EGUsphere, author comment AC2
https://doi.org/10.5194/egusphere-2022-345-AC2, 2022

Reply on RC2

Michael A. Storey and Owen F. Price

Author comment on "Statistical modelling of air quality impacts from individual forest fires in New South Wales, Australia" by Michael A. Storey and Owen F. Price, EGUsphere, https://doi.org/10.5194/egusphere-2022-345-AC2, 2022

Thank you to the reviewer for taking the time to read and complete a review of our manuscript and provide useful comments, we appreciate it. I have written below a response to each of the comments in the review (underlined,italics):

- **Introduction: Line 85**, I don't know if it's clear to a reader from another country that NSW is a state of Australia, I suggest presenting some information regarding it here.

We will add some extra information for clarity.

- **Introduction: Line 97**, "proximity to human populations" does not affect "PM2.5 output", as the phrase suggests. Proximity affects the population exposure, I suggest rephrasing.

We will update this to clarify our meaning

- **Introduction:** I missed a brief discussion on using random forest models. Are there previous studies using this approach? Why are these models suitable for this work? There are limitations?

We will add a few sentences about random forest modelling and its advantages, which we believe would be best placed in the methods.

- **Methods - Fire Data, Line 155-167**, The choice of buffers and thresholds seemed a bit arbitrary. Was there some sensitivity test? Any justification for choosing these values (distance of 150 km, foliage projective cover>125, buffer by 2.5 km)?

The foliage projective cover we referred to was actually a scaled score and translates to a cover fraction of 0.25. We will update the manuscript to say 0.25 instead as it makes more sense. Our study focused on forest fires. This threshold ensured only dense woodlands, open forest and closed forest was included in our study. We will update the manuscript to say this.

We can provide some further information about the 2.5 km buffer in an updated manuscript, and acknowledge that using a different buffer may have produced slightly different results.

150 km captures most of the eucalypt dominated Blue Mountains that is subject to the majority of fire activity near Sydney. We will add this detail into a revised manuscript.

- **Methods - PM2.5 Data, Line 191,** The PM2.5 definition ("particulate matter < 2.5 µm diameter as micrograms per cubic meter of air") could have been presented at the beginning of the manuscript.

We will include this information in the introduction

- **Methods - PM2.5 Data**: The authors do not mention any issues related to data validation or missing data. This happened? If so, what was the strategy to resolve this?

We will add a couple of sentences about NA values for $PM_{2.5}$ data. There were no issues with ERA5 of VIIRS hotspots data because these were downloaded in a standardized/pre-processed format. There were some accuracy issues in the fire history polygon data, which we have mention in section 2.1.

- **Methods, Line 212:** Please check the writing: "modelling to account for account for seasonal"

We agree this is unclear, but will update the sentence so the meaning is clearer.

- **Results, Figure 3 -** I didn't see the unit of measurement on the x-axis of the first graph (PM2.5). Is this ugm-3?

We will update the plot with the correct units (ugm-3)

- **Discussion,** In general, when analyzing the influence of fire conditions and weather conditions on PM2.5 dispersion, the work does not consider the role of the formation of secondary aerosols from directly emitted precursor gases throughout plume transport. Can secondary PM loading (from smoke precursors) under- or over-estimate the modeled PM2.5? Which predictor variables might have a greater relationship with this effect? It would be nice to include some discussion on this in the manuscript.

We suggest the best solution would be to add a few sentences in the methods that say that observed PM2.5 at the air quality stations could be primary or secondary, which can be influenced by sunlight, temperature, humidity etc., but our analysis did not distinguish between primary and secondary.