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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Basic characteristics of atmospheric particles, trace gases andmeteorology in a relatively clean Southern African Savannah environment" *by* L. Laakso et al.

L. Laakso et al.

Received and published: 24 June 2008

Anonymous Referee #1 Received and published: 13 May 2008

General comments: The authors present a fluently written paper on regional air pollution parameters in a region which has not been investigated in depth yet. They have made great efforts to perform valuable long-term measurements in this area.

Unfortunately data availability does not allow more detailed analysis of correlations between individual parameters, which would be desirable. The available data are, however, sufficient to provide a basic understanding of the pollution in this area and make this paper worth to be published in ACP. I would personally appreciate a more detailed presentation and discussion of both DMPS and AIS data as both performance

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Discussion Paper

and results of these measurements under adverse conditions may be of special interest for the scientific community.

*Currently, one of our students is preparing his MSc-thesis on new particle formation (DMPS and AIS), particle size distributions (DMPS) and their characteristics as a function of air mass origin (HYSPLIT trajectories) and potential field fires (MODIS satellite fire data). For this study, we utilize observations for the whole period (23 July 2006 - 6 February 2008). In article we decided to show only preliminary data, as a complete analysis of NPF is completely out of the scope of this paper. Additional reason for keeping the analysis on a slightly shallower level was that we wanted to use the complete background data set for more detailed analysis, not only the first year of the measurements.

For the same reason, we decided to leave correlation studies out. However, as both referees require more statistical analysis, we calculated the correlations for morning (06-12), afternoon (12-18), night (21-03) and for whole day, and added a new section discussing the topic. We did not want to include the correlation tables to the original manuscript, but they can be found from the end of "Answers to Referee 2".

We are also ourselves really curious on detailed studies and results, especially related to NPF, but as the practical issues like struggling with customs, electricity, calibrations and other simple things has taken most of the time, we have not been able to do more comprehensive study - yet.*

Abstract: "Gases and particles had a clear seasonal and diurnal variation, which was associated with field fires and biological activity together with local meteorology"; the statement about the seasonal variability of particles needs to be removed. A clear seasonality is not visible in the presented graphs. Furthermore data availability is not sufficient for such statement (see below).

Removed

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Section 3: Please add correction factors derived from calibrations for gaseous pollutants to provide information about the stability of the gas monitors for the reader.

Calibration coefficients (Appendix A) + one sentence on NOx-measuring problems added.

Section 4.1: A deeper statistical analysis of the correlation between trace gases and particles would be desirable. For this purpose data availability should, however, typically exceed 66 percent either for daily or monthly averages. As summarized in Table 1 data availability for particle number and mass concentrations does not fulfill this requirement for about half of the observation months. The authors should state this problem in the text of the manuscript more clearly.

*We calculated correlation coefficient between different variables for different times of the day (morning, afternoon, night and the whole day). We shortly discuss the main correlations found in the text. However, as discussed earlier, we will do such analysis for the whole data set, not only for the first year of the measurements. We hope that the referee is patient and wait for our more comprehensive gas phase chemistry paper which we will prepare later on.

We calculated the correlations for the whole period. As the processes behind the gas phase chemistry and new particle formation are most properly similar throughout the year (except for organic vapors and NO), we suppose that this will provide us with basic relations between different processes.*

It may be more appropriate to omit boxes like December in Figure 10 because this box is only 4.65 days of measurements. This amount of data is not representative for the whole month.

*We decided to show data even for those months with rather low data coverage, as the data still provides information on what is taking place during each month. One reason adding the number representing data coverage was to warn potential data users for

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uncertainties. *

Missing discussion about some visible annual variability of gaseous pollutants as well as scattered description of reasons for these has been discussed in depth by reviewer 2.

The seasonal variability of trace gas concentrations is now discussed in paragraphs 7 and 8 of section 4.2, as suggested by both reviewers.

Y-Axis labeling in Figure 10 needs to be changed, could be mistaken as a log scale at the first glance!

Changed

"The highest particle number concentrations were observed in the same wind sector as the highest SO2 concentrations (Fig. 11). The reason for this is discussed shortly in Sect. 4.3." needs to be discussed there, it is not.

Corrected

Section 4.3 The discussion of new particle formation events is rather short. Discrepancies between DMPS and AIS derived concentrations in the overlap region (Fig. 18) need to be clarified. Furthermore a color code for dN/log dp is missing in this graph.

*As described in the legend, this figure is for illustrative purposes only. AIS and DMPS measure different things and typically, concentration of particles is 10-100 higher than the concentration of ions, depending on the unknown charging state of the particles. Thus, adding colorbar does not provide accurate information.

The aim of this figure is to describe NPF qualitatively (shape of the growing mode, duration of the nucleation, period of the growth etc.), not quantitatively. Complete quantitative analysis for the whole particle and ion dataset will be provided after approximately one year (early 2009).*

"clearly, we have enough nucleating and condensing vapors as well as solar radiation

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for nucleation to take place throughout the year" : Available data should be sufficient to identify primary factors necessary for new particle formation events. Please identify those factors by statistical analysis and provide results in this paper.

We followed the suggestions by both referees and calculated the correlations. However, again, we want to stress that such analysis is in our agenda (and currently under way), but we want to carry it out for the whole data set, not only for this limited period.

Minor remarks: Page 6315 line 24: No article...has

Corrected

Figure 3 is not referenced in the text

Added

Page 6319 line 21-22: The concentrations...are

Corrected

Hameed (6327-3) or Hamed (6330-1)

Corrected

Piketh or Pikketh

Corrected

Interactive comment on Atmos. Chem. Phys. Discuss., 8, 6313, 2008.