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Interactive comment on "Technical Note: Using DEG CPCs at upper tropospheric temperatures" *by* D. Wimmer et al.

Anonymous Referee #1

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This manuscript examined the performance of DEG UCPCs at upper tropospheric relevant temperatures. Freshly formed particles in the CLOUD chamber were used to test the counting efficiency of DEG UCPCs. The growth rates of freshly formed particles were measured by DEG UCPCs, NAIS, and PSM. Temperature effect on particle growth rates was explored. For sub 3 nm particles, their CPC counting efficiency is a strong function of particle chemical composition. This manuscript presents a nice exploration on the calibration of CPC performance using atmospheric relevant aerosol. A strong temperature effect on CPC counting efficiency and particle growth rate was reported. Though with high uncertainties, the findings are of special interest. The reviewer has the following comments to be addressed.

1.) The manuscript states that "There is a clear shift in the cut-off diameter towards larger sizes at lower temperatures". One may argue that clear evidence to reach this statement is missing, i.e., the counting efficiency of freshly formed particles from the CLOUD chamber at room temperature. Comparing to the counting efficiency of ammonium sulfate at room temperature was unconvincing to draw this statement since particle composition strongly affects the counting efficiency.

2.) The statement that growth rates calculated from three instruments converge at high temperature is unconvincing from Figure 4. In the current linear scale, the low values in growth rates at higher temperatures may disguise their differences.

3.) The authors stated that the problem of low signal to noise ratio is reduced by using PSM instead of aerosol electrometer as a reference method. Please discuss the uncertainties and problems introduced by making this switch. For instance, PSM itself may exhibit strong temperature effect in its counting efficiency.

4.) Though this manuscript refers to Wimmer et al (2013) for details about DEG UCPCs, some key information should be provided to make the manuscript self-sustained, e.g., the temperatures of the saturator and condenser for both CPC 1 and CPC 2. Which CPC was used to obtain the results in Figure 3? Was an aerosol electrometer or PSM used as the reference to obtain the black curve in Figure 3? If it is an aerosol electrometer, please discuss the suitability in comparing them with data using PSM as the reference, i.e., blue, green, and red curves in Figure 3.

5.) In Figure 3, two different data points were given for some particle sizes. Please explain their differences and which data points were used for the regression.

6.) For different CLOUD chamber conditions, temperatures at the inlets of DEG UCPC and PSM should be reported. Otherwise, the findings of this study can not be readily evaluated or compared by future studies.

7.) Please report whether UCPC and PSM saturator and condenser temperatures are affected by the CLOUD chamber conditions. In addition to reporting the count-

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ing efficiency (as given in Figure 3), these temperature information will help to better understand the saturation profile in the condenser and particle activation.

8.) In Figure 2, the two grey lines are not at the half maximum as stated in the manuscript.

9.) When discussing CPCs for sub 2 nm particle detection, Iida et al (2009) should be cited. After examining more than 800 hundreds working fluids, this reference suggests a few suitable working fluids for sub 2 nm measurement (including diethylene glycol which has been used by following studies). It also experimentally demonstrates their capability in detecting sub 2 nm particles.

10.) Line 5 in page 12800, it should be "Outdoor".

11.) Line 28 in page 12802, please replace "make-up flow" with "transport flow". In addition, please add 2.5 lpm dilution flowrate in Figure 1.

12.) Line 7 in page 12804, the reference format is incorrect.

Interactive comment on Atmos. Chem. Phys. Discuss., 14, 12797, 2014.