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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Impacts of water vapor/aerosol loading trends and land cover on aerosol microphysical and radiative effects on clouds during the Amazon biomass burning season" *by* J. E. Ten Hoeve et al.

Anonymous Referee #2

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General comments:

The manuscript is well written and complements previous analyses considering the effect of biomass burning aerosol particles on warm clouds, based on MODIS data over the Amazon. In this case, the authors analyse data from MODIS products Level 2, with smaller spatial resolution (from 1 km x 1 km up to 10 km x 10 km) compared to the Level 3 products (1° x 1°) used previously (Yu et al., 2007, Koren et al., 2008). Also, a smaller area is considered, in order to minimize meteorological differences due to spatial variation. The effects of column water vapor (CWV) as well as distinct

vegetation cover (forested or deforested areas) on the aerosol-cloud interaction are also analysed.

Although this manuscript includes more years in the analysis than previous studies, why the data were restricted to years 2004 to 2007 only? MODIS data from Aqua satellite is available from 2002 up to the present.

Authors claim that the temporal variability of CWV during the burning season can also contribute to the "boomerang" shape identified by Koren et al. (2008) in the cloud fraction versus AOD plots, evidencing a meteorological effect on the previous studies. In the present study, only when CWV is high the "boomerang" shape is observed.

After minor corrections the manuscript can be accepted for publication.

Specific comments:

In Figure 2, it is not clear if instantaneous and only the pixel over AERONET site data are used. If not, please especify the time interval for AERONET averaging and the spatial resolution for MODIS averaging data for both AOD and CWV comparisons.

Figure 6: If data presented in figure 6b are from a more restricted cloud top pressure interval, why cloud optical depth of figure 6a presents higher variation (vertical scale goes from 4 to 20) compared to values in figure 6b (from 4 to 28)? Is MODIS cloud optical depth reliable enough for this kind of analysis? As explained in page 24936, lines 1-2, if cloud fields are more homogeneous in figure 6b, compared to 6a, why COD presents higher variability?

Page 24936: Reduction of COD is attributed solely by absorption of radiation by aerosol particles. Water vapour also absorbs radiation. What is the effect of different water vapour content in heating the atmosphere and consequences to the cloud field? Could not part of the responsibility attributed to aerosol absorption be due also to water vapour?

In my opinion, data in Figure 7 is too noisy to allow any conclusion about the aerosol

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effect on cloud fraction.

Are the differences observed in Table 2 for forested and deforested areas statistically significant? What are the standard deviations? Looking at frequency distributions presented in S.2, it seems that if relative distributions were considered, no significant differences would be observed.

Considering the 5° x 5° area, what could explain the stability difference between forested and deforested areas, particularly for cases in which forest areas are unstable and deforested areas are stable? According to Figure 1, deforested areas are surrounded by forested area.

Technical corrections:

Page 24942, line 20: Change NE by NS in: "In this study, a 5° NS x 5° WE region. . ."

Interactive comment on Atmos. Chem. Phys. Discuss., 10, 24919, 2010.