

## ***Interactive comment on “Enhanced representation of soil NO emissions in the Community Multi-scale Air Quality (CMAQ) model” by Quazi Z. Rasool et al.***

### **Anonymous Referee #1**

Received and published: 8 July 2016

This is a well done study that advances our understanding of regional modeling representation of soil NO emissions through the evaluation of improved (where appropriate: spatial and temporal) representation of soil conditions, fertilizer application, land use/land type, deposition, and meteorological influence. As regulation at the state and federal levels reduce the traditionally largest sources of NO<sub>x</sub> emissions (ie: power plants, mobile sources), other sources, like soil, will become relatively more important. Therefore, improvement of our understanding of the processes behind soil NO, and the relative contribution to air quality issues, is becoming increasingly important. I recommend this paper is published after a few minor edits.

Introduction: Lines 68-69: Suggest rewording this sentence for clarification. It seems to

C1

suggest that deposition is a larger source of N in agricultural soils than fertilizer, which does not seem to be supported by the referenced papers.

The last two paragraphs of the introduction talk about your approach without specifically mentioning that you will be applying your updates to the CMAQ model (ie: you don't say you are running CMAQ). You should add that. Also, the text does not say whether you are running your simulation with bi-di (Figure 3 would suggest you are.) Can you clarify in the text?

Methodology: Lines 156-157: Awkward use of the word “significant”. Are you trying to say that dry spring fertilizer application happens a lot?

Lines 164-165: make units consistent.

Lines 174-175: Personally curious, is there an existing or theoretical pathway through which this information could be used to reduce fertilizer demand and actual application? Would it be significant?

Lines 285-287: Do you say anywhere what the baseline year is for EPIC? (ie: land use, and management practices must be based on some start point? Or updated annually?)

Results and Discussion: Lines 356-357: this is in stark contrast to your introduction and suggested purpose for evaluating improved representation of key factors (ie: that NO emissions from soil are 1.5 to 4.5 times too low in the traditional YL representation). You discuss some reasons why (lines 436-438). Why would these factors not apply to other areas that are not over-estimated?

Lines 384-396: was met model performance for rain evaluated for this region in July? ie: did you test this hypothesis? Since this also could help explain the over-estimation in the mid-west, it seems like this would be important to test.