

Interactive comment on “Statistical properties of aerosol-cloud-precipitation interactions in South America” by T. A. Jones and S. A. Christopher

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Received and published: 8 January 2010

Response 1:

General Comments: We appreciate the reviewer's constructive criticisms of this manuscript and have taken these comments into account during the revision process. However, we disagree with the overall statistical assessment provided by the reviewer. We do agree with the example provided by the reviewer that rainfall amount is dominated by atmospheric processes and that aerosol-cloud interactions are correlated to these processes to some extent. Since this is the case, we are not necessarily looking for a PC variable that only includes aerosol-cloud interactions. For example, PC2 includes several atmospheric parameters in addition to AOT and cloud properties. Since AOT is heavily weighted in this variable, one of two conclusions can be drawn. Either,

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AOT is highly correlated with the atmospheric conditions affecting rainfall present in this variable, or that aerosols present within these atmospheric conditions are directly affecting rainfall amounts. The relative importance of one vs. the other interpretation is difficult to quantify using this method, but if aerosol concentrations were not playing at least some role, then AOT should not have a significant weighting in this (or other) PC variables related to rainfall amount. Since the other reviewers provided a more positive assessment of the manuscript, we decided to revise the manuscript according to their comments and resubmit for additional review and publication. We do want to emphasize that your comments were deeply appreciated and were kept in mind as revisions were made.

Specific Comments: The large weights for LAT and LON in some PC variables are a reflection of the relative spatial distributions of certain atmospheric, aerosol and/or cloud properties. So as you say, changing the spatial distributions would change the weighting coefficients. However, LAT and LON were included so that the spatial distribution could be taken into account as certain conditions favorable for AIE may only occur in certain regions and not others. We believe it was important to account for this as part of the PCA process. If LAT and LON are removed, other weights do change, but the physical interpretations of PC1-3 do remain very similar. Thus, we are confident in their physical significance. Multilayer clouds were removed from this analysis by only using MODIS cloud properties from the lowest cloud layer and for water-phase only clouds. This is now stated in the data section.

Interactive comment on Atmos. Chem. Phys. Discuss., 9, 21463, 2009.