We appreciate the time and thoughtful feedback provided by the editor. The editor's comments are shown below in black, with our detailed responses in blue.

Public justification (visible to the public if the article is accepted and published): Dear authors, I thank you for the careful revision of the manuscript. I would like to ask you to further improve it in the following points:

Line 99: CB6: Say which version of CB6 are you using. Cao et al., ACP, 21, 12687-12714, 2021 have shown that there are differences in the treatment of carbonyls.

- The mechanism used in this study was CB6r2, as implemented in F0AM v4.1. We have specified this explicitly at first mention (Line 99) and in Section 2.4.

Lines: 178-179. Because of the different importance of HO2NO2 between CB6 and the other mechanisms, It would be useful to provide further information on how HO2NO2 is treated in CB6.

- In CB6r2, HO_2NO_2 (denoted PNA) is represented explicitly, forming from HO_2 and NO_2 and removed by thermal decomposition and photolysis, in the same way as in MCMv331, SAPRC07, and RACM2. We have added this description to Section 2.4. We note that HO_2NO_2 is in fact treated comparably across all four mechanisms; the apparent difference in its importance arose from a labeling error in Figure 3 and Table S9.4, which we describe and correct in our response to the following comment.

Line 286-289: Can you write how much HO2NO2 contributes to HOx production in CB6. We can see in the HO2 losses the reaction of HO2+NO2 for CB6 but not the reverse thermal reaction or photolysis of HO2NO2. Could you provide the contribution as a comment in the text?

- In addressing this comment we identified that the HO_2NO_2 decomposition reaction had been mislabeled as PAN decomposition in the CB6 panel of Figure 3 and in Table S9.4. This was a labeling error in the harmonization of reaction categories across mechanisms and did not affect the underlying budget. The reaction the reviewer notes as missing from CB6 production, the reverse of HO_2 + NO_2, is in fact present and is the largest single contributor to HOx production in CB6. HO_2NO_2 thermal decomposition accounts for 37.8% of total HOx production, consistent with its role

in the other mechanisms (23–37%); HO_2NO_2 photolysis is negligible. We have corrected the figure, the table, and the associated discussion in Section 3.1, and have added the HO_2NO_2 contribution as a comment in the text.

Lines 13-15 : I would rephrase as follows: Our aim was to investigate the chemical processes linking hydrocarbon emissions to the formation of ozone in winter, with a focus on the role of carbonyls as ozone precursors, their primary versus secondary origins, and the impact of various hydrocarbon groups on carbonyl and ozone production across four chemical mechanisms.
Line 18: Similarly, SAPRC07 and RACM2 …

Line 61: During the summer, hydroxyl radicals …

- We have adopted the rephrasing at Lines 13–15, Line 18, and Line 61 as recommended.

Line 222: HO2 and RO2 have the radical on oxygen – please correct

- The radical notation has been corrected at Line 222 to HO_2• and RO_2•, placing the radical on the oxygen.

Lines 246-260. Could you combine the discussion? Can you provide information on the contribution of HO2+NO and RO2+NO to O3 formation? For this discussion the NO/NO2 budget would be more useful I think.

- We have combined the two paragraphs discussing the O_3 budget into a single discussion (Section 3.1). We agree that the NO→NO_2 conversion provides a more informative, process-oriented view of O_3 formation than the O_3 production budget, which is dominated by the trivial final step O + O_2 → O_3. We have added a new Table S8.5 quantifying the contributions of HO_2 + NO and RO_2 + NO to NO→NO_2 conversion for all four mechanisms. HO_2 + NO contributes 43–51% and RO_2 + NO 49–57% of the radical-driven conversion, and the total conversion tracks the simulated O_3 levels across mechanisms (lowest in RACM2, highest in CB6), consistent with the differences in total HOx production.

Lines 368-370 please break the sentence in two. Also instead of ‘the ultimate precursors’, I would rather say ‘ the key precursors’

Lines 472-475. Please break the sentence in 2 or 3 smaller sentences.

- The sentences at Lines 368–370 and Lines 472–475 have been broken into shorter sentences as suggested, and "the ultimate precursors" has been changed to "the key precursors" at Line 370.

Lines 561-563: The fact that hydrocarbon oxidation forms carbonyl which can produce ozone can be found in any chemistry book. What need to emphasize here is that you show the importance of secondary source of carbonyls and which precursor molecules are responsible for the high aldehyde levels. Some rephrasing of this last paragraph could be useful.

- The concluding paragraph has been rephrased to emphasize the principal findings of this study rather than the general mechanism of carbonyl formation. The revised paragraph now leads with the predominantly secondary origin of the carbonyls driving wintertime O_3 and identifies light alkanes as the main precursors responsible for the elevated acetaldehyde levels.