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Interactive comment on “Impact of 2050 climate change on North American wildfire: consequences for ozone air quality” by X. Yue et al.

Anonymous Referee #2

Received and published: 3 July 2015

The manuscript by Yue et al. examines the changes in burned area caused by forest fires in the mid-century over Alaska, Canada, and the US, using a regression-based method. Resulting effects on ozone air pollution are also investigated. For both burned area and for air quality, the effects are found to be strongest in Alaska and western Canada, but also substantial in the rest of Canada and the US.

The manuscript, which nicely builds on the authors' previous work focusing on the western US, is a very useful addition to the literature, as it is the first work to provide such future estimates using output from multiple climate models as meteorological input. It is well written, and the methodology is well described. I certainly find it suitable

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for publication in ACP, following some minor corrections that I suggest below.

GENERAL COMMENTS:

- My impression after reading the manuscript was that the authors downplayed the importance of pollution effects of fires in Alaska and western Canada. Aside from the (sparse) population in those regions that is exposed to fire-generated pollution, would more ozone not be harmful for the ecosystems of the region as well? If so, I would suggest that the authors discuss this in the Discussion and Conclusions section.

- I feel slightly uneasy with the 1981-1999 period being referred to as “present day”. I suggest that the authors explain why it is acceptable to use this term for a somewhat earlier period (which is centred at around 1990).

SPECIFIC COMMENTS:

Page 13869, Lines 1-2: Please rephrase to avoid implying that these are the only important emissions from North American wildfires.

Page 13869, Lines 14-20: These would fit better towards the end of the introduction section (though some of it is repeated anyway).

Page 13871, Line 3: Please add “in the scenario used” after “concentrations”.

Page 13874, Line 23: Is “also” needed here?

Page 13875, Lines 14-16: I do not find it entirely clear how the 44 and 132 terms arise. Perhaps this paragraph could be more explanatory in that respect.

Page 13876, Lines 15-17: Is this scaling used for the future too? That should be clarified here.

Page 13877, Line 8: “US. FCCS” - There seems to be a typo here.

Page 13878, Line 28: Please add “per unit area burned” after “consumption”.

Page 13881, Line 22: It might be better to use “yr-1” or “year-1” instead of “a-1”, as it

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is more conventional.

Page 13882, Lines 3-4: Is the 20% of emissions released above the boundary layer occurring for specific meteorological conditions, or randomly? Please specify.

Page 13882, Line 16: Please add “additionally” between “we” and “implement”.

Figure 3: Please briefly remind the reader (in the caption) where the observations come from.

Figure 4: Please add “meteorological” before “observations” in the caption.

Page 13885, Lines 2-5: I am not sure I understand – Table 2 suggests that 500 geopotential heights are used extensively in the regressions, but this sentence implies that they are not. What is the case?

Figure 5: Please add a parenthesis indicating “(midcentury/present-day)” or something similar above the bottom panel, for clarity.

Page 13886, Line 4: Yes, but please provide a reference for the “a common problem in GCMs” statement.

Page 13887, Lines 19-20: Can you explain why there is this different behaviour between western and eastern parts of the region?

Page 13889, Line 16: Maybe the authors meant to write “overestimate” here?

Page 13891, Line 8: Please change “results” to “result”.

Page 13893, Line 15: Please add “for” before “all” and “we” before “calculate”.

Page 13894, Line 10: I would suggest explicitly stating whether the expected changes mentioned are increases or decreases (the latter, I presume). Also: Is it likely that dead vegetation may temporarily imply more flammable fuel?

Page 13894, Line 22: Suggest changing “of” to “from”.

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Page 13895, Line 8: Not every reader will be familiar with what the $\Delta\text{I}\text{S}\text{3}/\Delta\text{CO}$ ratio is useful for, so please add a sentence to explain (perhaps with a reference).

Page 13895, Lines 17-20: Yes, but larger scale effects could become stronger with more PAN being formed.

Page 13895, Lines 20-22: The work of Marlier et al. (2014) suggests that at least the temporal resolution effect is minimal for ozone.

REFERENCES:

Marlier, M.E., A. Voulgarakis, D.T. Shindell, G. Faluvegi, C.L. Henry, and J.T. Randerson (2014), The role of temporal evolution in modeling atmospheric emissions from tropical fires, *Atmos. Environ.*, 89, 158-168, doi:10.1016/j.atmosenv.2014.02.039.

Interactive comment on *Atmos. Chem. Phys. Discuss.*, 15, 13867, 2015.

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