

## ***Interactive comment on “Study of the kinetics and equilibria of the oligomerization reactions of 2-methylglyceric acid” by A. W. Birdsall et al.***

**A. W. Birdsall et al.**

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Comment 1.) 2-MG formation: The authors should be clear in their introduction, discussion, and conclusions sections that it remains unclear how even 2-MG forms from MPAN + OH. Although I can't state here recent results from my own group (since it is currently under review and not fully published), the results presented here clearly argue against fisher esterification as a source of oligoester, sulfate ester, and nitrate ester derivatives of 2-MG. Just to prevent confusion for the readers of your article, I would be clear that the formation mechanism of monomeric 2-MG remains unknown. I strongly believe that unlocking the mystery of 2-MG formation might provide the mechanism that explains the oligoesters, sulfates, and nitrates of 2-MG. Clearly, the results shown here argue against 2-MG undergoing fisher esterification reactions in the aerosol phase.

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Their conclusion is important and strongly supported by the chemical data presented.

Response: We have made the reviewer's recommended additions to the Introduction section and at the end of the Conclusions section.

Comment 2.) The authors don't describe any uncertainties that might be applicable to their study, especially when translating their findings from bulk solutions to aerosols. For example, does the Kelvin effect become an issue? What could these uncertainties be and how might they affect the current conclusions? The only problem aerosol scientists (who are not chemists) might have with the current approach is that you are using bulk solution studies to infer aerosol-phase processes. I encourage the authors to describe any uncertainties or potential pitfalls with their current approach in the discussions or conclusions.

Response: We have added a brief discussion to the Atmospheric Implications section concerning how the Kelvin effect could lead to small particles that have lower water content than equilibrium partitioning might suggest, and how this effect could lead to more favorable oligoester formation.

Comment 3.) Page 30042, Line 2: I would make sure to cite Surratt et al. (2010, PNAS) for this sentence, especially since this study showed that MPAN + OH produces 2-MG and its oligoesters like that of MACR and isoprene oxidation under high-NOx conditions. Chan et al. (2010, ACP) didn't use MPAN in that study, although they explored the importance of NO<sub>2</sub>/NO ratios.

Response: We have added the suggested citation to the revised manuscript.

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