

Interactive comment on “Evaluation on the role of sulfuric acid in the mechanisms of new particle formation for Beijing case” by Z. B. Wang et al.

Anonymous Referee #2

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This manuscript contains an analysis of measurements of sulfuric acid concentrations and particle size distributions made in Beijing during the time frame of the 2008 Olympics. The findings add to the growing body of literature showing a wide range of relationships between the formation rate of nano-particles and the sulfuric acid concentration. This work adds incrementally to this knowledge, showing that new particle formation can occur even in highly polluted environments and documenting the range of relationships between these parameters. The measurements appear to be of high quality, and the analysis and interpretation is clear and logical. I recommend the manuscript be published in ACP following minor changes.

Specific comments:

- 1) P. 24172, lines 24-25. The authors conclude from examining Fig. 2 that "the existing
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aerosol concentration is more likely the key limiting factor to determine the observation of NPF events in Beijing rather than the concentration of gaseous sulfuric acid." This is not at all clear from Figure 2, which does not show a hard boundary of condensation sink term beyond which NPF does not occur. Rather, at lower CS term values, NPF can proceed readily, and at higher CS term values NPF can proceed if sulfuric acid concentrations are sufficiently high. Thus the CS term and the sulfuric acid concentration each play determining roles in whether NPF proceeds or not. It would be interesting to see if there is a combination of terms, perhaps $[H_2SO_4]/CS$ term, that could be plotted against the NPF rate, J. For example, Lee et al. (Science, 301, 1886-1889, 2003) found a relationship between the concentration of nano-particles and the ratio of sun exposure to aerosol surface area. Perhaps a similar parameterization, using sulfuric acid rather than sun exposure fraction, could be useful.

- 2) There are several recurring problems with English usage, especially indefinite vs. definite articles and prepositional choices. English issues occasionally obscure the meaning of the text, such as (p. 24172, lines 5-8), "the N3-6 and H₂SO₄ concentration showed similar variation trend on the NPF event days (gray background)." In addition, there are several typographical errors as well. I recommend a thorough edit by a skilled English speaker on the author list.

- 3) The figures are clearly presented, although Fig. 1 is rather dense and should be larger. Where possible, please apply different symbols in addition to different colors (e.g., Figs. 2-5), as ~10% of males suffer some level of color blindness.

Interactive comment on Atmos. Chem. Phys. Discuss., 11, 24165, 2011.