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Atmospheric Measurement Techniques Discussions

Interactive comment on "The effect of phase partitioning of semivolatile compounds on the measured CCN activity of aerosol particles" *by* S. Romakkaniemi et al.

Anonymous Referee #2

Received and published: 23 January 2014

Review:

This manuscript presents a model case study of how evaporation of ammonium nitrate particles and one particular semi-volatile compound would influence the measured CCN concentration in the DMT CCN counter. This is not reflected in the title and abstract, which are much more general and suggest a combined thorough modeling and measurement study (e.g. line 4-5 of abstract). Only at the end of the manuscript it was clear to me that no experiments on the partitioning of nitric acid would be presented. The title suggests a more general study of maybe more CCN counters, more semi-volatile compounds, or a quantification of the effect in terms of volatility etc.. In

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the case of what is actually presented, I think it would be appropriate for a technical note, but not for a full paper (even for a technical note, the scope is relatively narrow). I would therefore suggest to re-submit this manuscript as a technical note, with an updated title and abstract that more reflect what is actually done in the paper. To have a full paper, either the scope of the modeling study should be wider (e.g. use hypothetical compounds with a range of volatilities etc. . .), or experimental results for the nitric acid studies should be added.

In case of re-submission as a technical note several important points should be addressed.

1) The goal of the nitric acid model study is not very clear: For example in the conclusions is stated that "typical concentrations in the atmosphere are such that that concentrations of semi-volatile gases are too low . . . to affect the CCN studies" (page 8426, line 2-5), whereas in the introduction it is stated "we show that DMT CCN counters can be used to assess the effect of nitric acid on CCN activity" (page 8416, line 7-9) It sounds like two goals are mixed together: (1) To study what the effect would be in the ambient atmosphere, and (2) to make an initial evaluation if the CCN counter could be used for an experimental study in the lab, where high concentrations of nitric acid could be used to study the effect of nitric acid partitioning on CCN concentrations. It is ok to make both points, but clearly separate them and make them explicit. From the results it seems to me that at atmospheric concentrations the wall losses in the CCN counter are too large to see a much of effect of semi-volatiles on CCN concentrations. But it might be possible to make high concentrations of nitric acid in laboratory experiments, so that atmospherically relevant concentrations could be left in the air flow to interact with the activating droplets. If this indeed were the points the authors were trying to make, this should be stated much more clearly.

2) It is not very explicit throughout the manuscript if the nitric acid concentration mentioned is the concentration in the inlet, of in the CCN counter at point of activation. It would make things much more clear to also mention how much nitric acid is left over at

AMTD
6, C4070–C4072, 2014

the point of activation that then causes the reduction in critical diameter, e.g. at page 8422, line 5ff, and line 15ff; page 8423, line 15-16) but also other places. Or how much nitric acid was lost to the walls. Otherwise, for non-experts it can sound like actually 13 ppb of nitric acid would only have a small effect on CCN activation. For example, you could show how much nitric acid went into the particle and how much to the walls, before the particle was activated. Especially for the comparison with Laaksonen (page 8422), it would be good to mention this explicitly, otherwise it looks just like a discrepancy between different models.

3) Please have your paper proofread by a native speaker, as some formulations are quite cumbersome and there are problems with definite and indefinite (no) articles.

4) If you use the general term CCN activity in abstract etc. . . please define it first.

Interactive comment on Atmos. Meas. Tech. Discuss., 6, 8413, 2013.