the values corresponding to the very small and very large particles (too small). They show look more like in the paper by Dubovik et al. (2000). I understand that those errors bars were taken from the AERONET code output. However, I am aware that those error bars should be corrected for size distribution (for other parameters they are ok). I suggest, either to remove the errors bars for size distribution or contact the AERONET code developers and get updated errors bars for size distributions.

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Interactive comment on Atmos. Meas. Tech. Discuss., 4, 6351, 2011.

C2079