

***Interactive comment on* “The roles of sulfuric acid in new particle formation and growth in the mega-city of Beijing” by D. L. Yue et al.**

Anonymous Referee #1

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This paper presents an analysis on the characteristics and associated chemistry of a series of new-particle formation event observed in Beijing, China. The paper is very well written and easy to follow. The analysis is scientifically sound and sufficiently original to warrant publication. The authors have already addressed the major technical flaws when revising the paper for ACPD. I have only a couple of further suggestions for improvements. After considering these minor points, I highly favor the publication of this paper in ACP.

First, the authors quantitatively estimate how much coagulation between particles decreases particle formation rates during their measurements. This is a very important point when considering, for example, the efficacy by which atmospheric new-particle formation events produce cloud condensation nuclei. Besides a couple of theoretic

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cal analyses (Pierce and Adams, 2007, ACP 7, p. 1367-1379; Kerminen et al., 2004, Tellus 56B, p. 135-146), the quantitative role of coagulation scavenging in CCN production has been investigated in only one field study (Kuang et al., 2009, GRL 36, doi:10.1029/2009GL037584). By explicitly bringing up the tight connection between the nucleation rate, coagulation scavenging and CCN formation, the value of the result obtained by the authors would be very much enhanced.

Second, the authors provide quantitative information about the relative contribution of sulfuric acid and organics to the condensation growth of nucleation particles. Especially, they can distinguish between so-called sulfur-rich days when the contribution by sulfuric acid is more than a half and sulfur-poor days when it is less than a half (typically a quarter). I would be valuable for the readers if the authors contrasted their finding with the few earlier studies on this subject (e.g. Weber et al., 1997, JGR 102, p. 4375-4385; Birmili et al., 2003, ACP 3, p. 361-376; Boy et al., 2005, ACP 5, p. 863-878; Smith et al., 2008). To me, it seems that large contribution by sulfuric acid to the nuclei growth can be seen in a few locations only, such as Eastern US and China, whereas in most locations sulfuric acid typically explains less than 20 per cent of the condensation growth. The authors should add a brief discussion (one paragraph) on this topic with suitable references.

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