

## ***Interactive comment on “Changes in the domestic heating fuel in Greece: effects on atmospheric chemistry and radiation” by Eleni Athanasopoulou et al.***

### **Anonymous Referee #2**

Received and published: 12 April 2017

#### General comments:

The manuscript concerns the impact of increasing burning for residential heating in Athens, Greece.

Even if the Greek situation is peculiar due to the impact of the economic crisis, this subject has great importance over the whole Europe, where the use of wood burning for house heating is increasing in a number of areas of different states. Even if the scientific knowledge of the dangers associated to biomass burning is growing, the air quality impact of biomass burning in domestic devices is not yet perceived and understood by the population and decision makers.

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The manuscript is properly organized and well written. It points out that biomass burning for house heating has a major impact on the air quality and on atmospheric composition, while it has a minor influence on local radiative forcing.

The authors describe their approach to improve wood burning description within the emission modelling, that could be useful for model development and application in different areas and contexts.

Because the manuscript is proposed for publication in a special issue on coupled chemistry-meteorology modelling, discussion on the relevance of the on-line coupling approach on the presented results concerning atmospheric composition and aerosol chemistry is presently missing. The on-line coupling advantage is evident only for the studied aerosols feedback on meteorology, while it should be specified if any difference could be noticed on pollutants concentrations when feedback was switched off (Scenario 4).

The present form of the manuscript needs a revision including: clarifications, figures improvement, extension of feedback effects discussion.

#### Specific comments:

##### 2.2 Model framework and setup

Page 5

Line 3

The model domain is defined to be “the extended area of Greece” (the same definition is repeated in Table 1). This definition is quite generic and should be made more specific adding a Figure or a better definition of the domain boundaries.

Lines 5-6

The sentence “The atmospheric pressure...” is not understandable in this form. How where pressure and precipitation optimized? Do the authors refer to the choice of the

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microphysics scheme? What is the mentioned optimization?

Line 9

Does “constant initial conditions” mean uniform initial conditions?

Table 1

It is not clear how the initial and boundary conditions for aerosols are defined. Are the values included in Table 1 uniform in space? Are those values kept constant at boundaries?

2.3 Modifications of the aerosol emissions

Figure 2 is hardly understandable. Its quality should be improved.

Page 6

Lines 21-23

Does the sentence “Combined with the temporal...” refer to Figure 2?

Does Figure 2 describe average emissions or do plotted values refer to a specific hour?

Lines 23-24

Maximum wood burning emissions are said to be located at the urban core, while it would be reasonable to expect to have maximum emissions over peripheral areas, where the access to wood should be easier than in the center.

2.4 The aerosol optical properties

Page 7

Line 9

Concerning aerosols composition, it is not clear how the concentration values reported in brackets should be interpreted.

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Lines 15-18

The values used for Athens differ from those used by Vogel et al. (2009). Is the difference due to the geographic area of application or to any other understandable reason?

To which geographic region do values reported by Takemura et al. refer?

3.1 Impacts of residential wood burning (RWB) on atmospheric aerosol mass and chemistry

3.1.1 Aerosol model performance under smog influence

Page 8

Line 23

Do values reported in Table 3 as “daily mean” refer to the whole period mean as understood from the manuscript text?

Page 9

Lines 1-2

How (on the basis of what parameters) is it evaluated the mentioned 70% improvement?

Lines 10-11

The meaning of the sentence “which leads to the improvement of the half PM1 OA and of all PM1 BC the daytime peaks during the intense smog period” is not clear.

3.1.2 Representative spatial aerosol fields

Page 10

Lines 16-17

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The reference to PM10 EU alarm threshold is not clear, please include proper references to EU directives.

3.2 Impact of RWB smog on radiation

Page 12

Lines 25-27

The sentence concerning removal of absorbing BC is not very clear and should be rephrased to be more clearly understandable.

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Interactive comment on Atmos. Chem. Phys. Discuss., doi:10.5194/acp-2017-139, 2017.