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Interactive comment on "Impact of wildfires on particulate matter in the Euro-Mediterranean in 2007: sensitivity to the parameterization of emissions in air quality models" *by* Marwa Majdi et al.

Anonymous Referee #3

Received and published: 4 July 2018

General comments

This paper is about the modeling of wildfires in air quality models and the associated uncertainties on the aerosols concentrations and optical properties. The article is based on several numerical simulations of the 2007 fires in the Mediterranean region with the Polyphemus and CHIMERE models. Simulations explore the sensitivity of these models to chemical related factors (mainly VOC emissions) and dynamics (injection height).

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Discussion paper

The scientific approach is sound. The work presented is substantial (several simulations have been done and analyzed) but the conclusions and discussions deserve more work before publication. Several conclusions written in the manuscript are expected and already known. The risk is that the impact of the publication to a broader scientific community remains limited unless the authors put the conclusions into a wider perspective. In particular, this would require to add a section dedicated to a scientific discussion including more references to previous works on the subject if possible.

Specific comments

The added value of the CHIMERE model to the analysis must be better explained. The main conclusion I hold is the impact of the vertical resolution. The vertical resolution is certainly a factor of uncertainty for the representation of the boundary layer in general (with or without fire) and would deserve a full sensitivity analysis. At a minimum, this limitation of both models should be discussed.

The introduction refers to the study of PM2.5 and PM10. The latest are little discussed.

The fact that only one ground station was available to validate the model near fires moderates confidence in the findings. The paucity of the in-situ data (which is not the fault of the authors) should be pointed out in the general conclusion.

Both models include wet and dry deposition but little information is provided on the approaches. Are dry and wet depositions sources of uncertainties for PM2.5 and AOD? Wet deposition might not be predominant during the studied period.

The conclusion on the three months period evaluation says that the simulations are improved when fire emissions are included: is this surprising? It seems to me that the conclusion was expected unless there are previous studies that have concluded otherwise?

"Surface PM2.5 are particularly sensitive to the injection heights" is also an expected conclusion. Can the study help to decide between a PBL mixing of fire emissions vs.

injection height above PBL?

The introduction of the PPMfine fraction remains a little obscure for me and would deserve a little more explanation. It is important to understand this variable in light of its significant contribution to the composition of PM2.5 and the uncertainties in its definition (expected overestimation). How is this missing part treated in the other models?

Technical corrections

Figure 2: I assume that these are emissions calculated by APIFLAMME ?

Section 2.1: how are I/S/L VOCs represented in CHIMERE?

Table 2: I am confused between the Table marks and the comment above concerning the configuration of the CHIMERE model. The comment refers to simulation without I/S-VOCs and with fires but the table for the CHIMERE-ref shows a "Yes" for I/S-VOCs Change PB to PBL.

Figure 3 & 4: Legend: add "surface PM2.5"

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Interactive comment on Atmos. Chem. Phys. Discuss., https://doi.org/10.5194/acp-2018-309, 2018.