

Response to Reviewer Comments by U. Uhrner and H. Jorquera

Thank you very much for the detailed feedback and helpful comments. Below, we would like to clarify some of the main points from the general comments, especially the question concerning NMF patterns at midnight.

At the moment, we already received comments of two reviewers, but we are still waiting for further comments from other accepted reviewers. Therefore, a revised version of the article will be prepared after the closing of the discussion (September 5th).

General Comments:

1) Introduction and structure of the paper

We will shorten the paragraphs on health effects of particulate matter and provide more information concerning particle size distributions and particle processes. We will underline the interpretability and the usability of the outputs.

2) Extending the volume NMF part

We will wait for the comments of the other reviewers. Afterwards, we will decide if the volume NMF section should be extended, including detailed interpretations, or published in a second paper.

3) Differences in the NMF patterns between 00:00 and 24:00.

The explanation is as follows:

Mathematics: The calculation of NMF factors is based on the particle size distributions (PSD) of one day beginning at midnight (0:00) and ending at midnight (24:00). If we consider a single NMF factor (e.g. NMF-N3), and assume it has positive coefficients (weights) for two consecutive days, we observe the discrepancy in 24:00 at day t and 00:00 at day $t+1$. But obviously, the whole particle pollution pattern for each day is described by a superposition of the weighted NMF factors with time-varying coefficients. So NMF-N3 describes only one part of the whole particle burden, whereas the other 4 NMF factors describe further parts. The superposition of the NMF factors must result in nearly equal values for 0:00 and 24:00, whereas one individual factor does not have to show equal PSDs at 0:00 and 24:00.

Physics: Each of the factors describes a physical process (or a combination of processes), that depends on the time of day and that is not necessarily cyclic. For example, the local wind system underlying NMF-N3 could be more present at day t than at day $t+1$. If the weight of a factor would only change very little from day to day, then the pattern would have to be cyclic with very similar values for 0:00 and 24:00. In fact, the physical conditions (weather, emissions,...) and therefore the weights change from day to day. This results in necessarily differing values for the factors at 0:00 and 24:00.

We will discuss this feature of the NMF patterns in the revised manuscript more in detail.