Reply to Co-Editor Decision (Publish subject to minor revisions, 16 Nov 2017)

Co-Editor: Stating that BC represents only 10% of PM at night does not rule out primary emissions; while this would be considered a low fraction of diesel emissions, it could be considered typical for biomass burning from space heating. While the authors later state that domestic sources are unimportant, they should really state that at this point as well.

We have improved the clarity of the chain of arguments in the respective section, explicitly mentioning the non-relevance of domestic sources:

> "CS decreases rapidly on the Class I and II days (Fig. 6d) while this effect is much less pronounced on Class III days. We attribute this effect to two reasons: First, semi-volatile compounds, such as ammonium nitrate as well as semi-volatile organic matter present in the aerosol will partition from the particulate phase into the gas phase as ambient temperature rises. The importance of this effect has been demonstrated for the Melpitz site by mass spectrometric particulate matter measurements (Poulain et al., 2011). Second, vertical mixing starts in the lower layers of the atmosphere under the influence of intense solar radiation. This, as an overall effect, tends to dilute aerosols present in the surface layer. [...] As mentioned before, CS changes by a factor of approximately five between night-time and day-time on Class I and II event days. As BC makes up less than 10% of total particle mass at Melpitz, we rule out that any temporal changes in local anthropogenic emissions — neither from traffic nor domestic sources, can account for the observed decline in CS. We conclude that the partitioning of semi-volatile particulate matter into the gas phase and vertical mixing are the major effects reducing CS before NPF events."

Co-Editor: More detail must be provided on the statistical tests. The sigmas reported on figure 6 would appear to be standard errors, not standard deviations, and the formulation (or a reference) for the t-test performed should be given, along with the numerical results.

We added the following text, marked in blue in the revised version of the manuscript:

> "Remarkable differences in observed atmospheric conditions were found between Class I, II and III event days and discussed from Sec. 5.1. To supply a statistical statement, we performed Student's t tests to check whether the parameters OH, SO2, H2SO4, and CS were indeed different between these classes on a statistical level. Student's t test was used to decide wether the means of two populations (for example, CS on Class I and II event days) could be considered equal (null hypothesis) or different within statistical significance. Student's t-distributions (Student, 1908) were used because they refer to the probability distribution of the mean of a normally distributed population in situations where the sample size is small and population standard deviation is unknown (Hazewinkel, 2011). As a significance level of the test, we chose 99 %. A test was performed for every pair of 15 min mean values of the aforementioned parameters. In fact, the test compares the significance of the differences in mean values that can be seen in Fig. 6. The results of the test are shown in Table E1 in the Appendix."

As can be seen, we also added an Appendix E including the table of results that you requested.

Co-Editor: The terms 'proximity measure' and 'proxy' are not synonymous (they are not even linguistically related, being derived from the Latin 'proximus' and 'procurare' respectively). In this instance, the authors should be using the word 'proxy'. 'Proximity measure' is a term used to describe the similarity of two vector quantities (often used in machine learning) and is not appropriate here.

Reply: Thank you for this comment. The term "proxy" is now used throughout the text.

Co-Editor: In section 4.2, it seems odd that the motivation for the use of a method should be stated late in the section. I would try to put this sentence closer to the beginning.

Reply: The paragraph motivating the CI method was now moved to an earlier position, i.e. as the second paragraph of the section.

Co-Editor: The use of the word 'prototype' to describe Beijing on page 15 is a little odd.

Reply: Thank you for this comment. This sentence has been rewritten as

> "In the Chinese megacity Beijing, located in a temperate climate

and featuring high rates of anthropogenic particulate and gaseous emissions, the influence of SO2 and H2SO4 as precursors for NPF could be confirmed as well (Yue et al., 2010)."

Co-Editor: Generally, the standard of English still needs improvment, but I am assuming this will be rectified during copy-editing.

Reply: Thank you. We are happy to address the issue during the copy-editing phase.