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Interactive comment on “Surface modification of mineral dust particles by sulphuric acid processing: implications for CCN and IN abilities” by P. Reitz et al.

Anonymous Referee #1

Received and published: 3 March 2011

The manuscript entitled “Surface modification of mineral dust particle by sulphuric acid processing: implications for CCN and IN abilities” by Reitz et al. contains excellent information concerning the processing of mineral dust aerosols. With that being said, I found this manuscript very difficult to read and fully understand. There are a myriad of different experimental techniques used in this manuscript and there is much discussion about how to compare those techniques. Furthermore, there is much discussion about how to compare the two different experimental campaigns (FROST 1 and FROST 2). I feel like this manuscript should be drastically simplified which should not be too much of a problem since the manuscript is fairly long.

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There is a significant discussion about the quantification of the amount of sulfuric acid on the particle surface using the AMS (Section 2.2.3). As an example of a simplification, perhaps the authors could present this section as a “supplemental section”. The correction factors could then be given in the text of the revised manuscript. This would knock out Figure 2, 3, 4 and Table 1. There is also significant discussion about the products formed from reactions on the surface of the dust particles (page 7254). The authors admit that they don’t know exactly which substances were created on the particle surface due to reactions. Therefore, as a second simplification, the authors could remove all discussion of possible reactions. They could then just focus on surface modification (and not on the specifics of the surface modification) which is important in the IN discussion later on.

Finally, the figures need to be worked on. The way the graphs were labeled made it very difficult to understand what all the numbers and letters meant. I was also unable to tell from the captions on the graphs, which particle size was being studied. Figures 6a-c and 8a had particle sizes labeled. The authors’ state that the particles most extensively studied had a mobility diameter of 300 nm. As a simplification, could the authors just focus on 1 particle size (e.g. 300 nm)?

I would like the authors to comment on the ability to compare the data from FROST 1 and 2. Obviously, the authors are fairly confident that the two campaigns can be compared. However, with the amount of discussion about what it takes to compare the two campaigns, I am not so sure. Perhaps the authors should just focus on one of the campaigns or write two separate manuscripts describing each campaign. Focusing on one of the campaigns would help simplify the manuscript.

Technical corrections:

Page 7239, line 29 – artifacts

Page 7243, Line 9 - should read “allowing further restriction of”

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Page 7244, Line 15 – should read “thus they contained”

Page 7245, line 3 – I am not sure why the colon is there.

Page 7245, Line 9 – should read “S was determined to be approximately”

Page 7245, line 17 – “where” should be “were”

Page 7254, line 23 – (g) is not a good way to start a sentence. This was confusing.

Page 7254, line 25 – I am not sure why there is a colon after sulfur oxides.

Page 7258, line 2 – There is a huge space between the colon and the next word.

Page 7259 – line 3 – “two possible explanations”

Figure 6a. I find the arrows in the caption (connecting the abbreviation in the figure with its description) confusing. There has to be a better way to do this.

Figure 6a – need to define WB in the caption

Figure 6c. This figure is almost unreadable. Something has to be done with the x-axis labels. There is almost no discussion of this figure in the text (lines 23-28 on page 7251). How am I supposed to know what “Ir” is and why it was done?

Figure 7 – there should be a parenthesis after 98.

Figure 8a – There should be a oC after 50 in the second column.

Figure 8b – Again, the x-axis is nearly unreadable.

Figure 11. – “This graph was modified after Sullivan et al.” The word “modified” sounds strange here.

Figure 12. Should there be a “/” after 10-18 in the x-axis label?

Interactive comment on Atmos. Chem. Phys. Discuss., 11, 7235, 2011.

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