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Atmospheric Measurement Techniques Discussions

Interactive comment on "Radiative characteristics of aerosol under smoke mist conditions in Siberia during summer 2012" *by* Tatiana B. Zhuravleva et al.

Anonymous Referee #1

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Summary The paper is devoted to the analysis of microphysical, optical and radiative properties of smoke aerosol during extreme fire events in summer of 2012 over Western Siberia. The data from Tomsk AERONET site and satellite observations were involved into consideration. It was revealed that intensive wildfires in 2012 in Siberia were characterized by extremely high aerosol loading. The average AOD at 500 in the period of smoke mist has been six times greater than under the background conditions, and almost a factor of 2.5 larger than mean AOD in "ordinary" smokes in other years. The AOD value reached 5 in certain periods (on July 24-28). Smoke aerosol size distributions had bimodal structure with prevailing fine fraction. Abnormal atmospheric turbidity and high values of single scattering albedo resulted in strong cooling effect of

smoke aerosol. The results, presented in the manuscript, are of considerable interest from the point of view of radiative and climatic effects of the large-scale intensive wildfires in the boreal zones. The paper of T.B. Zhuravleva et al. is worthy of publication in AMT once the general and specific comments have been addressed.

General comments 1. It was stated in Chapter 2.1 that "An original approach, relying upon ground-based spectral measurements of AOD and radiance phase functions, was also used in addition to the algorithm of Dubovik and King (2000) to solve the inverse problem" (lines 104-105). But throughout the paper, only AERONET retrievals are considered. It would be worth to compare them with SSMART retrievals in certain situations. Especially it concerns SSA and asymmetry factors retrieved directly from the data of AOD and sky radiance measurements by means of RTE equation solution. 2. Relative contribution of coarse aerosol fraction into AOD is much greater in IR spectral region (1020 nm), than in blue (440 nm). In Table 3, only the regression equation between volume concentration of coarse aerosol and AOD (440 nm) is given. What about 1020 nm? Specific comments: Line 24. -"SSA(440 nm)=0,92". Change comma to dot. Lines 33-35. -"The maximal values of DRE were observed on July 27 (AOD(500 nm)=3.5), when DRE(BOA) reached -180 W m-2, while DRE(TOA) and DRE of the atmosphere were -80 W m-2." These values do not coincide with those on lines 560 – 561. Line38. - "diurnally radiative effects of smoke and background aerosol". Diurnal. Line 82. - "CE 318 has been operated at "Fonovaya" observatory. . .". Words "has been" are extra. Lines 177-178. - "(particle size 0.4-15 um)". Do these values refer to particle radius? Lines 253-255. -"The slight increase in Ångström exponent α, which depends on the interrelation between contributions of fine and coarse aerosols to AOD, also indicates that small particles predominate in smoke aerosol". Angstrom exponent depends not only upon relation between fine and coarse fraction, but also upon parameters of fine fraction. Lines 596-597. -"The width of the fine mode distribution increased. . .". What are the quantitative parameters of the fine mode broadening? Lines 601-602. -"The $\kappa\lambda$ variations in the wavelength interval of 675-1020 m are not as strong". 675 – 1020 nm. May be "not so strong"? Fine fraction is called throughout the text as “finely dispersed fraction”.

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