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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Size-resolved and integral measurements of cloud condensation nuclei (CCN) at the high-alpine site Jungfraujoch" *by* D. Rose et al.

Anonymous Referee #2

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Review of the "Size-resolved and integral measurements of cloud condensation nuclei (CCN) at the high-alpine site Jungfraujoch" by Rose et al.

General comments

The authors present measurements of CCN activity of aerosols at a high-altitude site at Jungfraujoch, Switzerland, during a 10-day intensive campaign in March 2007. Two CCN counters were operated in parallel, one of the being able to resolve CCN activation efficiency as a function of the particle size. These measurements were complimented with AMS measurements, allowing for a comparison of hygroscopicities (in

terms of the so-called kappa parameter) derived from the CCN data and, on the other hand, from the AMS data.

While the CCN activity of the aerosols sampled at the site has been studied in several previous studies (Jurányt et al., 2010, 2011), this study adds new information: 1) comparison of the performance of two different CCN instruments (emphasizing the importance of proper calibration), and 2) information on the size-resolved CCN activity and mixing state of the aerosol and dependence of these properties on the air mass origin.

I recommend this manuscript to be published in Atmospheric Chemistry and Physics after the authors have considered the following relatively minor comments.

General comments

1. As I noted above, the CCN activity of the aerosols sampled at the site have already been reported in previous studies, involving some of the authors of the current manuscript. The authors should discuss briefly what new information this study brings on the table compared to previous studies.

2. Section 3.1., first paragraph. The authors note that CCN concentrations measured by two operated CCN counters differ by around 20% on average at the lowest supersaturation applied. This is because the applied supersaturation differ between the instruments (0.099 vs 0.079%). Have the authors attempted to make a power-law fit to the CCN concentration vs supersaturation data (i.e. “Twomey’s power law-fit”, Twomey, 1959). This would allow for interpolating the measurements to the same supersaturation to see if the interpolated CCN concentrations would match.

Minor and technical comments

1. In section 2.3.1 is stated that the sampled aerosol is heated to 298 K, while in section 2.3.2 (page 32584) it is stated that the kappa values are calculated for temperature of 303 K. Please explain.

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2. Section 3.1, page 32587, line 21. Table 1 instead of Table 2.

3. Section 3.1, page 32588, line 16. See my previous comment.

4. Section 3.1, page 32593, lines 23-24. “This results was expected. . .” instead of “We expected this result. . .”, for example.

5. Section 3.4, second paragraph. Please give quantify the differences in kappa_a and kappa_a when comparing the hygroscopicities derived from AMS and CCN measurements.

6. Section 4, page 32598, line 18. Omit the second “sampled”.

References

Jurányi, Z., Gysel, M., Weingartner, E., DeCarlo, P. F., Kammermann, L., and Baltensperger, U.: 5 Measured and modelled cloud condensation nuclei number concentration at the high alpine site Jungfraujoch, Atmos. Chem. Phys., 10, 7891–7906, doi:10.5194/acp-10-7891-2010, 2010.

Jurányi, Z., Gysel, M., Weingartner, E., Bukowiecki, N., Kammermann, L., and Baltensperger, U.: A 17 month climatology of the cloud condensation nuclei number 10 concentration at the high alpine site Jungfraujoch, J. Geophys. Res., 116, D10204, doi:10.1029/2010JD015199, 2011.

Twomey, S., 1959: The nuclei of natural cloud formation. Part II: The supersaturation in natural clouds and the variation of cloud droplet concentration. Geophys. Pure Appl., 43, 243–249.

Interactive comment on Atmos. Chem. Phys. Discuss., 13, 32575, 2013.