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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Characterisation of sub-micron particle number concentrations and formation events in the western Bushveld Igeneous Complex, South Africa" *by* A. Hirsikko et al.

Anonymous Referee #2

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This manuscript focuses on new particle formation and growth events in an industrial area in South Africa. The study is based on measurements for over two years with an Air Ion Spectrometer (AIS), a Differential Mobility Particle Sizer (DMPS), and complementary measurements of some gas-phase compounds and meteorological parameters. The frequency of new particle formation events are higher here (86% of the analyzed days) than previously reported. Annual and diurnal variations in key parameters for particle formation and growth are presented and discussed, and there is also some discussion on particle emissions from local residential combustion. The topic

of this manuscript has been studied extensively during recent years and the methods used here are not new. However, the fact that the study is based on a long data set measured at a new location for this type of study, together with the fact that the observed frequency of new particle formation events is higher here than in previous studies, makes this manuscript interesting. I recommend it for publication after my, mostly minor, comments below have been addressed.

Comments:

1. I think it makes sense to give some background to the project in the abstract, but in the current version half the abstract is spent on providing background information and describing the site. I recommend a larger fraction of results and conclusions in the abstract.

2. It is interesting that the number of days with new particle formation events is higher here than in previous studies focusing on new particle formation. Could the authors add some discussion on what the reason for this might be? For instance, is the concentration of H2SO4 higher (or is the CS lower) in this study compared to other similar studies? Also, is there a clear difference between event days and non-event days (e.g. in terms of gas-phase concentrations or meteorological conditions) that may explain why new particle formation occur or does not occur on a certain day?

3. Can the estimated H2SO4 concentrations explain the observed growth rates?

4. Page 1907, lines 23-25: Do the authors mean that nucleation, Aitken and accumulation mode particle concentrations were correlated with BC, CO and NOx concentrations. . .? I think it would be easier to follow the discussion in this paragraph if a figure was added showing the median diurnal cycles of BC, CO, NOx, SO2, and estimated H2SO4 similar to Fig. 5. An alternative would be to provide a table with daytime correlation coefficients for each mode with BC, CO, NOx, and SO2?

5. Page 1908, lines 1-4: This sentence could be phrased more clearly. I suppose the

authors mean that the lack of correlation between the three modes with SO2 in the morning and evening suggest that the responsible source for the peaks in the morning and evening is residential combustion. However, the authors say on page 1907, lines 23-25, that concentrations of the three modes were associated with SO2 in daytime. I suppose then that the authors do not think that morning is included in “daytime”, but this needs to be explained more clearly.

6. Page 1907, lines 25-27: Wouldn’t you expect the concentration of nucleation mode particles to be anti-correlated to the CS, not being independent? That being said, I know this is not always the case.

7. Page 1907, lines 9-11: I think it looks as the nucleation mode midday concentration was higher during the dry season in Fig. 5.

8. Page 1912, lines 14-15: Only the Aitken mode particles did originate from nucleation in the afternoon, not the accumulation mode particles, right?

9. Page 1897, line 13: “a few other sites”

10. Page 1897, line 15: I would suggest “residential areas in southern Africa”.

11. Page 1897, line 20: Change “occurs” to “occur”, or remove “will”.

12. Page 1903, line 4 and line 5: “were used”

13. Page 1904, line 13: “from 10 nm up”? Do you mean larger than 10 nm?

14. Page 1907, lines 1-2: I suggest that you change “accumulation mode” to “the accumulation mode”, and “Aitken mode” to “the Aitken mode”.

15. Page 1908, line 1: remove “the” from “the NOx, CO,. . .”

16. Page 1910, line 29, “the future”.

17. Page 1911, line 11: Add space between “Even” and “though”.

18. Page 1911, line 24: change “faster” to “higher”.

Interactive comment on Atmos. Chem. Phys. Discuss., 12, 1895, 2012.