Responses to the Comments of the Anonymous Referee #3

We very much appreciate the constructive comments and suggestions from this reviewer. Our point-by-point responses to the reviewer's comments are as follows (the reviewer's comments are marked in Italic font).

Comments:

The authors attempt to investigate the fire aerosol-cloud-precipitation interactions by conducting modeling sensitivity studies. The performance of WRF-CHEM simulations were fully evaluated, and the responses of cloud microphysics and precipitation amount to fire aerosols were carefully quantified. However, I still have some minor issues about this work prior to its publication.

1. In the discussions in sections 3.1 and 3.2, it appears that the responses of cloud microphysics properties and precipitation to fire aerosols are sensitive to convection intensity of the systems selected for case studies, but the authors didn't show what are the criteria to determine the systems are convective weak. At least, some basic description about the selected convective systems should be provided so that the readership could have some sense about the convection strength of each system.

We thank the reviewer for pointing out this. The selected cases are chosen randomly from the difference fire periods of the two study regions. We did not set any criteria initially when we chose these cases. After we analyzed all cases, 3 mm $3hr^{-1}$ was set as the threshold to distinguish weak and strong convections. We have clarified this in Lines 223-224 of the revised manuscript.

2. Related to point 1, is that possible to do statistical analysis of fire periods for weak and strong convective systems separately? Since the weak systems are more sensitive to fire aerosols, I would expect that there might be more significant differences in cloud properties or precipitation between fire aerosol case and non-fire aerosol case when looking at those weak systems.

The reviewer's suggestion is well taken. We have thus analyzed the weak against strong convections. Practically, however, it is difficult to directly use the same statistics in the case study to all the convections in different types, not mentioning the relativeness of the criterion for separating them when put all the cases together. Instead, we have performed statistics based on domain averages. Here again, the threshold of 3 mm $3hr^{-1}$ for several selected cases is hard to apply to the domain wise statistical analysis, this is because that the domain-averaged rainfall in the statistical analysis is generally weaker than the averaged rainfall in the case study.

Therefore, we choose to use 1.25 mm $3hr^{-1}$ of the domain-averaged rainfall to separate weak from strong convective systems. We find that the conclusions regarding differences of hydrometers and rainfall in the weak systems between the FF and FFBB experiments stay the same, and such differences are still not significant. We have added one paragraph in Sect. 3.3 for the statistical analysis for weak and strong convective systems during fire periods. In addition, Table S1 has been added to show average daily-rainfall of FFBB and FF for strong and weak convections during fire periods over the Sumatra region (r1) and Borneo region (r2), and Fig. S8 to indicate the mean hydrometeor differences in percentage between FFBB and FF.

3. Are the fire periods shown in Table 2 the time periods during which the fire aerosols are continuously emitted into atmosphere? I just want to make sure that the cloud systems selected for statistics of fire season are those which were indeed influenced by fire aerosols. That means the selected cloud systems for analysis concurrently occurred with fire events.

In our FFBB simulation, the fire aerosols were continuously emitted into the atmosphere. We present the time series of fire counts in the two study regions in Fig. S2.

4. Please add uncertainties of precipitation for each case in Figure 9.

We assume the figure referred by the reviewer was Fig. 10. The uncertainties have been added in Fig. 10 in the revised version of manuscript.

5. In section 3.4, the impacts of fire aerosols on local circulations like land/sea breeze are not evident. Some figures like the mean wind fields for fire aerosol and non-fire aerosol cases to show their difference would be helpful.

We thank the reviewer's comment. We have added a new figure (Fig. 11) in the revised manuscript to illustrate the sea breeze increase in FFBB during the daytime (20 LTC) and the land breeze decrease in FFBB during the night daytime (2 LTC).