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Interactive comment on "The contribution of sulphuric acid to atmospheric particle formation and growth: a comparison between boundary layers in Northern and Central Europe" *by* V. Fiedler et al.

V. Fiedler et al.

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First of all we would like to thank the referees for the detailed and helpful comments. All mentioned points will lead to changes in our final manuscript:

Regarding the specific comments of referee 1:

1. Figures 1 and 2 will be removed, some DMPS plots added instead.
2. Correlation coefficients will be in Table 1.

3. Air mass directions will be in Table 1.

4. The point in time of the highest concentration was determined for each size class separately by fitting a lognormal distribution to the temporal evolution of the particle number size distribution of that size class.

5. 1 nm is thought to be the size of the critical cluster, so the size, at which the cluster starts to be stable. Starting from this point it makes sense to calculate growth etc.

6. Scavenging and growth will be quantified.

7. The term nucleation will be changed to formation and J to J3.

8. This relation is derived in Kulmala, 1988 and Kulmala et al., 2001. The assumption is in our case, that the condensing species is sulphuric acid. The factor $1.37 \cdot 10^7$ is mainly dependent on the product of mass and diffusion coefficient of the condensing vapor. In principle Kulmala et al. showed that the bigger the mass, the lower the diffusion coefficient, so the product of them remains rather constant.

9. Correctly, we would have to calculate equation 2 with C_{vap} - $C_{saturation}$. Kulmala et al. showed in Tellus 1998, that $C_{saturation} \approx 3 \cdot 10^6$ cm^{-3}, so more than one order of magnitude lower than C_{vap}, which means that it can be neglected.

10. The uncertainty is plus or minus 30 %, mainly due to uncertainties in the calibration setup.

11. will be removed.

12. will be changed to: independent from the two station locations.

13. This will be explained more clearly.

ACPD

5, S582–S585, 2005

14. will be changed to: The forcing of the initial growth in Heidelberg compared to Hyytiälä and less sulphuric acid contribution in Heidelberg may both be explained...

15. we will add in the text: The corresponding lifetime CS^{-1} is consequently 2 min to 33 min in Hyytiälä and 28 s to 8 min in Heidelberg.

Regarding the general comment of referee 2: Some DMPS plots will be added.

Regarding the specific comments of referee 2:

1. will be changed, see Ref. 1, point 15.

2. The Hyytiälä DMPS covers 3 to 500 nm. This will be corrected now in the paper. The data used for the CS analysis was at both stations over the complete size range, but this has no significant influence on the calculations, as the measured concentrations of particles with a diameter over 500 nm in Heidelberg were usually below 200 cm^{-3} (we will add some DMPS plots that show this).

3. see Ref.1, point 4.

4. The term nucleation rate will be changed to: The formation rates J3 of particles above 3 nm in diameter.

5. The MPI is located on a forested hill outside Heidelberg. It is true, that the region is very polluted and also a lot of local point sources exist, but we will add some surface plots to the paper that show, that their influence does not seem to be too high.

6. This feature did not exist on 7 of the 10 event days and was less pronounced on the other 3 event days.

ACPD

5, S582–S585, 2005

7. In Hyytiälä and Heidelberg the air was cleaner before events than usually. But this has of course to be seen with respect to the mean preexistent particle concentration on each day separately, and consequently with respect to the mean CS of each day. The CS before events was significantly lower than the mean CS of the corresponding day, but the mean could be high anyway.

8. see Ref. 1, point 12.

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5, S582–S585, 2005