**Reviewer 1**

We thank the reviewer for insightful comments. We have addressed these comments point by point below and revised the manuscript accordingly. The reviewer comments are in blue italics, our responses are in black text, and changes made to the manuscript are in red text. Line numbers refer to the original manuscript.

We first provide some context for this research and the structure of this paper. The measurements were made at a US military base that required permission for access, which in our case, was controlled by the base fire management team. During the performance of the study, fire managers raised questions about the data. This paper addresses many of those questions, resulting in a detailed analysis of why we trust our data, how we identified the fires responsible for the smoke measured and distinguished them from burning in the surrounding region, and why we did not detect smoke from some of the fires set on the base. We view these as valid questions that are pertinent to people who practice prescribed burning with the goal to minimize adverse impacts of their burning and which can be under significant scrutiny. Despite significant past collaborations with the fire team at this location, our access to the base was ultimately ended prior to our planned completion of the study.

**General comments**

*Regarding the results discussed in the light of the international literature - most of the ref are from the US and there are a few from Australia and Africa -all related to savanna burning – which is an odd choice of references considering the study sites were "pine-dominated uplands, and hardwood-dominated bottomlands' relate more to temperate forests than savannas. There are plenty of references for temperate southern Australian forests – would be more beneficial to compare studied emission factors/ ratio/ concentrations with relevant international literature.*

Response: We have reviewed the literature and added a reference that is complementary to our analysis. We looked at studies for temperate southern Australian forests; many lacked crucial information that would allow comparisons with our results, such as no PM data (Guérette et al., 2018), missing key information necessary for PM ER calculation (Possell et al., 2015), or a focus exclusively on specific types of vegetation (Reisen et al., 2018). However, we have included a recent study on prescribed fires in the eastern US, which examines forests with vegetation similar to those in our study (Travis et al., 2023). Overall, we have included a wide range of burning locations (fuels), such as savannas, to demonstrate that the variability we observe within our data is greater than the variability in the type of material burned based on literature values.

*I found ms a bit too long with too many minor details (at least for readers outside the USA or W Georgia specific area), I would prefer to read a more condensed version, less figures (there are 10 figures!) but a more prominent story. I kept going back and forward to make sure I keep track of the story.*

Response: While we acknowledge the reviewer's comment regarding the paper's length and details, we feel the comprehensive nature of the study can address concerns and issues that fire

authorities may have about monitoring emissions and attributing impacts of their burning. Example questions are: how do you know that smoke was from a fire we set, why do you not record smoke from some of the fires we set and why is the amount of smoke recorded variable? How do you assess background levels of measured species if not making measurements immediately upwind of the fire? What is the quality of your data and how do you assess this? This paper aims to answer these types of questions and provide a detailed analysis of burning from one region and will hopefully be useful to both scientific and fire management audiences. See our general first comment above. We have modified the last paragraph of the introduction to hopefully make this point. We have tried to clarify the flow of the paper by improving section labels and in some cases added introductory lines to sections.

*L360-361 and elsewhere reduce ' respectively' – 'wind data are 75, 14, and 162 minutes for April 6 (blue shading), 7 (yellow shading) and 8 (green shading), 2021 events respectively." - and just state number and date eg '75 min for April 6 (blue shading), 14 min for 7 April (yellow shading)" etc – it is a bit frustrating to stop and re-read which respectively corresponds to which number*

Response: The indicated lines and other lines were rephrased as follows:

L360-361: For the three events discussed in Fig. 5, physical ages estimated using the wind vector averaged from observed RAWS wind data are 75 minutes, 14, and 162 minutes for April 6 (blue shading), 14 minutes for April 7 (yellow shading), and 162 minutes for April 8 (green shading), 2021 events respectively.

L361-362: For the same events and using HYSPLIT trajectories closest to the surface and passing through the identified sources, ages were estimated as 130 minutes for April 6 (blue shading), 10 minutes for April 7 (yellow shading), and 40 minutes for April 8 (green shading) respectively.

*Technical corrections*

*Please use SI units for area – ha not acres (at least provide ha in the brackets)*

Response: Units in hectares (ha) have been added in brackets throughout the manuscript.

*L108 – 'unintended wildfires' -can a wildfire be intended?*

Response: This is a good point. The word "unintended" was omitted from the sentence.

*L131-132- not sure what it means – 'used as a smoke tracer to track its movement and dispersion' -to track smoke movements or CO movement? Since its= CO. Did you mean 'used as a tracer to track smoke movement ..'?*

*Also 1 month is not really a long-lived species*

Response: The lines indicated were rephrased to better address the idea, incorporating the second reviewer's comments on those same lines.

L131-132: Carbon monoxide serves as a standard tracer for combustion sources in atmospheric chemistry studies since it is a relatively long-lived species, with a typical lifetime of ~ 1 month, emitted during incomplete combustion and used as a ~~smoke~~ tracer of ~~to track~~ smoke ~~its~~ movement and dispersion (Forrister et al., 2015; Liu et al., 2016).

*L362 – I am lost which 'respectively' you refer to "130, 10, and 40 minutes respectively" - 75,14,162?  or blue or yellow or green or all together?*

Response: As per the previous comment, this line was also changed to be as follows:

L361-362: For the same events and using HYSPLIT trajectories closest to the surface and passing through the identified sources, ages were estimated as 130 minutes for April 6 (blue shading), 10 minutes for April 7 (yellow shading), and 40 minutes for April 8 (green shading) ~~respectively~~.

*L488 – 'proscribed'- prescribed?*

Response: The typo was corrected in the manuscript.


**Other changes made in the manuscript, not directly related to any reviewer comments, are minor adjustments aimed at enhancing the clarity and structure of our sentences.**