

Interactive comment on “A reference data set for validating vapor pressure measurement techniques: Homologous series of polyethylene glycols” by Ulrich K. Krieger et al.

Anonymous Referee #1

Received and published: 15 August 2017

Krieger et al. “A reference data set for validating vapor pressure measurement techniques: Homologous series of polyethylene glycols”

General comments:

The authors presented a reference data set for saturation vapor pressures of a homologous series of polyethylene glycols. The data set was obtained by five individual techniques (three types), including electrodynamic balance (EDB), flow tube tandem differential mobility analyzer (FT-TDMA), and Knudsen cell effusion mass spectrometry (KEMS). Computational modeling was also used to estimate saturation vapor pressures for comparison. In addition to the data set presented, the authors drew two con-

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clusions from their inter-comparison study: 1) vapor pressure measured at elevated temperatures can be extrapolated to atmospherically relevant temperature ranges as long as the temperature dependence is accurate, by stressing that the benefit of getting more accurate vapor pressure measurement data is larger than getting “real” data at low temperatures but with low quality (due mostly to difficulties in measuring extremely low saturation vapor pressures); 2) each technique has its own optimal range and should be used in those ranges to obtain high-quality data, which echoes the first point that extrapolation might be more beneficial than overly extended measurement range. The study is of great importance to the atmospheric science community, thus fits well with the scope of AMT. The data treatment is rigorous with error estimates for each technique well-presented, except for those arisen from RH (see specific comment 1 below). I recommend a minor revision with some specific and technical comments as follows.

Specific comments:

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?

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?

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

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the accommodation coefficient is assumed to be identical between samples.” Please specify.

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?

Technical corrections:

Page 3, line 25-26: please define EDB and FT-TDMA at their first appearance.

Figures: I don't see it necessary to present another figure for the cut-out of Figs 2 and 4. Inserted panels will do very well.

Figures 4, 6, 7, and 8: the sentence “Symbols as in Fig. 2” is redundant. You have all legends in those figures too.

Page 8, line 9: not sure what “these” are in “optimized these...”. Please specify.

Page 8, line 28: suggest changing “see Fig. 2 and...” to “as shown in Fig. 2 and ...”, and similarly for other sentence that introduce the figures.

Page 9, line 13: add a comma after “In addition”.

Page 10, line 12: suggest changing “shows” to “show”.

Page 10, line 13: suggest changing “differ at” to “differ by”.

Page 10, line 8: please use a consistent format for the units. “kJmol⁻¹” should be written as in line 2 on this page.

Page 15, line 1: not sure what “That” means. Please specify.

Interactive comment on Atmos. Meas. Tech. Discuss., doi:10.5194/amt-2017-224, 2017.