

Interactive comment on “Estimation of Asian dust aerosol effect on cloud radiation forcing using Fu-Liou radiative model and CERES measurements” by J. Su et al.

Anonymous Referee #1

Received and published: 12 February 2008

Summary: This research using a combination of CERES shortwave and longwave flux measurements with Fu-Liou model calculations to estimate the effect of dust aerosols on total aerosol and cloud radiative effect. Prior to publication, the major concerns listed below should be addressed.

Major Concerns: Throughout the manuscript, the authors should take greater care when discussing radiative effect. Often, it is not immediately clear whether the author is referring to aerosol direct effect, cloud effect, or both combined. After a carefully reading the manuscript, I was able to figure it out, but it would greatly help future readers if you define one set of terminology and use it consistently

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throughout the paper. More significantly, I have major concerns with the interpretation of the data and results. You select 16 dust cases, each of which have somewhat different geographical locations. Have you checked whether or not the change in geography has an effect on your results, especially for region #6. Please explain whether or not geography is important. Also, please explain in more detail how dust and pristine areas within each case are selected, since the reader may not have that reference readily available. Also, do you have statistics on the relative sizes of COD vs. CLD sample size? It appears the each case includes both COD and CLD data; however, the proportion of COD to CLD data is not reported. If this interpretation is not correct, please explain this in greater detail. For the results to be considered significant, information on the relative distributions of COD and CLD needs to be reported. I agree with reviewer 2 that the overall sample size is too low, and that a time series based off a single region would provide more convincing results. In your research, is the dust aerosol direct radiative effect alone negative (cooling) at the TOA? If it is, which I believe is the case, please state this explicitly somewhere. If not, please explain why you disagree with other results showing absorption as important, but not enough to offset the aerosol cooling effect. The most significant concern I have is the meteorological conditions associated with each case are not reported, specifically humidity conditions. You attribute much of the difference between COD and CLD regions as due to aerosol indirect effects on clouds. However, you do not consider the impact of the prevailing meteorological conditions on those clouds. Generally, dust aerosols are present under dryer than normal conditions. In dry conditions, clouds are less likely to form compared to more moist conditions. Your conclusions state that dust through indirect effects reduces cloud cover thereby decreasing the total radiative effect. How do you know that the reduction in clouds is not simply a result of the dryer conditions co-located with the dust aerosols. Please explain this point further and give evidence as to why you do not consider this issue important.

Minor Comments:

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Page 2067, lines 19-28. Please provide some evidence for your statements in this paragraph. Page 206, line 5. State coarse mode size here for the reader.

Page 2070, line 8. Change "word"; to "words"; Figure text needs to be made larger.

Table 1. Add CLD vs. COD statistics in an additional column.

Interactive comment on Atmos. Chem. Phys. Discuss., 8, 2061, 2008.

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