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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Sulfuric acid and OH concentrations in a boreal forest site" *by* T. Petäjä et al.

Anonymous Referee #2

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The article "Sulfuric acid and OH concentrations in a boreal forest site" by Petäjä et al. report on a three-month data set of H2SO4 and OH measurements at the Hyytiälä SMEAR station using the CIMS technique, and its comparison with the corresponding modelled species. The authors provide several proxy calculations of the sulphuric acid concentrations based on measured SO2, solar radiation and aerosol size distributions. Because sulphuric acid is a trace gas which is delicate to measure, it is important to know if proxies can adequately replace the actual measurements when not available. Hence, the scientific topic of this paper addresses important questions which fit into the scope of Atmospheric Chemistry and Physics. However, it is not clear whether it presents novel concepts, ideas or data. The authors do not give proper credit to related work and clearly indicate their own new/original contribution. While these are not the

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first H2SO4 measurements at the SMEAR station, they seem to cover the longest period of measurements. Of course, this can not be the only reason for a high level scientific publication. Therefore, I highly recommend to the authors to clearly specify how new their analysis is. Is it the first time that such a proxy calculation is performed from H2SO4 measurements? If not, how different the conclusions are from previous measurements at the same place or different places? The question of the variability of the k1, k2 and k3 empirical factors with space is of high relevance, in order to enable the reader to use them with more or less confidence (in case they do not have any possibility to measure it directly).

The scientific approach and applied method seem to be valid although a few precisions should be mentioned before publication. The authors state that k2 and k3 are calculated based on the ratios between the proxy and observed sulphuric acid concentrations (p 20202). Later, they state that only the 09:00-15:00 LT data was used to scale the k2 and k3, in order to better fit the maximum daily concentrations. Therefore, I do not understand how the proxies can over-estimate the sulphuric acid daily maximum concentration (page 20203). Does it mean that the "shape" of the proxy diurnal variation does not follow the shape of the real sulphuric acid concentration? Figure 3, the correlation are this time performed with the 06:00 to 18:00 data. Is this the main reason for the discrepancy to the 1:1 line?

Page 20204: do the authors have any explanation why the modelled H2SO4 correlate better with the measurements when the whole data set is considered, compared to when only the daytime concentrations are considered?

Technical comments:

Page 20196: Experimental setup The authors should mention the dates of the measurement campaign, even if it is stated in the abstract and it can be found from the figures.

Page 20197: ..From the main inlet flow a sample (typically 10 lpm) is extracted via a

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thin walled 1.27 cm ... Is the extraction performed perpendicularly to the main inlet?

Page 20199 How were losses evaluated? Were calibrations performed by taking into account these losses in the main and secondary inlet?

Page 20202 line 10: .. typical of Hytiälä

Page 20203 line 10: Medians of the daily maximum...The median of the measured sulphuric

Page 20206 line 17: The observation period is the longest period in Hyytiälä, over which sulphuric acid has been measured.

Page 20207 line 6: ...since it is the longest available sulfuric acid measurement data base in Boreal environment.

Interactive comment on Atmos. Chem. Phys. Discuss., 8, 20193, 2008.