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Comment

## ***Interactive comment on “Long-term aerosol-mediated changes in cloud radiative forcing of deep clouds at the top and bottom of the atmosphere over the Southern Great Plains” by Hongru Yan et al.***

### **Anonymous Referee #3**

Received and published: 17 March 2014

This observational study quantifies the changes in deep convective clouds radiative effects that are associated with changes in surface measured aerosol concentrations at the SGP. It does so over a climatologically meaningful sample size and finds a rather large net warming effect. This finding is of potential great importance, because presently even the sign of the net effect of aerosols on cloud radiative forcing is unknown. However, the results may change after addressing my comments below. This paper should be published after the authors will address the following comments.

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Page 4601 line 5: The AIV was not "discovered" by Andrea et al. (2004), but rather proposed or hypothesized by the second author of Williams et al. (2002). Please see the third line of Section 1.3 of that paper.

Page 4601 line 13: Please reference the latest IPCC here and elsewhere in the manuscript.

Page 4601 line 18: The AIV was not observed directly in the referenced studies, but rather the microphysical effects leading to the invigoration were observed, i.e., the delay of initiation of rain to above the freezing level.

Page 4603 line 13: It is still not completely clear how the CTT is measured. Lidar cannot see cloud tops except for thin cirrus. Radar may be attenuated through heavily precipitating clouds, and may not have the sensitivity to see the tops of the thin cirrus. Was GOES used for CTT?

Page 4603 line 16: Please replace the word "ensures" with "maximizes the likelihood".

Page 4603 line 11: How is cloud optical thickness determined at nighttime to the sufficient accuracy to separate at  $COT=10$ ?

Page 4608 Eq. 2:  $CRF(SZA, CN = 0)$  is physically impossible. I suggest changing the definition, say, from 0 to  $CN_0$ , which would be the unperturbed CN value.

Page 4608 Eq. 3: Define T.

Page 4609 line 14: The differences in cloud top temperatures are not shown in Figure 4d. Please point to the right figure.

Page 4609 line 20: The differences in the daily mean TOA SW CRF for the different CN values can be affected by the time of the measurement within the diurnal cycle. The same cloud will have different CRF when occurring at different times with different solar zenith angle. This factor must be taken into account when calculating the CRF. This may change the results substantially.

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Page 4610 line 15: How is cirrus classified between SAC and other kinds of cirrus clouds that are not generated by DCC?

Page 4614 line 7: Please specify the country to which this MOST belongs.

It would be very helpful to provide the figures in color. Since it is an online publication, there is no reason to eliminate the colors.

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Interactive comment on Atmos. Chem. Phys. Discuss., 14, 4599, 2014.

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