

Interactive comment on “Online mass spectrometric aerosol measurements during the MINOS campaign (Crete, August 2001)” by J. Schneider et al.

J. Schneider et al.

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Reply to Referees

Both referees recommend publishing the paper after some major and minor revisions. Since the major comments of both referees were similar, we will give a common reply here.

1. More detailed description of AMS

Both referees would like to see a more detailed description of the AMS and how the mass concentrations of the AMS are obtained in the paper. We agree and will include this in the revised version. Especially the fragmentations patterns that were used to obtain the color scheme in Figure 1 (which are based on partly unpublished lab work

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by other AMS users) will be described in more detail. We referred to submitted work by Hogrefe et al. (2003), but since this paper is not published yet, it will be better to have this information here, too. The paper by Hogrefe et al. describes the laboratory studies by Frank Drewnick, from which the correction factors of sulfate are inferred. The values for other species were determined by various groups inside the AMS users community. We will include a table with the calibration factors we used: (Frag-Corr: Fragmentation pattern correction, IE-Corr: Ionization efficiency correction, CE-Corr: collection efficiency correction)

	Frag-Corr	IE-Corr	CE-Corr
Ammonium	0.57	3.5	0.5
Nitrate	1.82	1.1	0.5
Sulphate	1.74	1.15	0.5
Organics	0.71	1.4	1

The collection efficiency of 1 for organics may be erroneous, but we do not have information if the aerosol was externally or internally mixed. The assumption that the organic aerosol components originate from biomass burning while the sulfate originates from industrial emissions could indicate that the aerosol is not internally mixed. Unfortunately, the size distribution of the organics was sampled only for a very short time period. This was due to the fact that the AMS was shipped directly to the campaign site and a standard operation procedure was not yet defined. Thus, we can not conclude on the mixing state of the organic and sulfate aerosol. If we apply a collection efficiency of 0.5 to the organics, too, we will increase the mass loading by a factor of which is the right direction but still markedly smaller than the filter results.

2. Diameter comparison

Both referees agree that the comparison of the different diameters as we measured them is misleading. However, to convert the vacuum aerodynamic diameter to the volume equivalent diameter, as measured by the diffusion battery (assuming spherical

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particles) needs the density of the particles. This density can be obtained by comparing the different measured diameters, as we did. To convert the total aerosol mass concentration into density, we would need to have an independent measure of total volume, which is not the case. On the other hand, we agree with referee 1 that the OPC diameters appear too high. We will investigate if there is an instrumental error or an error in the data analysis. The transmission curve of the AMS is poorly defined for the size range above 1 micron, but the MOUDI data indicate that the measured AMS distribution is realistic. We will try to treat this issue in more rigorous way.

3. Correlation $\text{NH}_4\text{-SO}_4$

The correlation of ammonium and sulfate will be further analyzed on a day-by-day basis. It is correct that significant correlation is only seen on August 22. The comparison of AMS and MOUDI for ammonium agrees better than for sulfate. However the quantification of ammonium is regarded to be more uncertain than that of sulfate. This will be discussed in more detail in the revised version.

4. Delta analysis and the role of $m/z = 44$

We agree that $m/z=44$ (that appears in the delta analysis as Delta 3) is not part of an ion series, but we know that $m/z=44$ is a tracer for both aged aerosols and for biomass burning. The latter has been confirmed by recent laboratory measurements. As mentioned above, we didn't measure the size distribution of $m/z=44$. We will include a more detailed discussion on the interpretation of the trajectories and possible sources for biomass burning. According to Sciare et al, ACPD 2003, the MINOS measurements were influenced by biomass burning during August 8 - 12 and 15 - 18. However, this is not visible in the AMS data.

5. Organics

See the comments under item 1.

6. Comparison between AMS, MOUDI and Filters

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A quantitative comparison will be given. The data had not been corrected for the difference between aerodynamic and vacuum aerodynamic diameter, since the density is not certain. From the agreement between Da and Dva it could be concluded that the density is almost 1. However, this does not match to the diffusion battery results. We will need more discussion on this topic. The transmission curve of the AMS is not so well known as that we want to correct the measured data using this curve. It will be more instructive to include the transmission curve into the size distribution plots. We will include a table with all measured substances and their individual errors.

Minor Comments

The minor comments of both referees are in almost all cases helpful and will be considered in the revised version.

J. Schneider

Interactive comment on Atmos. Chem. Phys. Discuss., 3, 3907, 2003.

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