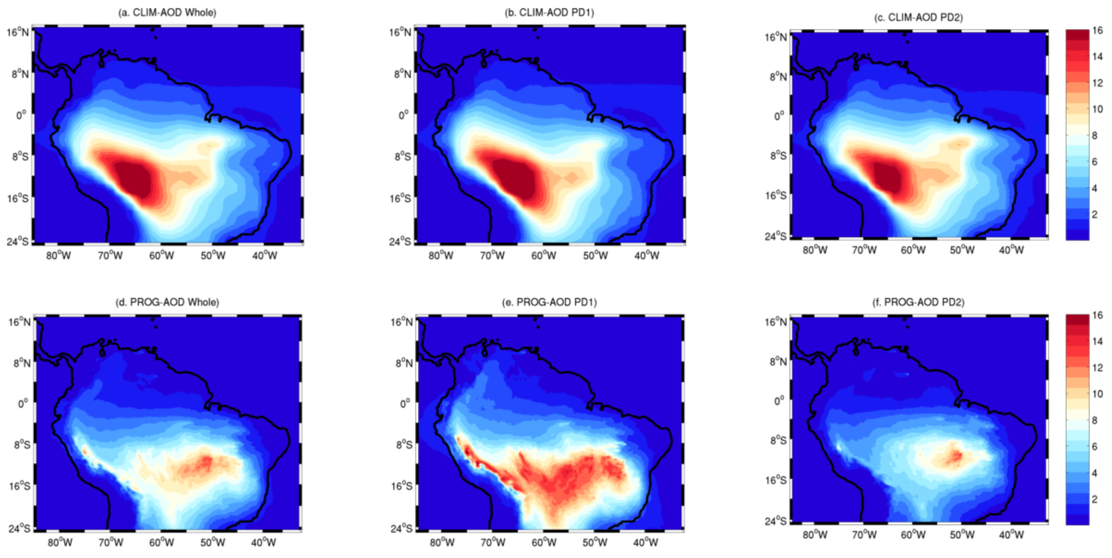
Anonymous Referee #2

We would like to thank the reviewer for taking time to review this manuscript thoroughly and for their comprehensive comments received. We have addressed all comments in turn below:

Comments: 1) I might be wrong, but I am not completely confident about the experimental setting: the PROG includes prognostic BBA while all the other aerosols are climatological. The difference with NOA (no aerosols at all) is thus not due only to BBA (I understand that BBA represent a large contribution to the AOD of the region (P18885), but there are other contributors too), hence the statement at P18890 L15 (and following analysis where the difference PROG-NOA is attributed to BBA aerosols) seems not completely correct.

We appreciate reviewer comment that the impacts contributed not only from BBA aerosols but also other aerosols. We have included statement that "*Impacts of other aerosols contributions are small in the Amazonia region during the SAMBBA period***" which can be seen in the revised Fig.2 (labelled contour values show BBA AODs). In addition, the figure below presents the ratio of BBA aod to other aerosols AOD's: other aerosols such as sea salt, sulphate, mineral dust, soot and fossil fuel contribution from models are small i.e. contribute about 6 to 16% of AODs over Amazonia.**



Modelled ratio of BBA AOD to AOD from other species (sulphate+mineral dust+sea salt+soot+fossil fuel). PD1 is period 1, PD2 is period 2, Whole is for whole period. Top row shows CLIM and lower row PROG.

2) Add significance test (e.g., masking out not significant areas) in the geographical maps (Figs. 2, 4, 5, etc.)

We have added contours of significance in Figs. 4, 5 and 6b. Since the only differences between the 3 models is their representation of aerosol, we have a clear chain of cause-and-effect from aerosol through radiation to meteorology. Values on plots are therefore informative, even where they are not statistically significant. We have therefore contoured the significant regions, instead of masking out the non-significant values. We cannot do this on Figure 2 as this is of model means states, rather than of differences. *We have calculated the significant values using the Standard Error (SE) using the following method (please note that autocorrelation has been accounted for in the time series of each pixel):*

*SE= (SD/ √N)*k*

where "SD" is the standard deviation and "N" is the number of points (i.e. how many times contribute to each pixel in the model domain). "k" is the autocorrelation correction factor. This is based on the J.R. Bence (1995).

k=[(1+p)/(1-p)]^0.5

where "p" is the autocorrelation function. "p" is calculated using the Prais-Winsten estimation (see Bence, (1995) – included in reference list) .

We have contoured the values where the SEs are greater than the absolute difference.

3) How representative is the specific period investigated compared to climatological

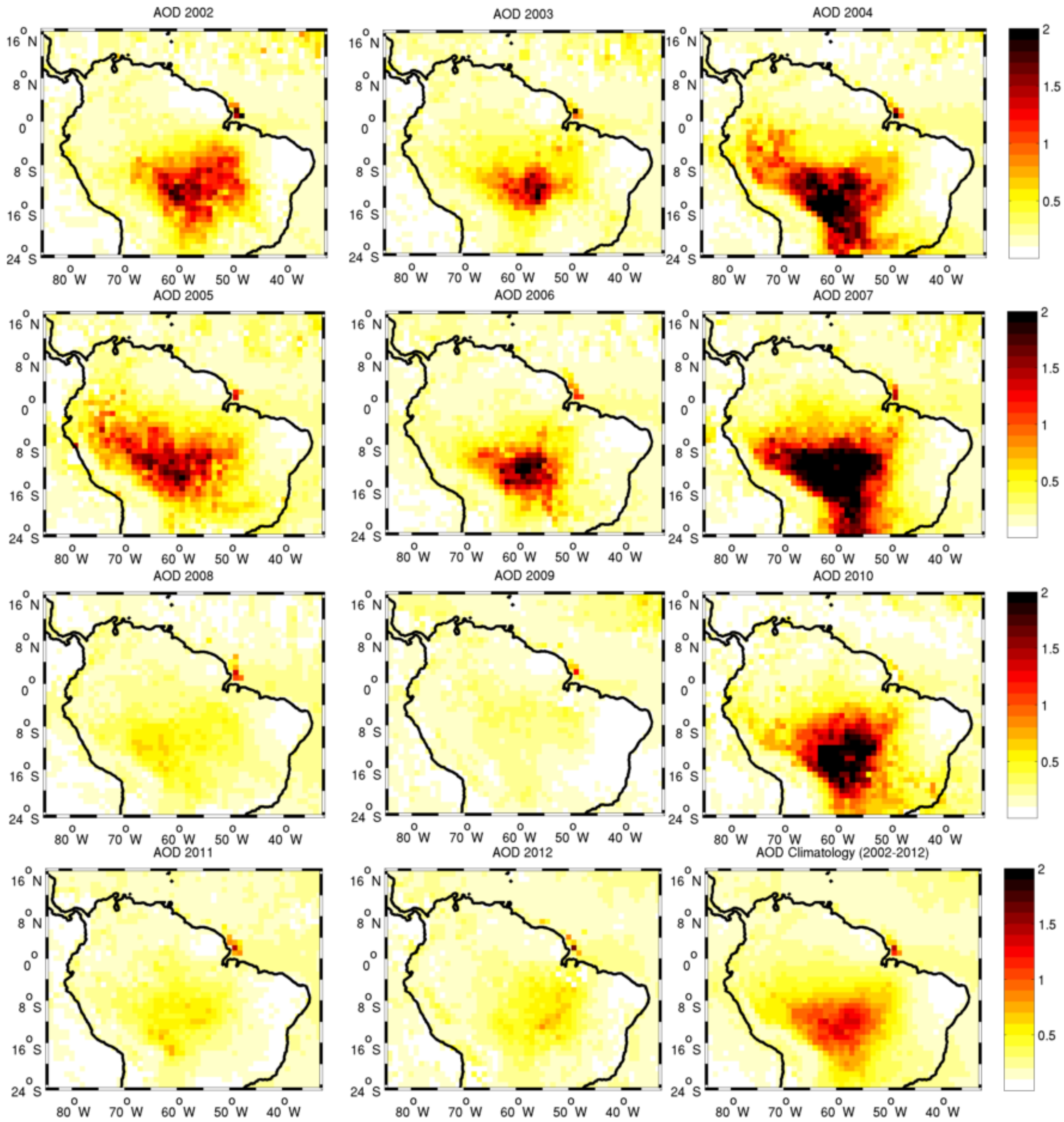
mean conditions?

Mean AODs from MODIS are presented in the figure below. All plots are for the model simulation duration (14 Sept to 03 October, towards the end of the dry season when AODs from BBA are high). The figure shows significant year-to-year variations in AODs and that 2012 is a below average year. This is now noted in the paper,

We have added

"We also expect BBA impacts to be greater in an average year, when compared with 2012, which had lower than average AOD values (i.e. approximate half the size)."

to the paper text.



4) Fig. 2: it would be helpful to plot BBA AOD as contours.

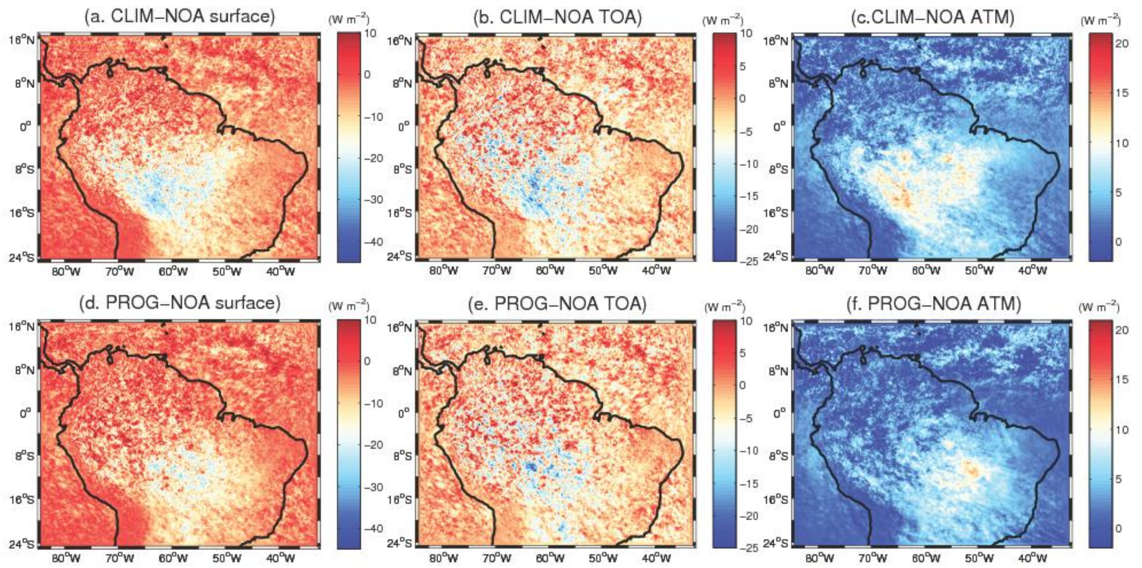
We thank to Reviewer for suggestion. We overplotted labelled BBA AOD contours in the revised manuscript (MS).

4) P18885, L11: what are the "total" emissions?

Emissions of BC from different sources such as on road mobile sources (i.e. diesel sources), biomass burning and domestic BC emissions. We have deleted the word 'total' to avoid confusion

5) P18893, L23: how do you infer that these changes are due to clouds?

The changes in 2-m temperature are consistent with changes in whole-sky radiation (below) and the differences between clear-sky and whole-sky radiation are due to clouds. In addition the changes are too unevenly distributed for it to be likely that they are from changes in advection.



Impact of (top row) CLIM and (bottom row) PROG aerosol representations on (a, d) the net surface radiation, (b, e) net TOA radiation, (c, f) net atmospheric divergence averaged over the whole SAMBBA period for the whole-sky.

6) P18899, L25: which variables are assimilated?

The global model is initialised using a continuous 6-hourly cycle of four-dimensional variational data assimilation (4D-Var) (Rawlins et al., 2007). But the LAM itself has it's own 6 hourly 3D VAR assimilation (Lorenc et al. 2000) where the u, v winds, potential temperature, density, pressure, and moisture variables are assimilated on a 6 hourly cycle. In the runs we analyse in this paper, the 2 day 00Z forecast is spun up from an assimilated start dump and then free running and is forced 3 hourly at the boundaries by the global model forecasts.

7) Fig. 6: could you explain the motivation for choosing this area?

We choose the maximum AOD loading region (Fig.2) to see the maximum impacts. Hence we took the 10-13^{o}S latitudinal average.

7) Fig. 11: mask out values around 0

We have masked out values in the revised manuscript.

8) Language improvements: P18887, L3: tropospheric P18887, L4: weakened P18887, L14: provided by P18893, L5: between 10 and 20 P18893, L7: for the whole period P18893, L11: scales of one degree

We thank to reviewer for language improvements help. We have made all suggested changes in the revised MS. Please see them in bold format.