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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Evidence of mineral dust altering cloud microphysics and precipitation" *by* Q.-L. Min et al.

Anonymous Referee #4

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Summary:

The authors present a study about the impact of dust aerosols on cloud microphysics and precipitation on the basis of different remote sensing instruments (Meteosat, MODIS, TRMM etc.). Although this is a well written manuscript there are some points, which must be investigated further, because the impact of dust aerosols on the mesoscale convective system is not that evident as the authors claim. Therefore I recommend major revision before this manuscript is suitable for publication in ACP.

Major points:

- What about the transport of the mineral dust? It is argued that there is transport of the dust to the South via air masses originating from Sahara and after that

the interaction with the mesoscale convective system occurs. However, it is not clear how this transport is represented. For corroborating the hypothesis of the aerosol-cloud interaction a transport study (using a transport model, e.g. FLEXTRA, LAGRANTO etc.) is needed. Then, also the altitude of the dust can be estimated which could be important in terms of how the dust is interacting with the cloud (as CCN or IN, respectively).

- What about the issue smoke vs. mineral dust (see short comment)? Is there a possibility to discriminate between biomass burning particles and dust particles? The authors focus very strongly on a possible modification of convective systems by mineral dust, but with a possible additional impact of smoke the picture could become less clear. Please clarify this issue.

- The authors try to rule out a possible impact of cloud dynamics on the different behaviour of the convective cells and the following stratiform precipitation. However, mesoscale convective systems are highly variable systems (multicell storms), producing new convective cells, which then are transformed into stratiform precipitation. The evolution of these systems and reorganisation can last for hours. Therefore I am sceptic that with this snapshot one can really distinguish between aerosol induced changes in precipitation and changes due to the variability in cloud dynamics. The authors should try to find a way for analyzing the time evolution of the MCS for a longer time and in more details (e.g. using Meteosat data in their full time resolution of 15 min). This could maybe corroborate the hypothesis of an aerosol induced change in precipitation; however, at the moment there is no clear evidence for this hypothesis from the available data.

- The statistical analysis is inappropriate: With a total ensemble of less than 20 events, it is not possible to draw robust conclusions - especially not, if a “normal” linear regression is used. This type of statistical analysis is highly sensitive to outliers, which can totally change the interpretation. Without new data (see point

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above) the authors should avoid such a statistical analysis and should maybe concentrate on more qualitative interpretations.

Minor points:

- Introduction: Not all model studies report an increase of precipitation, see e.g. Khain et al. (2008) for an overview.
- How good is the Aerosol Optical Depth retrieval in presence of clouds?

Technical points:

P: 18898, line 8: “stratiform” instead of “startiform”

Interactive comment on Atmos. Chem. Phys. Discuss., 8, 18893, 2008.