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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Stratocumulus cloud thickening beneath layers of absorbing smoke aerosol" *by* E. M. Wilcox

Anonymous Referee #1

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Wilcox presents a study exploiting a variety of satellite instruments within the A-Train constellation to investigate the influence of aerosol absorption in situations where biomass burning absorbing smoke is advected eastwards from Southwest Africa over the stratocumulus decks above the Atlantic ocean. He finds that the cloud and aerosol layers in the situations investigated (two seasons of July-August-September) are usually well separated with the aerosol above the clouds. Radiative transfer calculations and temperature profile retrievals for clean and polluted situations consistently show a warming by the aerosol layer with a maximum at 700 hPa. Wilcox shows observational evidence in support of theories developed previously in the literature based on model simulations that this warming leads to reduced cloud top entrainment and subsequently enhanced cloud liquid water paths – a negative-forcing "semi-direct"

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Interactive Discussion
Discussion Paper

aerosol effect.

This topic fits well into ACP, the results and their interpretation are interesting and convincingly and well described and interpreted.

Wilcox' manuscript is excellently written, both in terms of language and presentation of figures. His study is an excellent example for how the synergy of different satellite instruments of the A-Train constellation can be exploited to obtain important scientific insights.

I have difficulties proposing improvements to the manuscript. Here are a few:

- p18636 l3: Capital T in A-Train
- p18644 l22: An OMI AI of 1 would be representative for a purely molecular atmosphere; less than 1 could imply aerosol scattering. Thus, a choice of OMI AI around 1 might be a better one to characterize clean situations.
- p18645 l1: partly cloudy at AIRS footprint, or overcast at the 25 km scale
- Fig. 4: It might be useful to add a histogram of SST to see which bins matter most
- Fig. 5: It might be interesting to add a plot of (zonal mean) variation of both SST and LWP with latitude to see whether the co-variation is (partly) explained by distance from the ITCZ.

Interactive comment on Atmos. Chem. Phys. Discuss., 10, 18635, 2010.