

Interactive comment on “Nitrate transboundary heavy pollution over East Asia in winter” by Syuichi Itahashi et al.

Anonymous Referee #3

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This manuscript deals with an episodic model simulation and evaluation with PM_{2.5} and its composition measurements. The relationship among sulfate, nitrate and ammonium and the neutralization degree are well explained and discussed with the observations and simulation results. The manuscript provides interesting and scientific information on PM_{2.5} formation and transport in Northeast Asia. However it is not clear what the authors want to tell in the manuscript. The contents are good enough, but it would be better to reconsider the discussion points. Specific comments are listed below.

Abstract, Lines 29~35, “Analyzing the gas ratio, which is an indicator of the sensitivity of NO₃⁻ to changes in SO₄²⁻ and NH₄⁺, showed that the air mass over China was super NH₃-rich for type N, but was almost NH₃-neutral for type S. ~”

1) Is it because of low SO₂ to Sulfate conversion rate in Type N? It should be also

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noted that the observed levels of total NH₃ in Figure 6 are almost identical for Type N and Type S.

2) Why are NH₃ conditions for Type S and Type N different when we consider the target modeling period is quite short?

3) What determines Type N and Type S? Is it due to meteorology, different origins of air plumes, or pathways of back-trajectories? It seems that outflow from Shanghai area affects the monitoring sites for Type N, and air plume is transported from Hebei and Beijing for the Type S.

Figure 5, Why domestic influence does not appear on January 13 and 14 when dominant wind direction shown on Figure 4(c) is easterly?

Page 9, Lines 10: “the main component of SNA was NO₃- during the first episode and SO₄²⁻ during the second episode.” → It would be helpful to indicate quantitative portions of nitrate and sulfate for the episodes.

Page 9, Line 20: “ However, 20 the sensitivity simulation confirmed that the trans-boundary NO₃- air pollution was dominant for types N and S.” → The sentence is not clear. Does it mean that Type N and Type S are determined by sulfate concentration or Fs rather than nitrate concentrations?

Trajectory analyses: It seems trajectory results should be checked. For the Tn case in Figure 9, the trajectory and wind vectors are relatively well matched. However, in Figure 10, more northerly wind is dominant, and the trajectory origin should move more northward. But, trajectories in Figures 9 and 10 are almost the same.

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