

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 #1

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Current application of stable isotopes in atmospheric particulate nitrate to partition NO_x source contributions generally presupposes that nitrogen isotopic fractionation during the conversion of NO_x to NO_3^- is minor. Here Chang et al. present a comprehensive evaluation of the nitrogen isotope fractionation during gas-to-particle conversion of NO_x to NO_3^- . The computational quantum chemistry is applied to calculate the net N isotope effect ($\hat{\delta}^{15}\text{N}$) associated with the conversion between NO_x and NO_3^- , and validated through a source-specific monitoring campaign. The applicability of this method to atmospheric aerosol samples from a megacity shows satisfactory results,

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which are in line to atmospheric chemistry modeling and to what one can expect in terms of source impact in a traffic-intensive environment. The source apportionment model to calculate nitrate fractions of different NO_x sources is presented in a clear and concise way and is easily applicable by other researchers for similar studies. Great benefit with the method compared to other $\delta^{15}\text{N}$ -based source apportionment studies of atmospheric nitrate is the fact that coal combustion may be substantively overestimated in previous studies when the N isotope fractionation during atmospheric nitrate formation is neglected. This makes the study with more profound implications. I recommend this manuscript to be published in ACP with minor revision. 1. Title: replace “gas-particle” by “gas-to-particle” 2. L54: delete “nationwide,” 3. L103: add relevant reference 4. L154-155: to my understanding, the source apportionment study of pNO₃ was only performed in Nanjing 5. L190: it is a bit awkward to use “heartland” here 6. L203-207: I didn’t find the data of dicarboxylic acids and related compounds. No need to mention the method here 7. L317: enough credits should be given to previous researchers 8. L319-321: although described in the SI, relevant references should be added 9. Figure 2b: what “MSA” stands for 10. Figure 6: replace “ $\delta^{15}\text{N}$ ”

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