



Interactive comment on “Incorporating ¹⁵N into the outputs of SMOKE version 4.6 as the emission input dataset for CMAQ version 5.2.1 for assessing the role emission sources plays in controlling the isotopic composition of NO_x, NO_y, and atmospheric nitrate” by Huan Fang and Greg Michalski

Anonymous Referee #2

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This manuscript details the incorporation of N isotopic signature of NO_x into SMOKE and the simulation results. It is nice to see the progress made towards using isotopic signatures to constrain the NO_x inventory. Below are my comments:

Major remarks 1. The authors adopted a mean d¹⁵N value for each source as the

model input. However, large uncertainties are associated with each of the sources. 2. Page 8, lines 40-43, reasons were given here about why the results from passive sampling were excluded. What are the reasons why the passive sampling results were adopted for soil emissions. 3. Page 9, lines 20-31, I am confused about how the d15N-NO_x of gasoline values were chosen, as the authors show two different ones $-2.5 \pm 1.5\%$ and $-2.7 \pm 1.8\%$ and also show an equation in line 32. It's also unclear how onroad diesel NO_x d15N values were chosen and what uncertainties are. 4. First, if Figure 9 is the result of previous publication, it should be noted and cited. Second, Walters et al (2018) measured d15N of NO₂ instead of NO_x. It is questionable to compare that results with the simulation. Third, the simulation only considers direct emission signatures, while the observation should be influenced by both direct emissions and atmospheric processing. This adds more confusion to this comparison.

Minor remarks: Page 4, line 18, 'distinctive differences in d15N' is questionable, as there are significant overlap among different sources (Figure 1). This need to be clarified and interpreted appropriately. Page 5, line 17, 'NO_x chemical lifetime (~ 1 day)' is over generalized and the NO_x lifetime really depends on time and location. Also it needs references here. Page 5, line 20, how would only compare the emission sources be practical without considering other two factors. Table 1, the authors need rationale why the d15N of NO_x values were selected from only the listed works rather than including others. Page 8, lines 5-8, the results obtained by Felix&Elliott were d15N-NO₂ with passive sampler, but the authors compare the values with those obtained from dynamic flux chamber. The latter mainly measured NO directly emitted from soils. The authors should clarify this point and make proper selection of data as model input. Page 8, line 21, the authors need to clarify "these studies". The statement here is contradict to Table 1, which show the soils d15-NO_x is adopted from one study Felix&Elliott 2014. Page 13 Figure 2, what year does the simulation show? page 5, line 33, why did the authors used NEI 2002 instead of the most recent one?

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