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Comment on acp-2022-426

Anonymous Referee #1

Referee comment on "Seasonal modeling analysis of nitrate formation pathways in Yangtze River Delta region, China" by Jinjin Sun et al., Atmos. Chem. Phys. Discuss., https://doi.org/10.5194/acp-2022-426-RC1, 2022

Summary:

Nitrate has been the dominant chemical component of $PM_{2.5}$ in China during winter haze days in recent years. This manuscript used the CMAQ air quality model to investigate the impact of local emission and regional transport on nitrate formation as well as its major formation pathways in the Yangtze River Delta (YRD) region during the four seasons of 2017. Overall, the results are interesting and meaningful for future emission control strategy design. The manuscript is well written and easy to follow. I recommend accepting this manuscript after some minor revisions.

Comments:

- Lines 277-282: From Figure 2, the model performance in Hefei is better than the other three sites. Why do the authors only focus on the results in Shanghai, Hangzhou, and Changzhou?
- Lines 283-284: Underestimation of NO_3^- can also be found in spring, and the bias may even be larger than that in summer and autumn. It's better to provide the model performance in each season.
- Lines 313-314: Local emission only contributes negatively in winter and autumn, shouldn't be "in the four seasons".
- Lines 315-317: The indirect transport doesn't seem to contribute as large as −7% in autumn according to Figure 3b. Please check the numbers.
- Line 317: Avoid such expressions as "−12%−−42%".
- Line 70: Please check the format of this paragraph.
- Lines 373, 376, and 381: "HNO_3^{-}" should be "HNO_3".
- Line 415: Providing TNO_3 production rates from different pathways at different model layers would be more helpful.
- Figure 7: The text in the figure is too small. Please make it larger.
- Lines 440-445: The indirect transport of nitrate can also be formed from the

transported HNO_3 from outside YRD region reacting with the locally-emitted NH_3. As can be seen from Figure 3, direct transport contributes considerably to HNO_3. The authors should clarify this in the revision.

- Line 772: Table 3 is not for "model performance".
- Line 106: Actually, atmospheric oxidant doesn't include N_2O_5.