

## ***Interactive comment on “Worldwide biogenic soil NO<sub>x</sub> emissions inferred from OMI NO<sub>2</sub> observations” by G. C. M. Vinken et al.***

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We thank reviewer #1 for the review and constructive comments provided. Please find our detailed replies to the comments below. We adapted our manuscript in line with these recommendations. We marked updates in our manuscript corresponding with this review with a blue text colour.

### **Comments**

*1) The paper should include a more thorough discussion of how it excludes the possibility of biases that are correlated with soil NO<sub>x</sub> emissions. Could burning of Agricultural wastes or large scale fires that occur with similar timing and be misinterpreted as soil NO<sub>x</sub>?*

C5656

In this study we attribute observed NO<sub>2</sub> enhancements to soil NO<sub>x</sub> emissions based on the modelled contribution of a particular source to the NO<sub>2</sub> column, and do not attribute based on timing of emissions (as was done in e.g. Ghude et al., 2013). Our filtering minimises the influence of other strong NO<sub>x</sub> sources on the NO<sub>2</sub> column over our selected regions, and as a result the bias from collocated non-soil emissions correlated should be small. For example, the influence of fires is minimised, by screening out situations with fires according to (daily) GFED data. Also, we reduce absolute biases in either model or observations (due to other emission sources) by fitting an offset in our regression. We have extended the discussion of our filter in the manuscript (Section 3.1).

*2) The paper overstates the case for large uncertainties in emissions in the literature. Figure 1 shows that with the exception of 1 paper the mean values reported by 16 papers over the last 20 years are quite similar. This paper should lay out the current challenge which is to narrow the uncertainty of this more recent range - or explain why it is still reasonable to consider the outliers in the literature as likely.*

Indeed, reporting the full range might have overstated the uncertainty. We have adapted this in the manuscript.

*3) Hudman et al. report substantial interannual variability in specific regions. In light of those analyses how representative of global average behavior is an analysis of a single year?*

Indeed, Hudman et al. (2012) report on interannual variability for the Mid-Western USA. In our work, we constrain emissions in 11 independent regions on different continents and hemispheres. We acknowledge that while the variability for one particular region may be substantial, the use of 11 independent regions will dampen the possible influence of variability on our estimate of the global total. Extending our work to cover more years would be useful to improve the soil NO<sub>x</sub> parameterisation, but is beyond the scope of the current study.

C5657

## References

Ghude, S. D., Kulkarni, S. H., Jena, C., Pfister, G. G., Beig, G., Fadnavis, S., and van der A, R. J.: Application of satellite observations for identifying regions of dominant sources of nitrogen oxides over the Indian Subcontinent, *J. Geophys. Res.-Atmos.*, 118, 1075–1089, doi:10.1029/2012JD017811, 2013.

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Interactive comment on *Atmos. Chem. Phys. Discuss.*, 14, 14683, 2014.