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## ***Interactive comment on “Fire emission heights in the climate system – Part 2: Impact on transport, Black Carbon concentrations and radiation” by A. Veira et al.***

### **Anonymous Referee #2**

Received and published: 6 April 2015

The authors determine the sensitivity of BC concentration, loss and radiative effects to biomass burning emissions height. Their main conclusion is that, globally, after a basic emission height parameterization has been implemented, the sensitivity to emission height is a 2nd order concern after emissions magnitude and removal processes.

This is a well-thought out paper with appropriate conclusions drawn from the results. Much effort is currently being spent on emissions height observational estimates and parameterizations. It will be useful for the community to know that there are limits to the gains that can be made from more complicated emissions heights parameterizations.

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I recommend acceptance after the following are addressed.

General comments \*\*\*\*\* The authors need to clearly describe what distinction is being made between clear and all-sky model AOD for the comparisons with remote sensing retrievals in Section 4. This distinction is made for in section 5 for radiative forcing.

Please make the numerical scales the same across panels within Figures 5-8. It's important to easily compare the variability and magnitude etc between regions, but this is hard when the scales change. Please also consider making the scales the same in panels within each figure.

Specific comments \*\*\*\*\* Title: I do not think that 'Black Carbon' should be capitalized

P6696 L2: change "former studies" to "previous studies"

P6696 L5: as discussed in 4.3, the importance of emissions heights has been quantified previously. Perhaps you mean to say, the sensitivity to emission height is still uncertain and has been examined with only a few models.

P6699 L22: Omit "We identified a fraction of" at the start of this sentence.

P6706 L10: In addition to the spatial and temporal collocation, what distinction is being made between clear and all-sky model AOD? My understanding is that the AOD retrievals considered in this study will be clear-sky only. If no distinction is being made for the model, to what degree is this contributing to the discrepancies between model and each different retrieval?

P6707 L19: Omit 'considerable', change 'entail' to 'cause', omit 'subsequent'

P6707 L23: Omit 'therefore'

P6710 L4: Suggest providing possible reasons for the non-linear increase in BC burden w/ emissions, even if only speculative.

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P6713 L17: Following the general comment, for Figures 5 & 6, please use the same y-axis scale in all the time series.

P6717 L3: 'is in the following analyzed...' sounds awkward

P6720 L4: suggest replacing 'Besides two..' with 'In addition to..'

P6722 L5: When mentioning the importance of emissions fluxes, I think it's important here to re-iterate that the GFAS aerosol emissions still require a substantial (3.4) correction factor.

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Interactive comment on Atmos. Chem. Phys. Discuss., 15, 6695, 2015.

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