Reply to Reviewer J. Reid

We thank the reviewer for their helpful and insightful comments. Please see responses to specific comments below.

Specific comments

1) Where does navigational error fit into things like Table 1? As shown by Hyer, in Brazil attribution between forest and field is not straightforward as the fires tend to be along the tree line.

Navigational errors are kept to a minimum in the generation of the fire-size pre-operational product in the following manner. Firstly the land use is calculated using a fine-resolution product (derived from MCD12Q1, at a 500 metre resolution), which is proportionally resampled to a 8 km x 8km grid. This represents about 4 pixels at the resolution of GOES NADIR, or 64 pixels for MODIS (used in this work). It is assumed that the land use category for that 8 km grid cell is simply the most common one within that grid cell. This grid is used for grouping the fires (all within a single grid box are grouped together), and from this we derive the fire area and size values. The fire area and size derived coefficients are estimated by simultaneous observation of FRP (from GOES and MODIS products) and Landsat imagery (that gives the Land use and land cover type by visual interpretation). In this case, we assumed that fire location by MODIS or GOES grid cell are related to the close fire cluster located in Landsat image. Also, if two or more fires are located near the MODIS or GOES detection we eliminate this from analysis to avoid errors in fire size determination.

Locational errors will still be present, as the fires could be located anywhere within a pixel (or even in a neighbouring pixel due to misregistration). But by degrading the resolution of the pre-operational product this error will be hopefully be minimized.

2) Can you please elaborate a bit more in regard to the derived optical properties on page 6070? Instead of just saying look at Fast et al. (2006) could you please say if BC is in an external, internal or coated sphere model? This may have ramifications later on for Wo comparisons.

In these experiments we used a Maxwell-Garnet mixing rule. This is already stated in section 4.3, but will be added at this point as well.

3) It is a minor (and personal point) but in regards to the discussion on page 6078 on secondary organic aerosol production and all of its

subsequent , Vakkari et al (2014) cited, but Reid et al., 1998 was the first to make this point I believe. . .8ˆ)

Will add reference to Reid 1998 at this point.

4) I am quite keen on knowing a bit more on the comparison between the model and trmm such as in Figure 3. These are week+ comparisons. Any chance we could get several 1 day comparisons also included? I just don't pick the best...;) Model representation of precipitation is a big deal in aerosol modeling and inversion.

A selection of daily averages of precipitation have been made and are to be included in the supplementary material.

5) Figure 5. Please label on the figure which is which. It is not entirely clear form the caption. Although, I wonder if there is a calibration bias between terra and aqua here even more apparent than what can be seen in Figure 6. Maybe a scatterplot is in order?

Labels have been added to this figure to make it clear which subfigure refers to what. The caption has also been modified to make the meaning clearer (see below). Note that as the Terra and Aqua satellites overpass at different times of day (with Aqua sampling approximately three hours after Terra), it is expected that they will measure different values. Figure 5 shows combined Terra and Aqua data, to compare with WRF-Chem model data extracted at the same time as the overpasses.

"Horizontal map of column AOD at 550 nm, comparing the WRF-Chem model runs agains MODIS Aqua and Terra satellites…(a and d) combined MODIS and TERRA satellite data..."

to

"Horizontal maps of column AOD at 550 nm, comparing the WRF-Chem model runs against MODIS measurements onboard the Aqua and Terra satellites. WRF-Chem data was extracted at times close to the overpass times of the Aqua and Terra satellites over South America… (a and d) combined Aqua and Terra satellite data..."

6) Figure 10. Please show the volume distributions too. You can't hide behind a log scale.

Volume plots have been made and have been included in the main paper. As expected, these highlight the discrepancy between the model and measurement in the higher size regions (around 1 μm diameter).

Hyer, E. J., and J. S. Reid (2009), Baseline uncertainties in biomass burning emission models resulting from spatial error in satellite active fire location data, Geophys. Res. Lett., 36, L05802, doi:10.1029/2008GL036767.

Reid J.S., ,P.V. Hobbs, R.J. Ferek, J.V. Martins, D.R. Blake, M.R. Dunlap, and C. Liousse (1998), Physical, chemical, and ra- diative characteristics of the smoke dominated regional hazes over Brazil, J. Geophys. Res., 103, 32,059-32,080.

Reid, J.S., E. J. Hyer, E. M. Prins, et al., (2009), Global monitoring and forecasting of biomass-burning smoke: Description and lessons from the Fire Locating and Modeling of Burning Emissions (FLAMBE) program, J of Sel. Topics in Appl. Earth Obs. And Rem. Sens, 2, 144-162.

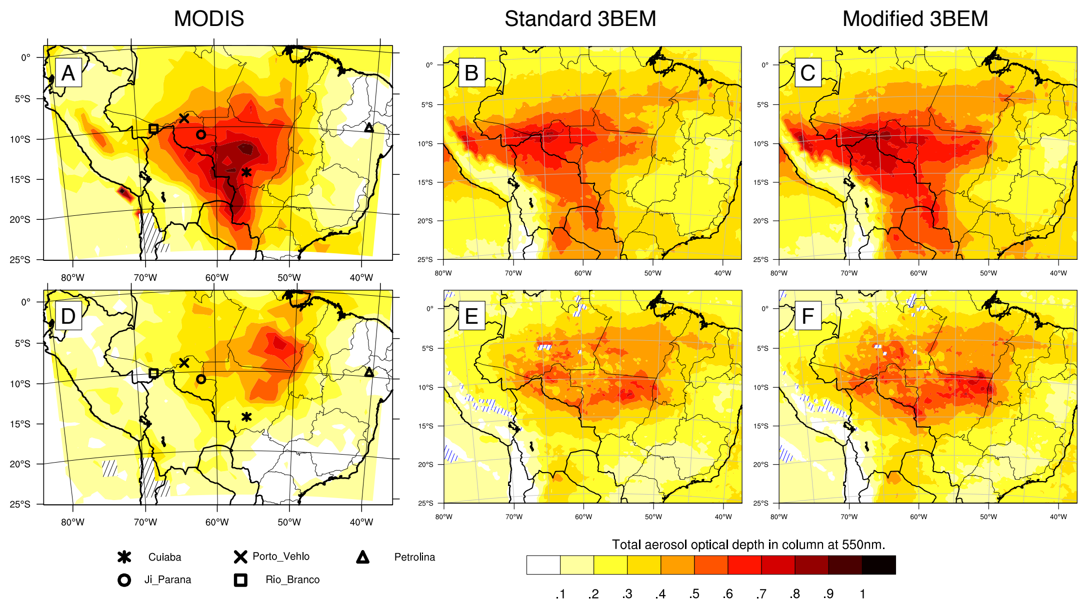

Figure 1: Horizontal maps of column AOD at 550 nm, comparing the WRF-Chem model runs against MODIS measurements onboard the Aqua and Terra satellites. WRF-Chem data was extracted at times close to the over- pass times of the Aqua and Terra satellites over South America. (a, b and c) for the first phase of the campaign (6–22 September 2012), (d, e and f) averaged over the second phase of the campaign (23–30 September). (a and d) combined Aqua and Terra satellite data, (b and e) from model runs using standard 3BEM emissions, (c and f) using modified 3BEM emissions. The symbols in panels (a and d) signify the location of AERONET sites operational during the campaign period.

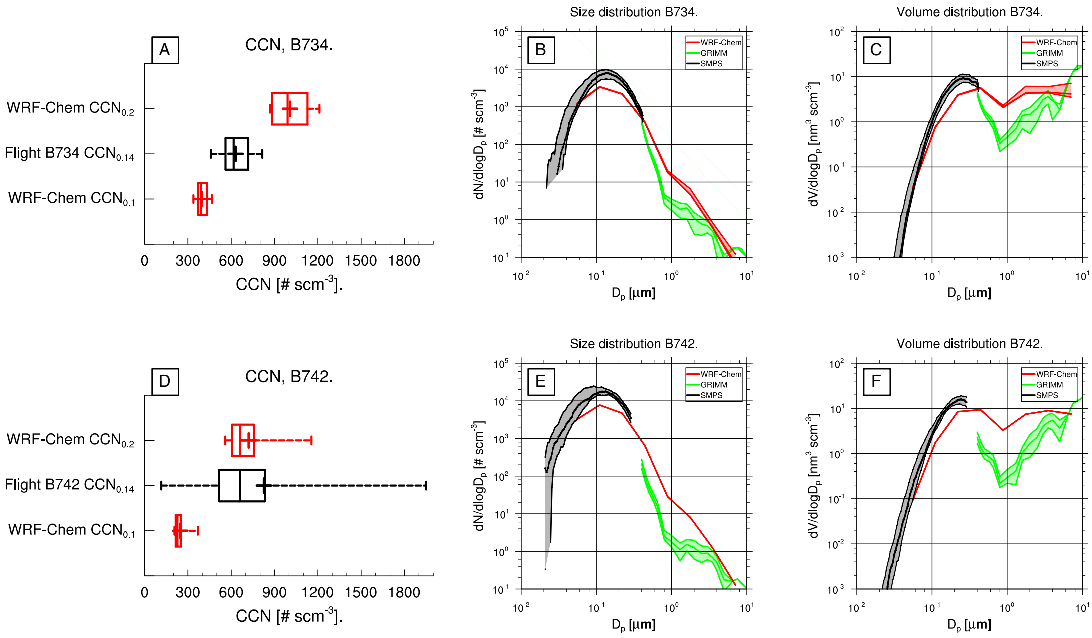

Figure 2: Plots of CCN concentration (scm-3) and size distribution dN/dlog10(Dp) (scm-3). Comparing flight data from flights B734 (a, b and c) and B742 (d, e and f) with model data from modified emissions run. Model data extracted along flight path and interpolated in vertical axis and in time. CCN plots show CCN concentration at approximately 0.14% supersaturation ($CCN_{0.14}$) from measurements, with CCN concentrations at 0.1% and 0.2% supersaturation ($CCN_{0.1}$, $CCN_{0.2}$) from model. Number and volume size distributions show date from WRF-Chem across the full the 8 MOSAIC size range in red, the SMPS instrument below 0.3 µm in black and the GRIMM instrument above 0.3 µm in green. Central lines show median and shaded regions show interquartile range.