**Anonymous Referee #1**

This paper is well written and focuses on the fine and course aerosols (especially nitrate) transport and transformation processes in long-range transport (LRT) from China to Japan. The authors analysis the transformation process including heterogeneous reaction of SO4–, NO3-, NH4+ and their precursor gases by using the Chemical Trans- port Model (CTM) and measurement system. The author's CTM model reproduces well the temporal variation of aerosol observation in Kyushu. The authors demonstrate that the coarse particle is majority of total nitrate and the heterogeneous formation of dust and sea-salt nitrates is important process of course nitrate. Additionally, the authors suggest a critical importance of inclusion of aerosol microphysical processes in nitrate modeling. This paper is a leading study in which the formation mechanism of nitrate in East Asia is analyzed quantitatively by using the CTM and aerosol observation.

Thank you very much for your kind reviewing of our manuscript. We have revised our paper based on two reviewer comments, and provide a point-by – point response as below. The revisions are indicated in red in our revised manuscript. We hope our revisions are sufficient for your comments.

**Minor comments:**

1. Line 5 of page 3: It is better that "We also examined" is changed to "We focused on" because the nitrate analysis is strong point in this paper.
   Reply: Thanks. We corrected.

2. Chapter 2: Monitoring site information should be added.
   Reply: We added basic information around the monitoring site.

3. Line 11 of page 3: "Aerosol Chemical Speciation Analyzer and NHx measurement" is better.
   Reply: Thanks. We corrected.

4. Lines 18-19 of page 5: Which version of EDGAR is used in this paper? The targeted year of EDGAR and REAS? Which emission inventory for volcanic SO2 is used? Biomass burning emission is included in the simulation?
   Reply: We revised by including of the version of EDGAR (Ver. 3) and REAS (Ver. 2.1). Volcanic $SO_2$ emission is based on the Japan Meteorological Agency's data base (we included the URL). Biomass burning information like GFED is not included in our simulation.

5. Lines 14-15 of page 6: "The precipitation difference is important for ***" is not clear. Some explanation needs to be added.
   Reply: We added some explanations why the precipitation is important for $NH_3$ emission intensity. Please see reply for comment of reviewer 2–15.

6. Line 12 of page 7: Why the high CO is a product of LRT? High CO concentration may be influenced by local emission sources.
   Reply: Reviewer 2 also commented for CO comparison. Peak concentration of CO and $SO_4$ usually observed simultaneously, so we believe that high CO peak may be influenced by Chinese CO emission. However, the inclusion of CO result is not critically important for our purpose, so we removed the discussion for CO from revised manuscript.

7. Line 14 of page 8: "The increase in" should be deleted?
   Reply: Thanks. We corrected.

8. Line 23 of page 9: It is better that "(a) NHx" is changed to "(a) f NH4+, C NH4+, and NH3" such as "(b)".
   Reply: Thanks. We revised.

9. Line 1 of page 10: Why is the modeled HNO3 overestimated?
   Reply: Because the $NH_4NO_3$ equilibrium between $NH_3$ and $HNO_3$ is

given as

$$HNO_{3\,(g)} + NH_{3\,(g)} \rightleftarrows NH_4NO_{3\,(p)}$$

In equilibrium condition, if $NH_3$ is small, then $HNO_3$ could be higher to keep equilibrium.

10. Figure 1: The time should be considered in the unit of SO2 emissions such as “Kg/year/grid”.
    Reply: Thanks. We corrected.

11. Figures 3, 5, 6, 8, 10 and A1: The number of “0” or “5” outside right axis should be deleted.
    Reply: We removed the line numbers from the figure pages.