

## ***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 #2**

Received and published: 6 December 2011

### **Summary:**

The manuscript by Chubarova et. al. describes the smoke aerosol and its radiative effects during extreme fire event over Central Russia in summer 2010. Aerosol measurements from two AERONAT stations in the Moscow area are presented and compared with typical for that area aerosol conditions. Microphysical and optical aerosol properties, refractive indices, radiative effects of the aerosols are calculated and discussed.

In general, this is a well written paper which provides reader with the good understanding of the aerosol optical properties during the extraordinary event and brings more

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knowledge on the optical properties of the atmospheric biomass burning aerosols.

The paper can be published in ACP once the general and specific comments have been addressed.

### General comments:

1. The section “Discussion” does not bring new information and does not raise any new question besides those which are discussed in “Results” and “Conclusions”. A lot of numbers from the “Results” and “Conclusions” are repeated here.
2. It is not clear how significant was the increase of the air temperature and how much lower was the precipitation comparing to typical summer conditions in Central Russia. Please, give numbers or show the comparison plot.
3. The discussion on the Nesterov’s number might be organized as a separate chapter (3.2).
4. When you talk about Moscow, do you use the information from others than MO MSU stations? Please, clarify in the text.
5. Do you have the information on the visibility during the event? Would be interesting to include that information as well.

### Specific comments:

p. 6352, line 11

- according to the Table2, the average SSA for fire conditions 2010 was 0.96

p. 6352, line 12

- explain what AOT is

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p. 6352, line 13 and further on

- AOD in Moscow or at MSU MO?

p. 6353, line 10

- "... typical properties of the atmosphere". Typical globally or for the studied area?

p. 6353, line 13

- clarify, what are the "other wildfire conditions"

p. 6353, line 15

- is "Moscow MSU – Moscow State University" – the other name for MSU MO? The information in parenthesis is read as the names of three stations

p. 6353, line 15

- "some distance" – not clear how far, indicate the approximate distance

p. 6354, line 16

- what do you mean by "morning and evening conditions"? Explain the difference

p. 6354, line 20

- Eck 1999 – not in the reference list

p. 6355, line 2

- add " $0.5\mu < \dots$ "

p. 6355, line 2

- is "Version 2.0" same as "level 2.0"? You speak about version first and in the next paragraph move to levels. I suggest to explain what are the different levels and after that mention which data were used in the current study.

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p. 6355, line 29

- correction was applied to AERONET level 2 data?

p. 6356, line 1

- Was Langley plot method applied when it was possible? Not clear.

p. 6356, line 8

- “raw” means AERONET level 1 data?

p. 6356, line 11

- matching between Zvenigorod and Moscow?

p. 6356, line 16

- “Moscow” means “MSU MO” or other station?

p. 6357, line 16

- suggest to use more concrete than the “heart” geographical location

p. 6357, line 18

- write “and in” instead of “and to”

p. 6357, line 18

- write “the” instead of “these”; define the starting and ending dates of the period

p. 6357, line 26

- write “close to zero” instead of “zeroised”

p. 6358, lines 4-10

- what were the N values for the other fire events in Moscow area? Statistics for the years from the “Discussion” part will be interesting to see here.

p. 6358, line 10

- “These creates. . . .” – not clear. Statistics for N show that especially favourable conditions for fires were observed in 2010?

p. 6358, line 17

- what is “r” here? Correlation coefficient? “r” is used on p. 6355, line 2 to define the radius

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p. 6358, line 20

- give the reference the source for back trajectories.

p. 6358, line 26, 25

- use “R” for the correlation coefficient

p. 6359, line 1

- was the special processing applied for the whole Moscow data set as well? Not clear from the “methods” section. Why the only point is shown on Figure 4? Add the other line for the special processing in Moscow as it is done for Zvenigorod

p. 6360, line 7

- write “5a” instead of “5”

p. 6358, text for Figure 5

- What was the reason to combine figures 5a and 5b into one figure? Figures 5a and 5b contain different information that can't be compared.

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p. 6360, lines 10-12

- give numbers

p. 6360, line 16

- delete “l”

p. 6360, line 18

- which “typical” conditions?

p. 6360, section 3.3

- explain what REFR and REFI tell about

p. 6361, line 9

- use “agreement” instead of “accordance”

p. 6362, line 19

- use “high” instead of “higher”

p. 6362, line 22

- used in present studies? Not clear

p. 6362, line 25

- results from Chubarova et al. (2009) and from present studies are mixed – not clear. SSA was (?) lower than SSA from the Table 2? Which SSA was used to model 2010? In the table 2 SSA =0.96. Why here and further (p.6363, line 16) the given number is 0.95-0.96?

Why there is a difference between measured (0.96) and modeled (0.8-0.9) SSA?

p. 6363, line 6

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- explain “EW radiance”

p. 63613 lines 15-18

- make the sentences more clear.

What are the additional effects of the gas absorption?

p. 6363, line 67

- add “. . . . 1.45 for typical conditions”

p. 6363, paragraph 2

- what do those changes tell about?

p. 6363, line 15

- use “lower” instead of “less”

## Tables

Table 1

- add statistics for 1972 and 2002 for comparison

## Figures

Figure 1

- 15h is UTC or local time?

Figure 2

- which station?

Figure 3

- give the reference for the trajectories source

## Figure 4

- in the caption use the explanations for the lines (colors, symbols) instead of the numbers. Or add the numbers to the legend
- use the dates (as in figures 1 or 2) instead of Julian days
- give more precisely (section number) the location of the explanations in the text

## Figure 5

- divide figure to 2

## Figure 6

- give the explanation for error bars
- specify colors in the caption ( “fire conditions (red) and in typical conditions (black)”)
- what are the AOT numbers in the legend – daily mean? Explain in the caption

## Figure 7

- explain in the caption what are F and C
- put the remark that the regression equation is given for fine particles

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## Figure 8

- mention the colors in the caption

## Figure 9

- combine 9a and 9b.

## Figure 10

- change the format for x-axis to “0.5”, “1.0”, etc

## Figure 11

- mention short name RFE in the caption

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