

***Interactive comment on “Influence of biomass
burning on CCN number and hygroscopicity
during summertime in the eastern Mediterranean”
by A. Bougiatioti et al.***

Anonymous Referee #3

Received and published: 18 December 2015

The paper presents case studies of aerosol hygroscopicity and CCN-activity as recorded at the Finokalia measurement station in the presence of biomass burning influence from Greece or Croatia. While not revolutionary, the paper presents useful data on the hygroscopicity of ambient aerosol particles, and the analysis and discussion presented are generally reasonable. I therefore recommend publication in ACP after the following, mostly technical, comments have been addressed satisfactorily.

General / major comments:

1. The authors present the plume from the Balkans as a representative case of more aged biomass burning aerosol. This is certainly true, but it is also possible that the

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type of biomass burned at the Balkans can be different from the Greek plumes. It is well known that the properties of biomass burning aerosol from different types of fuels can differ significantly, so I would expect it to be difficult to separate the effect of ageing vs. the type of fuel being burned. The authors should comment on this. In general, the generalizability of the reported results to areas outside the eastern Mediterranean should be discussed in the manuscript.

2. I am not convinced, at least based on the presented discussion, that the differences in condensation and coagulation are the primary factors explaining the different mixing states of the smaller and larger particles. Wouldn't it be a more plausible explanation that the smaller particles that make their way to Finokalia have originated primarily from secondary sources while the larger particles have a more important primary particle component? This smaller variability in the sources of the smaller as compared with larger particles could also potentially explain the observed smaller variability in the hygroscopicity distribution as well. In general, the discussion of the coagulation and the condensation is unquantitative and thus sloppy, for instance I suspect the authors in refer only to self-coagulation when they talk about “coagulation” in general in the text. It is well known that coagulation is more efficient for particles with different sizes, acting therefore primarily as a loss mechanism for the smaller particles, while being similar to condensation from the perspective of the large particles. This section of the discussion of the results on p. 21555–21556 needs to be revised, along with the corresponding discussion in the conclusions section.

Minor / technical comments:

3. When giving the kappa values throughout the manuscript (particularly in Tables 1–3), please pay attention to the number of significant digits given in light of experimental variability and error. Is it really possible to constrain kappa within 0.001–0.01? If yes, please provide justification why you think so.
4. The quality of the figures is in many cases insufficient and the fonts and linewidths

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chosen are too small. Please revise all figures keeping in mind the readability of the figures in typical ACP print versions.

5. P. 21541, line 12: Please quantify what you mean by "smaller" particles.
6. P. 21541, line 23: "BBOA" not defined before used. Please revise.
7. P. 21541, line 23: "enhancements" compared to what? Please clarify.
8. P. 21542, line 20: "impact" -> impacting
9. P. 21542, line 25: What do you mean by bb aerosol being "half of ammonium sulphate"? I presume you mean the hygroscopicity parameter, but please clarify.
10. P. 21550, line 1: "CALPSO" -> CALIPSO
11. P. 21550, line 8: "bellow" -> below
12. P. 21550, lines 24-26: The sum of the average concentrations of the individual components is quite a lot less than the average of the total aerosol. Could you elaborate on why? Perhaps using the medians instead of the arithmetic averages would be warranted?
13. P. 21553, line 25: "It appears, thus" -> It thus appears
14. P. 21555, line 14: "role ... to" -> "impact ... on the composition of the sampled..."
15. P. 21555, line 15: I assume the sigma denotes arithmetic standard deviation. Please clarify.
16. P. 21559, line 17: Please add a reference to the "prior studies" mentioned.

Interactive comment on *Atmos. Chem. Phys. Discuss.*, 15, 21539, 2015.

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