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

**O. Vesna et al.**

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We would like to thank this reviewer for his valuable comments.

Regarding his major comment, the construction of growth factors from the measured functional group analysis, we would like to state that this was not the main aim of this study. Our study demonstrates that ozonolysis of oleic acid particles under reasonably realistic conditions does not lead to a substantial increase of hygroscopicity, while this is the case, when a polyunsaturated compound, arachidonic acid, is used as parent material. In addition, and surprisingly at first glance, humidity during reaction was playing a decisive role in determining hygroscopicity of the product particles at least under the short time scales of the present study. The NMR analysis showed an increase in the ratio of carboxylic to aliphatic protons in line with the growth factor. The idea of the back of the envelope calculation using ZSR was more to rationalize the parallel

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evolution of the two quantities rather than providing a real quantitative estimate. The composition of the product particles is far away from those, which would allow ideal solute behaviour.

We admit, however, that the presentation of this calculation has got two short and in addition contains a typo as correctly pointed out by the referee. In view also of a similar comment and recommendation made by the other referee, we will simplify and clarify the presentation of the calculation. We will make sure that the figure shows the same ratios as the calculation does. We will emphasise its qualitative character. As mentioned above, the important point should be the role of water during ozonolysis.

With respect to the comment on the experimental part, we will clarify the reactor design (flow reactor) as well as add information how humidity in the reactor was adjusted and measured.

We agree with the comment on the absence of deliquescence and the lack of importance of showing hydration and dehydration curves separately. We will change Figure 1 to show colors to better differentiate the processed from the unprocessed ones and to deemphasize the hydration vs dehydration curves, but explicitly mention this in the text.

With respect to the filter samples being more sensitive to larger particles than the HT-DMA experiment, we thank the referee for this comment, and we will add a caveat on this on p15659. In view of the qualitative character of the analysis and the other evaporation issues, this is not affecting the general conclusion from the humidity effects.

Regarding the evaporation losses, we agree with the referee that we should also think about losses of the acids, not only the aldehydes as mentioned in the text. We will add this possibility to the text on p15658 along with references to these studies. We note however that evaporation of glutaric or malonic acid from the complex product particles may be quite different from their evaporation from the pure substrates.

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A plot of GF90 vs COOH/CH might be a good idea for the revised version.

Regarding the role of water in oleic acid ozonolysis: yes, we believe that it is playing a role there as well in a similar way. However, the formation of more acidic products does not manifest itself in higher hygroscopic growth factors within uncertainty, because these C9 acids are not soluble. CCN activity measurements might be more sensitive.

With respect to the transfer to the atmosphere, we would like to make two points: 1) given that we observed roughly linear changes with O<sub>3</sub> concentration between 0.5 and 2 ppm, we expect to be reasonably well away from potential second order effects, see also the comment by Chak Chan and our response to it. 2) As mentioned in the introduction, in a number of cases, the mass fraction of fatty acids in atmospheric particles can be substantial and among those, the fraction of unsaturated representatives may even exceed the saturated ones. Nevertheless, we will add a caveat regarding the concentration range used, as well as the difference in particle structure and composition.

With regard to Figure 3, we agree that the arrows in the scheme are confusing. We will be happy to amend it according to the suggestions made by the reviewer.

We thank the referee also for all other minor comments, which will be included when preparing the revised manuscript.

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

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