

## ***Interactive comment on “Air quality and radiative forcing impacts of anthropogenic volatile organic compound emissions from ten world regions” by M. M. Fry et al.***

**Anonymous Referee #1**

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Fry and co-authors have written a detailed analysis of regional differences in NMVOC impacts on air quality and climate. This manuscript advances beyond past work mainly by analyzing a larger number of regions. Their model predicts smaller RF from NMVOCs than past work, which they attribute mainly to differences in other emissions. The manuscript is thorough and clearly written, emphasizing the regional differences in GWP that may be useful to other scientists and policy makers. I recommend publishing this with the following minor changes.

The estimated present-day net RF, relative to preindustrial, includes all biomass burning NMVOC emissions in the RF calculation. This implicitly assumes that there were

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no preindustrial NMVOC emissions from biomass burning, which is incorrect. I suggest using the RCP scenario for historical biomass burning to provide a better estimate of the net RF since preindustrial times, with caveats on the inventory accuracy.

Abstract line 16 says RFs are negative (when NMVOC) emissions are reduced, then line 19 says RF is positive (since preindustrial era). While both statements are correct in context, this is confusing. I suggest beginning the sentence on line 19 with, "NMVOC emissions have increased since the preindustrial era, so the global net present-day RF, relative to preindustrial, is ..."

The abstract attributes the lower RF and GWP values in this work compared to previous estimates to, "differences among models in ozone, methane, and sulfate sensitivities, and the climate forcings included in each estimate." This is vague, whereas section 4 clearly attributes the differences to greater NMVOC/NO<sub>x</sub> emission ratios in the current work. I suggest using the more clear section 4 claim in the abstract. It would also help to clarify if the emission inventories used in the earlier work have later been found to be erroneous, or if the inventories differ mainly because they are meant to represent different years (year 2005 in this work vs. ???? for previous work). In addition, is the model resolution in the current work higher than in previous estimates of NMVOC RF? Model resolution can alter O<sub>3</sub> production and its response to emission perturbations. In general, higher resolution tends to reduce O<sub>3</sub> production, which might be consistent with the smaller RF in this work compared to prior papers.

p3 line 22. More accurately, VOC oxidation \*begins\* with reactions with OH, as well as O<sub>3</sub> and NO<sub>3</sub> radicals. Many other reactants enable subsequent oxidation steps.

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