

## ***Interactive comment on “New particle formation in the western Yangtze River Delta: first data from SORPES-station” by E. Herrmann et al.***

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In response to Referee #1

To put our manuscript into perspective, we have added a short “review” of the current state of nucleation and particle formation research in China (in section 1), identifying typical research foci to date (Beijing, Hong Kong, urban in general) and certain shortcomings (few long-term observations, size range often limited to 10nm), more clearly expressing which present significant gaps our manuscript addresses.

The manuscript presents the longest and most comprehensive data set on aerosols in the YRD to date. It is the first work to report on particles as small as 1 nm in China. The revised version presents a detailed analysis of the behavior of air ions

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during nucleation. It goes on to estimate sulfuric acid concentrations with the latest proxies by Mikkonen et al. (2011) and on this basis looks into the role of sulfuric acid during early growth. A closer analysis shows that McMurry’s particle formation criterion is ultimately in disagreement with our observations, prompting the development of an empirical parameter based on our observations. In a similar fashion, the nucleation rate is parameterized, expressing particle formation as a function of a set of reasonably easily to obtain observables.

In short, the revised manuscript does what the reviewer wishes for: Sections 4 and 5 have been merged into section 3, making for a more concise structure. The revised manuscript provides deeper, well-founded insight into the role of ions, nucleation probability, nucleation rate, sulfuric acid, and how they relate to the conditions at the site.

To comment on the few single points the referee raised:

1. In general, it is entirely possible to have effects that are significant on the small scale but not important in the big picture. We believe this is one such effect. The revised manuscript analyses the role of ions in much more detail, finding that less than 1% of particles are formed with a charge. This means that ions are not very important in particle formation. Still, we do observe a difference in ion cluster concentrations during event days. Seeing that this effect occurs several hours before particle formation actually begins, however, makes it rather unlikely that this observation would be directly connected to NPF. Instead, it is more likely that this observation indicates processes that coincide with favorable particle formation condition. Thus these heightened cluster concentrations are merely an indicator of NPF, not a cause. 2. Section 5 has been completely re-written (and merged with chapters 3 & 4), now giving a new, well-argued and stringently numerically derived parameter that should address all the referee’s concerns. It also (with a similar formation parameterization) gives more insight into the specifics of NPF in the YRD, and points towards essential next research foci.

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