

Interactive comment on “North American isoprene influence on intercontinental ozone pollution” by A. M. Fiore et al.

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RESPONSES TO ANONYMOUS REFEREE #2

The specific comments from Reviewer 2 are surrounded by **. We have adopted nearly all of the suggested revisions and we believe the manuscript is now much improved thanks to this review.

The manuscript makes use of the model data in the HTAP database. This dataset is supplemented by additional model calculations investigating the effects of biogenic isoprene emissions. The paper is well written and scientifically sound. Parts of the manuscript can be hard to follow. A further split into subsection could possibly make the arguments easier to follow.

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We have thoroughly revised the manuscript and now include a separate section entitled, “PAN as a proxy for regional changes in O3 precursor emissions”, as suggested.

****Figures are rather small. Could the size be increased so that they at least fit the pagewidth?***

The figures were shrunk from our original uploaded size in the printer-friendly version of the manuscript, though the online version does show the figures at a larger size. We will check with the editorial staff to see if this can be improved in the printer-friendly version.

****The colour scales, in particular in Fig. 2, are hard to interpret as the colour blue appears both on the negative and positive end of the scale. ****

We are not clear on exactly what the reviewer is referring to here since the color scheme uses red at the high end of the scale and we do not see where blue is straddling zero. Could it be a difference of viewing on a screen versus printing, or perhaps different printers? In any case, we chose this color format (one originally developed by Ed Browell for displaying ozone lidar measurements) in order to emphasize the continental outflow plumes, and to permit some quantification of the changes over both the source and intercontinental regions.

****The title of the paper does not reflect that the paper also deals with the influence on domestic ozone pollution.****

We prefer not to emphasize the domestic influence in the title since the role of isoprene has been the subject of much study in this region, beginning in the late 1980s and the new aspect of our work is the intercontinental extent of isoprene influence.

****Section 3, page 24830, top. I guess the NOx and isoprene emissions are co-located on the 1.9 x 1.9 degree grid, but possible not on a finer grid. How might the calculated effects of isoprene emissions be affected by model resolution?***

We have tried to clarify that we are referring to the general high emissions of both

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NO_x and isoprene in the eastern United States rather than an exact spatial pattern correlation which would indeed vary with model resolution. The text now reads, “The spatial patterns of the surface O₃ response to NA isoprene and NA anthropogenic emissions correlate strongly ($r=0.71$); both of these sources are predominantly located in eastern NA and are subjected to the same meteorology which exports O₃ from the NA continental boundary layer.”

**page 24830, lines 21 - 22 But the main reason must be that PAN formation "steals" NO₂, and makes less NO₂ available for HNO₃ formation?*

Yes, revised as, “Over NA, NO_y deposition decreases when isoprene emissions increase since isoprene is a direct precursor to the peroxy acetyl radical, thus favoring PAN formation relative to nitric acid (HNO₃); the decrease in OH associated with increasing isoprene emissions in the model would also tend to decrease HNO₃ production (Horowitz et al., 1998)”

**Section 4 – In this section you discuss regional vs intercontinental, and separate effects on ozone and PAN. It would be easier for the reader if you could make the distinction between these clearer in the text. The potential for PAN as an indicator for ozone precursor emissions could be a subsection. **

We have attempted to improve the flow in this section and now include a new section, “PAN as a proxy for regional changes in O₃ precursor emissions”

**Page 24831, line 20 Should it be Fig. 3?*

Yes (though now Fig. 4). Thanks for catching this typo.

**Section 5 – Page 24834, lines 1 - 10 It could be stated even clearer that the modulation refers to the response to NA anthropogenic emissions and not the actual concentrations. **

We have eliminated this sentence in revising the paper to more clearly communicate the key message.

****Page 24834, Line 16 Should it be 40 - 100% ?****

The 10-20% refers to the change in NO_y deposition shown in the bottom panel of Figure 4 (now Figure 6). We are estimating a response to a full 0-100% range of isoprene nitrate recycling by doubling the values in response to a change from 40 to 100%, which are shown in the figure.

****Last part of section 5, from Page 24834, line 23 Am I right to say that this point must be partially illustrated also by the difference in dotted and dash dot lines in figure 3?***

Indeed, thanks for pointing this out. We have now moved the relevant discussion out of Section 4 and into Section 6 (formerly Section 5) and refer to Figures 5 (dot-dashed and dotted lines that were previously in Figure 3) here.

Interactive comment on Atmos. Chem. Phys. Discuss., 10, 24821, 2010.

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