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Discussions

Interactive comment on "The Rate of Equilibration of Viscous Aerosol Particles" *by* S. O'Meara et al.

Anonymous Referee #2

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Review of manuscript acp-2015-1019 "The Rate of Equilibration of Viscous Aerosol Particles" by S. O'Meara, D. O. Topping and G. McFiggans

The authors compare three model frameworks treating condensed phase diffusion in aerosol particles taking into account a concentration dependence of the diffusion coefficient. Applying the models to measurement techniques they investigate how to design experiments to constrain measured diffusion coefficients best.

The topic of the paper is well suited for publication in ACP, the manuscript is well written and organized and the conclusions are all supported by the modeling and illustrated with appropriate figures. It is my pleasure to recommend it for publication in ACP.

The authors may consider the following comments before submitting the final version.

In the last paragraph of the introduction the authors mention that a Fickian framework may not be appropriate for some systems, in particular glassy polymers. While an

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extensive discussion is clearly beyond the scope of the manuscript, it will help the reader if the authors give some basic information in a few sentences on what causes non-Fickian diffusion, i.e. mechanical deformation in response of a solvent diffusing in a matrix.

Discussion of Fig. 1b and the figure: For a reader not familiar with the topic it would be helpful to introduce first the case of Fickian diffusion with a concentration independent diffusion constant and only then compare to one in which the diffusing species acts as a plasticizer. Also, the caption of Fig. 1b should contain the info that it shows the response to an instantaneous increase in RH from 10 to 20%.

The authors use e-folding times as a metric for diffusion time. Of course this is technically correct, but may lead to a misunderstanding for a reader who is not familiar with the topic. The temporal response of system in which the diffusing species acts as a plasticizer cannot be described by a single exponential. The approach of the authors to take as a measure the time when the difference between average bulk and surface concentration has changed by e is valid, but a short discussion is appropriate.

In the same context: I would very much appreciate at least one example in which the authors do not only compare e-folding times (in the sense mentioned above), but directly compare calculated profiles with the three models for a case leading to a steep diffusion profile. Did they observe any differences between the models here?

And last: there is no discussion on how the models compare in terms of computational speed. Of course this my dependent on the specific coding and comparison may not be easy, but either there is a significant difference between the ones coded by the authors or not. Whatever is the answer, it is of interest for a reader who would like to use one of the model framework

Technical: The Lienhard et al. 2015 paper is published now in ACP.

Interactive comment on Atmos. Chem. Phys. Discuss., doi:10.5194/acp-2015-1019, 2016.

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