Atmos. Chem. Phys. Discuss., 10, C3707–C3709, 2010
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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Impacts of absorbing biomass burning aerosol on the climate of southern Africa: a Geophysical Fluid Dynamics Laboratory GCM sensitivity study" *by* C. A. Randles and V. Ramaswamy

Anonymous Referee #3

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The manuscript discusses model simulations of direct and semi-direct aerosol effects due to carbonaceous aerosols from biomass burning emissions over southern Africa applying an atmospheric model. The atmospheric GCM used is a state of the art model; the aerosol cycle is not simulated but aerosol properties are prescribed; aerosol effects on the cloud's microphysics are neglected. A set of simulations is performed keeping the sea surface temperatures fixed and varying the assumptions about carbonaceous particle's properties. The authors analyze just the dry season and conclude 1. that carbonaceous aerosol warm the atmosphere and enhance a thermally driven

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circulation spinning up the water cycle, and 2. that purely scattering aerosol would cool the atmosphere and damp the water cycle.

I think, these conclusions are meager and similar conclusions can also be found in other publications. However, I think, there is space for more thorough analyses of the results, although the investigation has also some conceptual weaknesses.

The authors state: "Our equilibrium experiments are neither appropriate to gain insight into the actual time evolution of the 20th century climate response to bb aerosol radiative forcing nor can they predict real changes in the African climate.“ What the investigation was good for?

Model set-up:

- The treatment of the aerosol effects is pretty simple and it does not include all effects.

- The assumption of an externally mixed aerosol might result in a too high SSA.

- Coupling of a mixed-layer ocean model, easy to do, would have increased the value of the simulations.

- The scenarios attempt to bound the real world but the AOD of the experiment MOZEX is definitely too low and the absorptivity of all experiments is lower than observed during the SAFARI campaign.

- Why have the aerosol properties of the experiment HIGHHEX only been scaled at altitudes below 4 km?

- Industry and traffic emit large amounts of BC. Are these emissions included?

Further analyses:

No experiment shows any significant change in precipitation during the dry season. Roeckner et al have shown that aerosol induced changes of the soil water content affects the onset and the strength of the wet season. I suggest analyzing additionally

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the soil moisture and potential aerosol impacts throughout the whole year.

The discussion section lacks any comparison to other publications.

Typo Table2: area average 19E - 50W; isn't it 19W – 50E?

Interactive comment on Atmos. Chem. Phys. Discuss., 10, 9731, 2010.