

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

### **Anonymous Referee #1**

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General comments: This paper reports an interesting data set. However, the data analysis is largely missing a clear presentation and a diligent and in-depth discussion, a proper comparison with similar studies published by other research groups, and a thorough evaluation of the experimental methods. A major revision is required before final publication can be recommended.

Specific comments: The authors fail to refer to previously published OH and H<sub>2</sub>SO<sub>4</sub> long-term measurements at Hohenpeissenberg station (e.g., Rohrer and Berresheim, Nature, 442, 184-187, 2006; Berresheim et al., Int. J. Mass Spec., 202, 91-109, 2000) which discussed in detail the validity of proxy variables such as J(O<sub>1</sub>D) and UV-B and the precision and accuracy of the experimental technique, respectively. No J(O<sub>1</sub>D) measurements were made in the present study, and global radiation and other param-

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eters used here can only be relatively weak proxies for OH, and /or H<sub>2</sub>SO<sub>4</sub>. Correlations with UV-B need to be clearly discussed in comparison with other studies previously published. Figure 1 is hard to read, Figure 2 does not make much sense, at least with respect to night-time data (no radiation). Figures 3, 4, and 6 are all log-log formats obscuring much of the information in the data. Regressions should instead or in addition be shown in detail within particular linear scales. The authors should clearly state how the correlation coefficients were determined. Are they derived from log-log or exponential regression of the data?

It is not clear which CIMS instrument was used in this study. Since each prototype has its own precision and accuracy of measuring OH and H<sub>2</sub>SO<sub>4</sub>, this needs to be done systematically and in detail in this study, unless it has been described previously. I assume this was not the same instrument as used by Tanner et al. (1997), and corresponding estimates should not be adopted from previous versions of CIMS instruments. More details also need to be reported on the operational stability, especially calibration factors. Background OH signal is not always identical with ambient H<sub>2</sub>SO<sub>4</sub> signal, this should be examined. SO<sub>2</sub> measurements also need to be presented or at least discussed. How many data were below detection limit? The caption of Figure 6 states the same detection limit for OH as for H<sub>2</sub>SO<sub>4</sub>. This must be wrong! The authors should clearly state the detection limits for both compounds based on standard deviation and signal integration time (see also Figure 9 and section 2.1.1). The typical DL for OH of the CIMS instrument is 3e5 molec/cc for 5 min, for H<sub>2</sub>SO<sub>4</sub> it is about one order of magnitude lower.

A description of the OH model is missing and should be included along with measured ranges of NO<sub>x</sub> and VOC concentrations. In section 3.1 no discussion is given regarding possible mechanisms of H<sub>2</sub>SO<sub>4</sub> generation at nighttime (which may also proceed at daytime) as previously mentioned in the above literature (e.g., peroxy radical or Criegee radical reactions with SO<sub>2</sub>). Estimated nighttime OH production rates are not presented. Measured OH concentrations (section 3.2) are relatively low compared to,

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e.g., Hohenpeissenberg (latitude ?) and no seasonal cycle seems to be apparent. A discussion of both points should be included. Hohenpeissenberg should not be characterized as "more polluted" (section 3.3), rather a comparative discussion of NO<sub>x</sub>, SO<sub>2</sub>, VOC, UV-B and ozone data time series from both stations should be made and included in the OH model with reference to the previous publications by the Hohenpeissenberg group given above. Just quoting values and assuming a qualitative difference in pollution levels is unacceptable.

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

**ACPD**

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