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Atmospheric Chemistry and Physics Discussions

Interactive comment on "On the formation of sulphuric acid-amine clusters in varying atmospheric conditions and its influence on atmospheric new particle formation" *by* P. Paasonen et al.

Anonymous Referee #2

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The authors are describing results from a modelling study concerning formation of clusters consisting of two molecules of sulphuric acid and two molecules of either dimethylamine or trimethylamine or a mixture of both. Free parameters in the modelling are the concentrations of sulphuric acid and the amines, the temperature and the relative humidity. The findings are compared with atmospheric observations.

Since the last decade there is a lot of progress in the understanding of atmospheric new particle formation. Sulphuric acid is realized as a main component in this process. A couple of field and laboratory studies point to a cluster stabilizing effect by amines

due to a strong acid-base interaction. This fact is also supported by quantum-chemical calculation.

The presented manuscript shows impressively from the viewpoint of elementary processes how formation of two-acid/two-base clusters can be influenced by reaction parameters. This manuscript is well written and includes a huge number of information. It is suited to publish in this journal and I can recommend publication.

Some explanations/clarifications could improve this manuscript some more.

1) What is behind the DACM model? Is it a kinetic solver for the ODE system resulting from the addition/decomposition steps for all intermediates/clusters including sink terms or are equilibrium conditions generally assumed or what is considered else?

2) The chemical structure of the clusters "2 SA x 2 DMA" and "2 SA x 2 TMA" should be given allowing the readership to get a visual impression. Here it could be explained where a third SA could be attached in both cases.

3) I guess there is a shortcoming in the discussion of the RH dependence. The authors found a drop of cluster formation with increasing RH or the cluster formation was nearly unaffected by RH depending on the amine considered in the cluster. This finding should be discussed with respect to atmospheric observations and lab results, if possible!

4) DMA and TMA, a secondary and a tertiary aliphatic amine, were chosen as the model amines in this study. Other amines with atmospheric relevance are for instance pyridine and aniline and derivatives. What can we expect for the process of cluster formation and growth from an aromatic amine, or from a primary amine with a relatively large phenyl group (steric hindrance)? Are some explanations possible with the current state of knowledge?

Interactive comment on Atmos. Chem. Phys. Discuss., 12, 11485, 2012.