Response to Short Comments from Meiyun Lin

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Title: Ozone-vegetation feedback through dry deposition and isoprene emissions in a global chemistry-carbon-climate model

Does your model account for the influence of soil water availability on ozone deposition? A recent paper by Lin et al. (2019) demonstrated a key role for water availability in modulating O3 deposition variability on seasonal to interannual time scales via changes in stomatal conductance, with the effects on monthly mean daytime Vd,O3 variability as large as a factor of two. Their results are highly relevant to your literature review and discussions. It would be interesting to show if the effects of ozone damage on surface ozone discussed in your article differ substantially during dry versus wet years.

Response:

Thank you for the helpful comments. In ModelE2-YIBs, soil water stress is included following Porporato et al. (2001) to affect both plant photosynthesis and stomatal conductance (Yue and Unger, 2015). As a result, drought will reduce O_3 dry deposition and increase surface [O_3]. However, the model predicts present-day climate with small interannual variability, making it difficult to compare O_3 damaging responses in dry versus wet years. A CTM model driven with observed meteorology is a better tool to examine this issue.

Nevertheless, we agree that water availability is important for O_3-vegetation feedback. In the revised paper, we added following discussion:

'Variations in meteorological parameters may also influence O_3-vegetation feedback. Plant stomata tend to close under drought stress to prevent water loss. As a result, dry climate may weaken O_3-vegetation feedback through regulation of stomatal conductance (Lin et al., 2019). The effects of drought cannot be evaluated using ModelE2-YIBs, which simulates climatology with small interannual variability. In the future, a chemical transport model (CTM) coupled with a dynamic vegetation model (such as GC-YIBs developed by Lei et al. (2020)) will be used to examine drought impacts by using observation-based meteorological forcings.'

References

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