

This manuscript focuses on an important issue, specifically the relationship between ammonium and nitrate with mineral dust in China. The variability in previously reported relative concentration trends is worth exploring in detail. There are a number of areas where the paper could use improvement prior to publication, particularly with connecting to the literature and placing the work in context.

Comments:

- Throughout the manuscript there are odd spacing issues, where two words are together without a space. As an example in the abstract “For these two groups, **NH₄+in** dust day samples **waspresent** in the form of ammonium salts externally co-existing with dust aerosols or the residual of incomplete reactions between ammonium salt and carbonate salts.”
- Line 51-54: The authors state the Asian dust has been transported as far as the north pacific, but this understates what has been observed for Asian Dust. Uno et al 2009 Nat Geosci showed that Asian dust can circumnavigate the globe. VanCuren and Cahill 2002 showed Asian dust impacting California air quality, while Ault et al. 2011 JGR and Creamean 2013 Science showed impacts of Asian dust on orographic precipitation in the Sierra Nevada (in California). Pratt et al. 2009 Nat Geo showed Asian dust influencing clouds over Wyoming.
- Though the authors note that a native English speaker was utilized for the revision, a considerable improvement in the grammar and proofreading are needed before the writing is at a publishable level.
- Line 233 insert comma after “samples”
- Line 266: Is it really a safe assumption that gas aerosol thermodynamic equilibrium is met for inorganic ions during a dust storm? It would seem that many non-aqueous (i.e. solid) aerosol would be present that would not have normal equilibrium partitioning. It would be nice to see some evidence of this. This would also help support the conclusion that Ca(NO₃)₂ and CaSO₄ are negligible.
- Line 282: The presence of Cu, brings to mind the question of transition metal ions and industrial sources of metal containing particles. How were these accounted for? Particularly since they often have different properties and propensity for generating ROS as Weber and company at Georgia Tech have shown.
- It should be noted that there is a great deal of uncertainty regarding aerosol pH, particularly in North China, with estimates ranging from 3-7 pH units. This of course will affect nitrate. The authors could comment on this with respect to their data, though keeping in mind Hennigan et al showing the proxy methods such as NH₄⁺/(NO₃⁻+SO₄²⁻) are qualitative at best.
- What is the mineralogy of the Hunshandake Desert? Is it rich in CaCO₃? Based on a few assumptions made, documentation of the presence of this mineral from aerosols in the region would be helpful. Perhaps some of Ro and co-workers analysis of transported dust with SEM-EDX?
- Line 321 some evidence for “humid marine conditions might have enhanced particle-particle coagulation” would be helpful. The number concentrations in the marine boundary layer are unlikely to be > 10⁵ #/cm³ where coagulation is prevalent, more likely in the 10²-10³ #/cm³. Are the authors referring to fog-processing? That would seem to be the primary way this could happen in a marine environment.
- Line 326 The line “ammonium salts mostly co-existed with dust aerosols externally” is confusing as written. Is the population externally mixed with respect to ammonium nitrate and dust? Or are the salts co-existing with dust, but not other particle types? Please rephrase for clarity.

- Overall many of the conclusions on page 12 appear to mostly be speculation with little data to support it. I would recommend sticking to conclusions with more support from the data in the paper.
- Line 357: The source profile for coal, could it have dust mixed in? When the author's say that there is a "mixture of coal combustion and other pollutants" are they saying that they are internally mixed or simply present contemporaneously? Clarifying that point would be helpful.
- Overall the Figures could use improvement as portions are hard to read and the take home point of each is not always clear. It seems at times as if the authors are simply showing everything they can, as opposed to targeting their figure to the main points of the paper.