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Geoscientific Model Development Discussions

Interactive comment on "Characterising Brazilian biomass burning emissions using WRF-Chem with MOSAIC sectional aerosol" *by* S. Archer-Nicholls et al.

Anonymous Referee #1

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General comments

The paper is very well organized and presents important results of model-observation comparison associated to a field campaign conducted in Southwest Amazon region, in Brazil, during the dry season when biomass burning aerosol are released by vegetation fires. WRF-CHEM is used with several improvements with respect to previous versions. The comparison with observations, satellite and in situ, shows limitations but is certainly promising. The authors discuss the limitations of the parameterizations used and specifically point out the dependence of model results on fire area size and plume rise produced ejection heights. I believe the paper brings important contributions to the integrated modeling of aerosol and meteorology with the use of a quite

detailed dataset obtained with research aircraft.

Specific comments

Page 6071, line 13 – correct spelling ′cerrado′

Page 6082, line 12 – here is the first time Table 5 is mentioned. However neither here nor in the Table caption there is an explanation about the column heading B731, . . .Later on the reader finds out that these are flight numbers. Please include explanation in table caption.

Page 6084, lines 20-25 – If the meteorology of ECMWF forecast is identical to the one in the MACC-II run, this means that aerosol has no feedback on meteorology in the MACC-II run?

Page 6086, lines 1-2 – here and elsewhere the authors refer to the boundary layer without actually defining it. If it is the mixed layer, then the numbers of 1.5-2 km for the height over forest are very much higher than the ones reported by Fisch et al (2004, Theor & Applied Climatology). The range here is similar to the mixed layer height over pasture.

Page 6087, line 14 – Reference to Figure 3 which shows rainfall totals. Usually rainfall is shown with shading colors where blue means high amounts of accumulated rainfall and red small values, exactly the reverse of the shading used in the figure.

Page 6088, lines 18-19 – here the authors define the top of the modelled boundary layer as the height of the inversion in the temperature profile. However, as seen in Fig. 4d, there is another inversion at $\sim$650 mb that is probably due to subsidence and is too high to be the top of the local mixed layer.

Page 6089, line 17 – with reference to Figure 6 – apparently there is an error in the figure caption, in the line just before last, should be (a,c,e,g)?

Page 6098, lines 1-10 – The authors correctly state that modeling temperature inver-

sions is very much dependent on the vertical resolution. However, imposing a PBL height into the plume rise model may be a solution if the model is run in hindcast mode where the height is known from sonde data, for example. The large variability of inversion heights in a day to day basis, and also geographically, means that imposing a value in forecast model run may be even worse than the weak inversion produced by the parent model that is used now.

Interactive comment on Geosci. Model Dev. Discuss., 7, 6061, 2014.