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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Investigation of the effective peak supersaturation for liquid-phase clouds at the high-alpine site Jungfraujoch, Switzerland (3580 m a.s.l.)" *by* E. Hammer et al.

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This is a very good paper on the analysis of the aerosol microphysical and hygroscopic properties of the interstitial and total aerosol particles at the high-alpine station Jungfraujoch. The authors derived the activated fraction, activation diameter and estimated the effective peak supersaturation at cloud base.

I have some minor comments on the paper.

Unfortunately, there are no measurements at cloud base. The authors use therefore the liquid water content to calculate the temperature at cloud base height assuming

adiabaticity. They argue, that a relative error of 15% of the LWC measurements causes a relative error of T_{CB} of 0.2 K. Nevertheless, due to entrainment and mixing the LWC may deviate from the adiabatic LWC by more than 15% resulting in a larger error in T_{CB}.

Finally, the authors present the derived effective peak supersaturation together with their estimates about the vertical wind velocity. In Fig. 9 these findings are compared to box model calculations. For NW conditions the model overpredicts the observed supersaturation values. The authors speculate that either the cloud base updraft velocity is overestimated or vertical wind velocity fluctuations are responsible for this mismatch. To my eyes, especially the observations for the NW conditions agree well with the model calculations. The model calculations seem to represent an upper limit for the possible effective peak supersaturation resulting from the corresponding vertical wind velocity for adiabatic conditions. The deviations towards lower supersaturation values could probably be caused by entrainment and mixing, resulting in the evaporation of cloud droplets. Hence, the activated fraction decreases and the activation diameter increases, leading to a lower effective peak supersaturation. In general, I would not expect a perfect agreement.

In the introduction, the authors present a nice overview about previous measurements inside clouds and the derivation of activation diameter and supersaturation. In this context and in Tab. 3 following publication can give further information:

Ditas, F., Shaw, R. A., Siebert, H., Simmel, M., Wehner, B., and Wiedensohler, A.: Aerosols-cloud microphysics-thermodynamics-turbulence: evaluating supersaturation in a marine stratocumulus cloud, Atmos. Chem. Phys., 12, 2459-2468, doi:10.5194/acp-12-2459-2012, 2012.

Interactive comment on Atmos. Chem. Phys. Discuss., 13, 20419, 2013.