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Atmospheric
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Interactive comment on “Changes of fatty acid aerosol hygroscopicity induced by ozonolysis under humid conditions” *by* O. Vesna et al.

Anonymous Referee #2

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The paper is an interesting piece of work, treating an up to date topic. It surely should be published in ACP. However, as illustrated in my comments to page 15660, the conclusions should be elaborated somewhat more. I suggest doing the calculations for the hygroscopic growth thrice, based on the assumptions that only malonic acid, only glutaric acid or only adipic acid would have been formed. With this, the sources for discrepancy between calculated and measured growth factors can be elaborated further, adding to the results of this work (see my comments below). Also, as indicated in my comments, I ask for some other smaller (mostly technical) changes to be made.

(p. = page; l. = line)

p. 15653, l. 25-27: please add, at which RHs this significant water absorption was

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observed

p. 15654, l. 15 (and all other occurrences): delete the delete the ’a’ in ’Hasson et al., 2001a’;

p. 15654, l. 22: can you be sure that there was no thermal decomposition of your OA and AR at the oven temperatures used?

p. 15655, l. 17 and 23: In line 17, it seems that you varied the dry diameter of the particles between 20 and 250nm, whereas in line 23, you say that you only used 100nm and 68.5nm for OA and AR, respectively. Please make this consistent!

p. 15656, l. 4: Your dehydration case would make sense if the particles in question would deliquesce somewhere below 80%RH. They don’t do this - in fact I don’t see any deliquescence at all. Also, keeping hydration and dehydration separate in Figure 1 makes this figure rather busy without adding much. You could mention that you tested the two cases and didn’t find any difference, and not distinguish between the cases in Figure 1. In any chase, please say explicitly in the text that you didn’t find any deliquescence.

p. 15657, l. 6: This is your first mentioning of the presence of water vapour during the reaction. Please describe earlier (p. 15655, somewhere around line 5), how the vapour was added to the reactor (humidification, flows, RH control, inlet into reactor and mixing with organics and ozone).

p. 15657 and p. 15658: Please refer to Figure 3 at appropriate places in the text.

p. 15658, l. 7 ff: You have an important point here: The result that AR particles treated with ozone under dry conditions did not grow hygroscopically, whereas they did so when water vapour was present in the reactor! I think this needs to be stressed more. I suggest you divide Figure 1 a) and b) in two figures, you don’t use different symbols for the hydration and dehydration case any more, but add data for the cases when the organics were treated with ozone, only.

p. 15658, l. 18 u. 19: glutaric acid has been described to vary in size in TDMA-setups (with no heating of humidifying in between the two DMAs), possibly due to evaporation of the substance from the particles (Kumar, P. P., et al. (2003), Atmos. Chem. Phys., 3, 509-520, Rissman, T. A., et al. (2007), Atmos. Chem. Phys., 7, 2949-2971). Please discuss this in your text and add the respective citations. This could be part of the explanation, why your modelled hygroscopic growth factors are larger than the measured ones. This leads to the next point:

p. 15660, l. 1 ff: I like the fact that you try to model the hygroscopic growth! But it needs to be redone. Using a 3:1 ratio for MA:GA (malonic acid : glutaric acid) doesn't have a sound base anywhere. The sentence "... MA and GA assumed as products of about 0.40" (line 6) doesn't make sense to me. I would also expect, that not only the soluble substances MA and GA are built, but also the only slightly soluble C6 fragment adipic acid (AA). My suggestion: Do the calculations three time, once assuming only MA was built, once assuming only GA was built, and once assuming only AA was built. You will get three growth factors, which, surely, will enclose the measured one. And this will make it easier to see, too: Assuming only MA was formed will give by far too high growth factors. For AA, no growth should be observed. This makes clear that the formed acid groups might belong to substances that don't show high hygroscopic growth, like AA. And assuming only GA was formed will probably turn out pretty close to the measured value - but here I would like you to comment on the fact that GA could evaporate, thus decreasing the mass of solute in the particle and adding an additional source of uncertainty. So please change this part of your work accordingly!

Figure 2 (b): What do you mean with "corrected" in "H-TDMA measurements were corrected to 90%RH"? Please add an explanation to your main text body.

Interactive comment on Atmos. Chem. Phys. Discuss., 7, 15651, 2007.