Review of "Assessing the mineral dust indirect effects and radiation impacts on a simulated idealized nocturnal squall line" by R. B. Seigel et al.

General Comments

The authors used the RAMS as a cloud-resolving model to investigate the individual effects of mineral dust on a simulated idealized nocturnal squall line through (1) radiation, (2) cloud microphysics, and (3) the synergistic effects between (1) and (2). Factor separation is used on four simulations. Analysis shows that dust-radiation interaction increases precipitation and enhances the squall line, while dust-cloud interaction decreases precipitation and weakens the squall line. The synergistic effect is small.

Dust is the most abundant aerosol species in the atmosphere and has significant impact on regional and global climate. I find this topic about dust impact on squall line is interesting and important, although it is in an idealized case. However, I don't understand why the authors want to separate the dust-cloud interaction from the dust-radiation interaction. This study designed experiments to exclude dust radiative effect. The dust impact on radiation and its impact on cloud are normally fully coupled. It is necessary to include both of them, unless there is specific reason to exclude it. I didn't see any technical difficulties in this study to include dust-radiation interaction. I would suggest the authors extending their analysis to dust-cloud-radiation interaction and change the title to something like "assessing the impact of mineral dust on a simulated idealized nocturnal squall line". The excluding of analysis of dust impact on radiation will significantly reduce the values of this paper, although the idealized squall line is nighttime. I think the topic is suitable for publication in ACP after including the dust-radiation interaction and addressing some specific comments below.

Specific Comments

1. This study conducts one simulation for a 7-h case without any ensemble simulations. When authors subtract the result of one simulation from that of another one, how can the statistic significance be tested? The difference between two sensitivity simulations,

sometimes, comes from the numerical noise. I would like to see the statistical significance for all the signals when draw the conclusion.

2. More description about dust properties including dust emission, size distribution, and optical properties. Aerosols are internal or external mixed?

3. The sensitivity simulation without dust-cloud interaction will affect the wet deposition as the authors mentioned. The effect should be examined. For example, are the dust concentrations significantly different between the standard simulation and the one without dust-cloud interaction?