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Discussions

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*Interactive comment on* "Diffusion coefficients of organic molecules in sucrose-water solutions and comparison with Stokes–Einstein predictions" *by* Yuri Chenyakin et al.

**Anonymous Referee #1**

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In light of evidence for particle-phase diffusion imposing a kinetic limitation on gas/particle partitioning and other processes in the atmosphere, studies of diffusion are required to improve estimates or diffusivity. The aim of this paper is to improve our understanding of the accuracy of the Stokes-Einstein equation for converting measured viscosities to diffusion coefficients, and to present new measurements of diffusion coefficients in a system of atmospheric relevance. The method is well described and shows efforts have been made to minimise error, and references are given to its previous application. Results are presented very well (the multiple x-axes in figs. 5-8 are very useful) and the discussion is suitably informative and concise. Results are compared to those from previous studies in a useful and insightful discussion. Overall, the

study is suitable for the journal and is of a good quality.

The following are recommended minor revisions:

i) Clarification of what, if any, method was used to ensure that the weight fraction of sucrose in subsaturated (with regard to sucrose) samples was maintained between gravimetric preparation and sealing within slides. It is clear that a controlled RH environment was used to do this for supersaturated samples, but it is not stated how it was done for subsaturated samples. If no method was employed could it be shown, either through measurement or theory, that weight fraction is expected to be maintained between preparation and sealing?

ii) To show, either through measurement or theory, that there is negligible change to sample temperature as a result of laser exposure (since this would affect diffusivity).

iii) To make clear the source of plotted uncertainties. If these are from measurement repeats, this should be stated.

iv) It seems that uncertainty may be introduced by relative humidity measurements and scatter in plots used to derive the diffusion coefficient (e.g. fig. 4). If these are not factored into the plotted error bars, what uncertainty do they introduce?

v) Would be useful for comparison (perhaps in the supplement) to have on one plot the diffusion coefficient vs. water activity relationship for all three dyes and for water from the Price et al. 2014 study.

Technical point: i) Is the unit for y-axis on figure 4 right? Looks odd.