

Interactive comment on “Projections of mid-century summer air-quality for North America: effects of changes in climate and precursor emissions” by J. Kelly et al.

Anonymous Referee #3

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Overall, this is a very well written paper which should be published after considering the following comments:

- 1) Although biogenic emissions are allowed to change with the future climate, there is no discussion of how those emissions actually change between the current and future scenarios. The authors may want to consider including changes in BVOC emissions in Figure 2 or including an additional figure of a BVOC emissions map for the current decade and a delta from the future decade.
- 2) On p. 3894, lines 1-5, the authors indicate that the effects of changing CO₂ concentrations on BVOC emissions are not considered. Given that increasing atmospheric

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CO₂ concentrations have the potential to offset any increase in BVOC emissions due to increasing temperatures, the authors should include a brief discussion of how their results may change if BVOC emissions were suppressed by rising CO₂ concentrations.

- 3) Given the importance of the meteorological input for this analysis, it is important to provide some documentation of the performance of the meteorological simulations. Even something as simple as a comparison of modeled to observed temperature distributions would give the reader some confidence that the meteorological fields accurately represent observed patterns.

- 4) On p. 3899, lines 12-15, the authors mention that changes in wildfire emissions are not considered. Some mention of wildfire emissions should also be made in Section 3 (Scenarios) when the emissions inventory is discussed. The manuscript would also benefit from a brief discussion of how the results may change as a result of changes in wildfire emissions.

- 5) The figures with multiple panels would be more readable if each panel were labeled: (a), (b), (c), etc

- 6) On p. 3899, line 1, the authors comment that a reduction in ice cover (and the subsequent increase in sea salt emissions) is partially responsible for the increase in PM_{2.5} over Hudson's Bay. Beyond ice cover, what other land use/land cover categories were allowed to change between the current and future decades?

- 7) Given that this work produced such a long and extensive set of model simulations, it would be interesting to see a discussion and analysis of the inter-annual variability of the results (but this is probably better left to a follow up paper).

- 8) The paper clearly isolates individual effects such as climate change and future emissions and dedicates quite a bit of time explaining the general effects on PM_{2.5} and O₃ concentrations (e.g. changes in atmospheric reactivity), however, the paper does not make the connection between those general effects and the regional changes pre-

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sented. For example, the author notes, but does not explain why the Air Quality Index improves in Houston, Phoenix, Dallas etc (page 3902, Line 3).

9) Page 3893. Line 6. The current RCP 6 total emissions are compared.... to what? evidently to the Current Decade but this is not clearly explained.

10) In general, the introduction could be shortened.

Interactive comment on Atmos. Chem. Phys. Discuss., 12, 3875, 2012.