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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Interaction of anthropogenic and natural emission sources during a wild-land fire event – influence on ozone formation" *by* E. Bossioli et al.

Anonymous Referee #2

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Effects on the ozone production of the 2006 spring's wildland fire event over western Russia (24 April - 10 May 2006) are presented and discussed based on the application of a CTM. Results are compared with EMEP network measurements. The specific impact of biogenic emissions under a wildland fire event is assessed and some tests to evaluate the influence of uncertain fire parameters on the ozone estimated values are also provided and discussed. The paper is very interesting and it was a pleasure to read it and analyse it. It addresses one important and up to date research issue.

However, there are some aspects of the paper that should be improved and/or better explained, namely:

- results are mainly presented for the period between the 2nd and the 7th of May. Why this period? From figure 4 it looks the major emitting period happened at the first days of the event.

- the comparison between isoprene predicted values and measured ones indicates a weak performance of the model (see figure 2); can we trust biogenic emissions simulations with this not so good behaviour? Please, develop a little bit more this topic.

- fire characteristics, such as daily burnt area and type of consumed vegetation are needed; without this information it is difficult to assess results, particularly the fire impact on ozone production.

- emissions estimates are not clearly described; Sofiev et al. (2009) is referenced, but a better description of emissions (including the hourly variation of fire intensity and its relationship to emissions) and their analysis is needed. Smoke composition depends on the burnt fuel.

- there are European fire emission inventories developed by other authors. Please, compare your estimates with the available values.

- modelling results do not catch the smoke plume along the fire episode (see figure 5); this problem has to be addressed and much better explained.

- there are some publications about this particular case study or about other wildland fire effects on the air quality and it would be interesting to compare and discuss the performance indicators obtained here with the others.

Anyway, I consider this paper very interesting and scientifically sound deserving to be published with some revision.

Following you can find more specific comments along the document:

- 1. Introduction

The state-of-the-art is very good clearly showing the scientific advance of the current

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paper. Anyway it can be improved with some recently published papers.

- 2. Methodology, modelling tool, and input data

2.1 Atmospheric chemistry-transport models

- page 3471, lines 10-11: initial and boundary conditions are not described enough; please improve.

- Page 3471, lines 16-21: I'm assuming that smoke clouds are not considered in the photolysis rates adjustments. Please, state this clearly, because this could have an effect on obtained results.

2.2 Biogenic emissions

- page 3472, line 22: add a reference to MEGAN

- page 3473, lines 4-5: revise English, please

- page 3473, figure 1: why presenting the period from 2 to 7 May and not another one?

- page 3473, line 9: delete "the" between "with" and "recent"

- page 3474, line 7-8: improve the sentence starting with "During" and ending with "data". It is not clear enough

- page 3474, line 8: insert information stating that data in Figure 2 are measured and calculated.

2.3 Fire emissions

Please, also see my previous general comments.

- page 3474, line 24: why considering grass? Don't you have information about the fuel burnt?

- Figure 3 is not described in the main text

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- page 3475, line 11: PM behaviour is mentioned, but not shown at all.

- 3. Results

Insert a sentence introducing this Results section. It would help the reader to follow the analysis.

3.1 Episode analysis – comparison with O3 observations

The first paragraph makes more sense in section 2.3.

Figure 5 analysis reveals some modelling problems and I would like to see results from the first days of the fire event when emissions were higher. When comparing model results with EMEP measurements it looks modelling was not able to correctly catch the smoke plume. This problem has to be much better addressed in the paper.

- page 3476, line 17: why are you using US EPA metrics definition?

- in table 1 you're showing metrics for two NOx/CO ratios, which were not previously introduced

- page 3477, lines 9-10 and figure 7: correlation values are mentioned, but they are not previously included in the description of the statistical parameters (page 3476), nor in table 1.

3.2 Impact of fire emissions

- page 3478, lines 25-26: fires release very large amounts of NOx, but also of VOCs.

- page 3480, line 5: avoid mentioning figure 12 before including figure 11

3.4 Sensitivity to parameters of the fire emissions

- page 3482, lines 27-29: this information should be provided before when describing the fire event

I understand the sensitivity studies, but it is not clear the use of injection heights typical

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of crown fires, if the studied event mainly was a dry grass fire.

- 4. Conclusions

Part of the work was focused on performance of the application, but conclusions are too poor on this point. Only the last paragraph “touches” this issue. Please, include something about your performance evaluation work.

Interactive comment on Atmos. Chem. Phys. Discuss., 12, 3467, 2012.