

Interactive comment on “Nitrogen isotope fractionation during gas-particle conversion of NO_x to NO_3^- in the atmosphere – implications for isotope-based NO_x source apportionment” by Yunhua Chang et al.

Anonymous Referee #2

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Chang et al. propose a novel method to qualitatively determine the nitrogen isotope fractionation factor associated with NO_x oxidation to form nitrate aerosols. The authors argue that the nitrogen isotope fractionation is a fundamentally important but overlooked factor in terms of influencing the source apportionment of particulate nitrate, particularly in urban polluted atmosphere. The explanations given are supported by strong observations, theory, and modeling. Overall, this work contributes a potentially powerful new tool for the investigation of atmospheric nitrate sources, and the isotopic fractionation that occurs during chemical processing. I have no major con-

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cerns regarding this manuscript. As mentioned by the first reviewer, it is well written, well presented and it makes sound. Beyond the remarks given by the first reviewer upon which I agree, I would appreciate if the authors can also consider the following points: (1) I assume that the authors have wrote a program that incorporated all of the equations in the MS to calculate the nitrogen isotope fractionation factor and estimate nitrate source attribution. I believe it will be a valuable asset if the authors could make such program publicly available; (2) compiled from previous studies, it is surprising to see no significant difference of $\delta^{15}\text{N}$ values among different phases of nitrate. How the authors explain my doubt; (3) the use of two pathways to explain the nitrogen isotope fractionation is classic and maybe correct to a large extent. I was wondering if other pathways to influence the nitrogen isotope fractionation and subsequently contribute to nitrate formation need to be mentioned at least; (4) The references in the Reference list are not always in the appropriate order: "Chang, Deng. . . , 2017" should come before "Chang, Liu. . . , 2016a". "Felix, J. D., and Elliott, E. M., 2014" should come before "Felix, J. D., Elliott, E. M., Gish, T. J. . . . , 2013". "Felix, J. D., Elliott, E. M., and Shaw, S. L., 2012" should come after " Felix, J. D., Elliott, E. M., Gish, T. J. . . . , 2013".

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