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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Atmospheric sulphuric acid and aerosol formation: implications from atmospheric measurements for nucleation and early growth mechanisms" *by* S.-L. Sihto et al.

Anonymous Referee #1

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General Comments:

The paper is based on a very complex data set including particle number size distributions and sulphuric acid concentration playing the major role in the presented study. There are not many studies available so far which investigate new particle formation in connection with sulphuric acid. Thus, the study is generally unique and presents new results which may help to improve our knowledge about the process of new particle formation. The paper is clearly written and contains illustrative figures.

However, I have one major point which is completely missing in the discussion: How can you be sure that the nucleation takes place close to the ground based measure-

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ments? The whole study is based on the assumption that nucleation and growth take place at the measurement site. But, there are few studies available in literature about increased concentrations of ultrafines close to elevated inversion layers or due to local mixing processes at higher altitudes. Where does the sulphuric acid at the ground based measurement site come from? Is it produced there or advected horizontally or mixed downward within the mixed layer? Probably you have no evidence for such transport mechanisms but it should be discussed. Maybe there are some meteorological measurements available to get an idea about vertical mixing. Theoretically, sulphuric acid and clusters can be mixed downwards when the nocturnal inversion breaks up. I think this assumption is reasonable too. Is there a correlation with SO2 or OH? Maybe this would help to understand where the sulphuric acid has been formed.

Detailed comments:

Eq. 1 and 2: Why do you use CoagS(3-6) and CoagS(4nm). If you assume a mean value for the first one both should be very similar. Eq. 3: I don't understand this equation, what does 2 nm mean? A mean diameter, concentration?? What else may contribute to the growth of 1-3 nm particles?

Did you try to investigate how much sulphuric acid contributes to the growth of 3-6 nm particles? This would be interesting too. What is the conclusion from the correlation between nucleation rate and concentration of terpene oxidation products? Do you think they participate in the nucleation process or just in the growth to detectable sizes? The study includes only a short time period and finally 15 days have been evaluated which is not representative for other seasons. Are the observed new particle formation events typical for this time of the year in Hyytiälä?

Technical comments:

Page 3848, line 3: 'to' is missing between up and the There are few other small errors concerning English grammar, please read it again carefully

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Interactive comment on Atmos. Chem. Phys. Discuss., 6, 3845, 2006.

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