

## ***Interactive comment on “The FireWork v2.0 air quality forecast system with biomass burning emissions from the Canadian Forest Fire Emissions Prediction System v2.03” by Jack Chen et al.***

**Anonymous Referee #2**

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The paper presents a number of updates to the Canadian operational biomass burning (BB) emissions model and its verification for North America (NA) for 2017 fire season. Several improvements have been made to the model to improve the parameterizations of the BB emissions, fire plume rise and behavior. These updates have resulted in improvement of the simulated O<sub>3</sub> and PM<sub>2.5</sub> concentrations.

The development of new capabilities for smoke forecasting is very important. As recent years showed the wildfires in the US and Canada can cause severe air pollution episodes affecting millions of people. Accurate and timely air quality forecasting plays a

C1

critical role for stakeholders and public to mitigate the effects of the adverse air pollution from wildfires.

The paper is well organized. This study deserves to be published in GMD. My major comment is that while the verification of the ground level PM<sub>2.5</sub>, O<sub>3</sub> and NO<sub>2</sub> are important, it is uncertain how accurately the model simulates concentrations of the chemical species aloft. Smoke aerosols in the atmosphere affect radiation, thus affecting weather and climate. The authors demonstrate that the new plume rise algorithm injects fire emissions at higher altitudes compared to the previous version of the model. This change leads to the reduction of the high bias in the ground level PM<sub>2.5</sub> concentrations forecast by the older model. To verify the PM<sub>2.5</sub> concentration simulations within entire atmospheric column, it would be helpful to compare the model predicted AOD fields. Figure 10 illustrates the model's ability in capturing the wide smoke plume over NA. However, this is a qualitative comparison. I realize that a full quantitative verification of the model versus the satellite AOD is beyond scope of the paper. Therefore, I suggest comparing the model with satellite measured AOD over NA for 1-2 episodes at least, so a reader can get an idea how realistic is the forecast total aerosol burden from fires.

Page 18. If you discuss these SI figures here, then move to the main text.

Table 7. Are these daily concentrations? Specify.

I suggest merging section 4 and 5.

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Interactive comment on Geosci. Model Dev. Discuss., https://doi.org/10.5194/gmd-2019-63, 2019.

C2