

We thank reviewer 1 for the positive feedback and her/his suggestions. Below, we answer the specific comments one by one.

1) *The treatment of elevated RH in EDB is not very clear. The authors presented the relationship between water uptake by some PEGs and water activity (Fig. 1), and mentioned this in line 14-16, page 10. But in the description of the EDB setups, there is no information about whether possible water evaporation was taken into account for the saturation vapor pressure measurements or not. Does the error associated with RH in EDBs include this effect or after water evaporation is taken into account?*

Both reviewers are missing a detailed description on how we treat the data taken at elevated RHs in the EDB setups. We presented this in detail in previous publications, e.g. (Zardini et al., 2006; Soonsin et al., 2010; Huisman et al., 2013). We agree with the reviewers that the manuscript becomes more accessible when this analysis is presented again. Water evaporation is taken into account as the composition of the binary particle is constant with fixed relative humidity and temperature. Hence with each PEG evaporating the corresponding number of water molecules is evaporating from the particles as well to maintain constant composition. The error caused by the uncertainty of RH within the EDB is small compared to the error introduced by the uncertainty of the gas phase diffusivity of PEG and is neglected in our analysis.

We will add the following Appendix to the manuscript:

0.1 Appendix: Treatment of EDB data taken at elevated relative humidities

Evaporation rates in the EDB setups were measured not only under dry conditions but some also at elevated relative humidities. After the particle was equilibrated with respect to temperature and RH, any change in size, $\frac{dr^2}{dt}$, was attributed to evaporative loss at a constant composition, and the partial pressure of the PEG, p_{PEG} , under those conditions was calculated using Eq. (1) of Soonsin et al. (2010):

$$p_{\text{PEG}} = -\frac{1}{2} \frac{dr^2}{dt} \frac{x\rho RT}{(xM_{\text{PEG}} + (1-x)M_{\text{H}_2\text{O}})D}, \quad (1)$$

where r is the particle radius, x is the mole fraction of PEG, ρ is the density of the condensed phase, R is the gas constant, M is molar mass, and D is the diffusivity of the PEG vapor in the gas phase. The mole fraction of PEG in an aqueous particle was taken from the RH in the EDB (see Fig. 1 of the manuscript) by assuming that the particle water activity is equivalent to measured RH, i.e., that the particle is homogeneous and in thermodynamic equilibrium (which is a good approximation as long as evaporation is sufficiently slow). Density was estimated by assuming ideal mixing. As an example we show data obtained by the EDB setup of Union College at 286.5 K for PEG4 in Fig. 1.

Extrapolation of the data to a PEG activity equal one yields the saturation pressure of PEG at this temperature.

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2) *Page 3, Line 12 – 16. It is totally justifiable that the authors used PEGs for the purpose of this study. However, apart from the advantages presented here, I suggest the authors also mention a few caveats of using PEGs: atmospheric occurrence would not be very likely, but what about structural similarity with commonly found components in organic aerosols?*

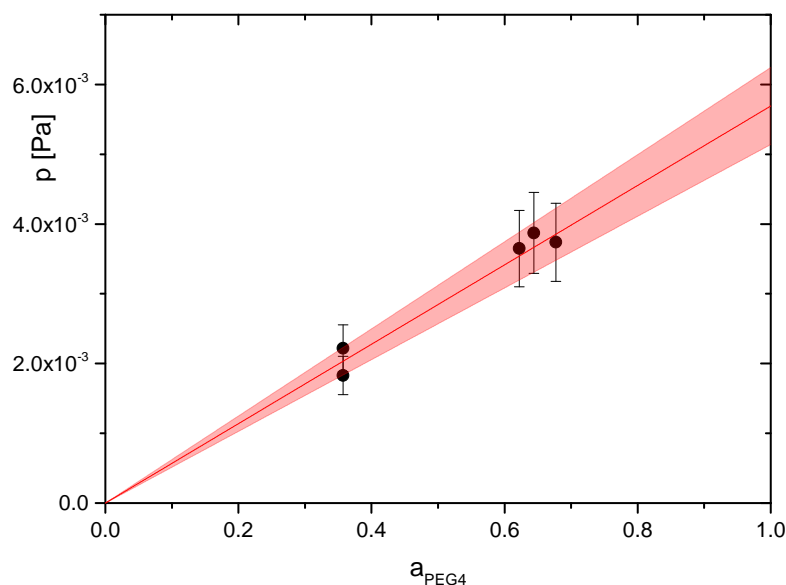


Figure 1. Partial pressures of PEG4 versus PEG4 activity deduced from evaporation rates of single, levitated, aqueous PEG4 particles in the EDB setup of Union College at a temperature of 286.5 K. Black symbols: experiment data, red line and shaded area: linear fit to these data with the 95% confidence interval. Extrapolation to $a_{\text{PEG}} = 1$ yields the saturation vapor pressure at this temperature, i.e. $p^0 = (5.69 \pm 0.55) \cdot 10^{-3} \text{ Pa}$ at this temperature.

We agree with the reviewer that the occurrence of PEGs in the atmosphere is unlikely. However, polyols in general have been observed frequently in the atmosphere as well as polyethers. Clearly, the hydroxyl group of the PEGs is a common functional group in organic aerosol compounds. However, we feel there is no need in the present context for direct atmospheric relevance of the compounds. More important for the selection of the PEGs are the three arguments listed at the end of the introduction section. We will add a fourth point to the revised manuscript:

PEGs contain ether and alcohol functional groups which are both abundant in the organic fraction of atmospheric aerosols. Although we do not expect the presence of larger PEGs in the atmosphere their functional groups renders them nevertheless relevant for the atmosphere.

3) Page 15, line 5: the use of accommodation coefficient is not clearly stated. Is it unity in all cases needed? In line 32 on page 7, it was only stated that “for all measurements the accommodation coefficient is assumed to be identical between samples.” Please specify.

We thank the reviewer for pointing out that our description is not quite precise here. For the KEMS setup it is important that the accommodation (or more precise the evaporation) coefficient is identical between reference samples and measured compounds, but its value may differ from unity. It effectively cancels out when relating the measured to the reference samples. For the FT-TDMA setup we assume it to be unity. The close agreement between the FT-TDMA data with those of the other techniques let us conclude that the accommodation coefficient is close to one.

We will change line 32 on page 7 to: For all measurements the accommodation coefficient is assumed to be identical between reference samples and the PEGs.

4) *If the authors suggest that this dataset can be used to validate vapor pressure measurements for other techniques by other researchers, a note on data accessibility would be helpful: included in supporting information? Contact authors?*

We agree. We made the data available already with the AMTD submission. It is available under the Assets button on the AMT web-page. The direct link is <https://doi.org/10.3929/ethz-b-000168628>.

Technical corrections.

We will change the manuscript accordingly.

References

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- Soonsin, V., Zardini, A. A., Marcolli, C., Zuend, A., and Krieger, U. K.: The vapor pressures and activities of dicarboxylic acids reconsidered: the impact of the physical state of the aerosol, *Atmos. Chem. Phys.*, 10, 11753–11767, 2010.
- 5 Zardini, A. A., Krieger, U. K., and Marcolli, C.: White light Mie resonance spectroscopy used to measure very low vapor pressures of substances in aqueous solution aerosol particles, *Opt. Express*, 14, 6951–6962, 2006.