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Title: Photochemical aging of volatile organic compounds associated with oil and natural gas extraction in the Uintah Basin, UT, during a wintertime ozone formation event
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Reply to reviewers

We thank the reviewers for their comments. Below we respond to reviewer comments and describe revisions to the manuscript.

Reviewer 2.
The study conducted by Koss et. al. on the photochemical aging of volatile organic compounds in the Uintah Basing during a high ozone event utilizes the stagnant conditions to assume mixing into or out of the Basin is not occurring. These high ozone events in the wintertime conditions in the Uintah Basin are producing levels that rival the highest summertime urban ozone levels observed in the United States. The authors utilize the stagnant conditions and their measurements of aromatics and VOCs to, in part, determine emission rates from oil and gas operations, estimate OH concentrations, and estimate the mass budget of secondary products. I recommend this paper for publication in ACP with the following minor comments/thoughts:

1. Reading through the paper left me wanting to know more about the observed levels of other compounds. A description or plot of the NOx levels would help further identify the conditions along with developing an understanding of combustion sources in the Basin. Formaldehyde and methanol were shown to have primary emission sources and interested if the NOx correlates with the diurnal formaldehyde observations. The techniques used in the paper with additional measurements might help distinguish the secondary, combustion, or non-combustion related (methanol degradation in well fluids) sources of formaldehyde.

Response: We have added a time series showing NO_x concentrations to Figure 1. There is not an obvious correlation between formaldehyde and NO_x, and we have added a line stating this at Page 6420 Line 9. More research is needed to understand the relative primary and secondary sources of formaldehyde. This discussion may be worth a separate manuscript, especially considering formaldehyde's prominent role as a radical precursor.

2. The simplicity of this technique relies on dominant reaction pathways of aromatics with OH. On page 6409, line 21, a sentence might clarify the elimination of other sinks from ozone and NO3.

Response: We have added the line, "Additionally, reaction rates of the primary species considered here (C6-C10 aromatics) with O_3 and NO_3 are at least several orders of magnitude lower than reaction rates with OH (Atkinson and Arey, 2003)," at Page 6411 Line 1.