Comments from the three reviewers are in blue, and our replies are in black. Changes to the manuscript are highlighted in red.

The manuscript compiles and discusses diffusion coefficients for organic trace gases, important in atmospheric chemistry. The compiled experimental data are compared to an estimation method by Fuller (in Reid et al. 1987). Based on both, preferred values are suggested. Details of the assessment are documented in IUPAC style in an extensive supplement. This all is excellent work and should be published in ACP. (I did not check the supplement for errors and typos.)

Reply: We would like to thank Ref. 2 for recommending our manuscript for final publication and very valuable comments. We have carefully addressed his/her comments in the revised manuscript.

The authors may to consider two suggestions before final publication:

The first regards the representation of the deviation between preferred (experimental) values and the Fuller estimation. In my opinion deviation between preferred and estimated values point to a systematic problem, not to a statistical one. In this case I suggest to give the deviation with the suited sign (to indicate if Fuller over- or underestimate D), and not with +/-.

Reply: We fully understand the concern of Ref. 2. In fact, the deviations between the measured and estimated diffusivities are presented for each measurement in the supplementary documents, in which we also discuss how we assign uncertainties to the recommended values in details. The deviation is defined as (D_e/D_m-1) in %, where D_e and D_m are the estimated and measured diffusivities. Therefore, we would like to keep our current method to assign the uncertainties. We also refer to the supplementary information for further details, and have added a sentence in the second paragraph of Section 4 after we mention the supplement for the first time.

The second point regards the notation “Knudsen number of molecules”. I think this is misleading. The Knudsen number is a scaling factor for a certain problem and relates a particle radius to a free mean path e.g. of a condensing vapor. Kn determines dynamic regime of uptake for a given particle size. Kn “tests” if diffusion to a large particle (quasi motionless) or molecular kinetics rules by rationing the free mean free path (lambda) of the vapor to particle diameter. What the authors find invariant is lambda of the molecules. If I pluck in some numbers in Eq. 12 and consider the definition of Kn as lambda / Rp (Particle radius) then at 760 torr the lambda for many molecules including small inorganic is about 100nm, a typical value.

Therefore de facto mean free path is invariant not the Knudsen number. Of course I am convinced the authors know all this, but I am warning because the semantics is misleading, although in praxis this has no effect.

Reply: We fully agree with referee 2’s comments on the notation and his/her insights into the Knudsen number and the mean free path.

In the revised manuscript, we have made the following changes: i) we have changed “Knudsen numbers of a trace gas” to “the Knudsen numbers for the uptake of a trace gas by particles”; ii) We have updated Eqs. (5) and (11) to include the mean free path, introduced λ_P (pressure normalized mean free path) to replace D_{norm} in Eq. (12) (P13, L18-30), and added a new figure to show that λ_P is constant for all gas molecules; iii) the title has been changed to “…Volume 2. Diffusivities of organic compounds, pressure normalized molecular mean free paths, and average Knudsen numbers for gas uptake calculations”, and the abstract has also been updated accordingly.

Minor comments:

page 5471, line 1-2: I suggest to mention one more time that “estimated refers to Fullers method. Something like: “: : :the difference between preferred and diffusivity estimated by Fuller’s method, then: : :”

Reply: Done.

page 5471, line 8: it would be helpful to give the value estimated by Fuller here for better comparison.

Reply: Done.

page5473, line 1: Is the estimated diffusivity for larger carboxylic acids larger or smaller than the "measured". Could internal hydrogen bonding lead to "unusal" molecular morphologies/folding or similar?

Reply: Estimated diffusivities are smaller than measured values for some acids and larger than measured values for other acids. In the revised manuscript we have made it clear for each acids.

page 5474, line 9: I suggest to state that the mean free path, which is approximated by Dp(X)/c(X), is relatively invariant and as a consequence Kn is similar for many vapors for a given particle size.

Reply: It is a very good comment. As we mention above, in the revised manuscript we have introduced a new parameter, the pressure normalized mean free path, to replace D_{norm}.

Typos

page 5467, line 14: use plural, “inorganic compounds” page 5471, line 8: singular, diffusivity page 5474, line 11: square

Reply: corrected.