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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Processing of biomass burning aerosol in the Eastern Mediterranean during summertime" *by* A. Bougiatioti et al.

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The manuscript, Processing of biomass burning aerosol in the Eastern Mediterranean during summertime," by Bougiatioti et al., describes measurements performed by an Aerosol Chemical Speciation Monitor (ACSM) and aethalometer during summer 2012 in Finokalia, Crete. This period was characterized by several plume impacts from nearby wildfires. The chemical signatures of the biomass burning aerosols from these wildfires that were observed at the Finokalia site are the main foci of this manuscript. Overall, the manuscript is well-written. The presentation and analysis of the observations is logically organized, and most of the conclusions are well supported by data. This is also a unique study, since during a single observation period five different

biomass burning plumes were observed. I have few concerns about this manuscript, and recommend its publication after consideration of the following points.

Response: We would like to thank the reviewer for the careful reading and do the best to integrate his suggestions to improve the scientific content of our manuscript.

25980/28: This sentence seems to infer that all five biomass burning plumes arrive at the Finokalia site during the early morning hours. This also seems to be demonstrated in Fig. 5c. Is this, in fact, the case for all events? If it is, why do you think these plumes all appear to impact the site at the same approximate time of day? Is it merely a coincidence?

Response: Based on the backtrajectory analysis performed for each fire event, three out of the five plumes arrived in early morning hours i.e. Chios (around 7 am), Euboea (around 5 am) and Andros with two plumes (one around 11 pm and one the following morning around 9 am). For the Croatia event, there were two different plumes, one arrived at around 1 pm (27/08) and one the next day (around 6 am). Finally the plume from Sicily arrived at the site around 1 pm. The fire events with the highest loadings (Chios and Euboea) are the ones that contribute the most in the observed diurnal variability (Figure 5c), which exhibits higher concentrations during early morning hours. Also, Finokalia station is mostly influenced by N-NW winds, and usually air masses from Greek mainland arrive to the site after approximately 8-10 hours (taking an average wind speed during summer of 30 km/h), therefore fires that started burning round noon in mainland will arrive during early morning hours at our site, depending on wind direction. So there was some variability in the time of arrival of these fires. It is possible that some of these plumes were aloft (above the nighttime mixing layer) and they were mixed downwards reaching the site in the morning. A brief discussion of this interesting point has been added in Section 3.2 of the manuscript.

25983/22: I am not very comfortable with this sentence: "Based on the results it can be seen that biomass burning may contribute almost half of the organic aerosol in

the area during summertime." Does this mean that: (a) When averaged over the entire summertime, half the organic aerosol are derived from biomass burning? (b) At any given instant, half the organic aerosol may originate from biomass burning? (c) Are the authors attempting to state what they repeat at 25984/23 in the Summary and conclusions section: "This suggests that the biomass-burning contribution to OA can be misidentified as OOA contribution, therefore underestimating the importance of BBOA."? I don't believe that they have shown (a) or (b) to be true, so I think you are trying to say (c) . . . and I like the way this is said in the Summary and conclusions section a lot more than on this line because it's much clearer. Please review this and correct it or make it clearer.

Response: We have deleted this rather confusing sentence. The statement in our conclusions: "During the fire events the contribution of organics to the total mass increased to almost 50%, with BC also showing an increase in contribution to almost 10% of the PM1" summarizes a lot better the results of our analysis.

Please review all references in the text to the Supplemental Information. In some cases (e.g., 25976/10) the incorrect figure number is given, and in other cases (e.g., 25978/lines 4 and 16) it would be good if the authors could make reference to the actual section in the SI to eliminate any confusion.

Response: We would like to thank the reviewer for pointing out these inconsistences. References to the Supplementary Information will be corrected in the new version of the manuscript.

25972/24: "trimer" Response: Corrected

25973/20: "wavelength" Response: Corrected

25977/12: "(Fig. 3)" Response: Corrected

25979/10: "Hildebrandt" Response: Corrected

25982/21: Might it be helpful to refer to SI-4.4 when discussing the similarities between

mass spectra? As suggested above, please review the main text and add references to the SI where helpful.

Response: This is a good suggestion. We have added the corresponding references in the revised paper.

Interactive comment on Atmos. Chem. Phys. Discuss., 13, 25969, 2013.