Atmos. Chem. Phys. Discuss., 12, C6568–C6569, 2012
www.atmos-chem-phys-discuss.net/12/C6568/2012/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Modeling South America regional smoke plume: aerosol optical depth variability and shortwave surface forcing" *by* N. E. Rosário et al.

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Received and published: 5 September 2012

This is a pretty straightforward paper on model and measurements of the 2002 biomass burning and is reasonably well laid out. The goal is an evaluation of their aerosol modeling system on its efficacy to simulate "clear sky" forcing. Really there are two parts which can be reviewed independently. The first and simpler component is a verification study on their modeled AOD versus AERONET observations. The second (and much more complex), is then comparison between modeled and measured surface fluxes.

All in all, their AOD analyzes are pretty darn good, even if there is a great deal of divergence at high AODs. But, I think they could have pushed the discussion for this

divergence much further. There is not much discussion on the smoke source function, leaving it to references. But I think it should be discussed in detail here in that it is likely what is most related to the AOD fields. In particular, I would look at satellite navigation issues, which could be the culprit. Resolution/scan issues can easily result in misdiagnosis of the source fuel. I suggest having a quick glance of Hyer and Reid which discusses these issues. Also, it is a small point, but for biomass burning it helps to compare apples to apples. I would recommend using the Norm O'Neill SDA product available on the aeronet page to compare too. It seems that the high aod events are spikes. Residual cirrus can be a big issue in the tropics (see Chew et al., 2012 in AE for a discussion). In fact, it might even explain some of the differences between aeronet and the model. If not that, you may want to also look for local sources. It is likely a more minor term, but hygroscopiciy and the impact in uncertainty is hardly discussed and probably should be.

While AOD is straight forward, flux comparisons are anything but. I understand the rational of only doing comparisons for "clear sky" In fact, with a mesoscale model in the tropics doing the cloud component would be an extremely tough gig. But, also in the tropics, defining "clear sky" is problematic. It is not clear to me how "clear sky" conditions are defined. What I think they mean is clear lien of site, as defined by aeronet. But, diffuse contributions (reflection of clouds) can be important when one is talking about relatively small departures induced from aerosol particles. This result in the RMSE's relative to signal as being somewhat large. This also makes regression style verification not the best way to go about evaluation. The cloud issue also makes such calculations of mean radiative flux impact such as in figure 10 product difficult to practically apply. Discussion on this point is warranted.

Interactive comment on Atmos. Chem. Phys. Discuss., 12, 17465, 2012.