Response to Referee #2

The authors provides an interesting and instructive work on the radiation effect of aerosols from biomass burning and the impacts on meteorological parameters including clouds, temperature, relative humidity, and rainfall in East China by conducting two parallel numerical simulations with the online coupled model WRF-Chem. The experiments are well designed and the presented results are generally convinced. Overall, I believe that it is a valuable study to highlight the importance of straw burning in weather modifications as well as air quality deterioration. It is worth to be published in ACP after adding more in-depth discussion of the simulated results. The specific comments are shown as follows.

Response: We would like to appreciate the referee for providing such great suggestions. We will conduct more simulations and revise this article.

As pointed out in the present work, BC was the most important factor that alters the radiation budget. However, in the ARI simulation, BC was emitted not only from crop straw burning, but also from residential combustion and transportation, especially in anthropogenic emission-intensive region like East China. It is hard to figure out the effects of straw burning through these two simulations. Thus, this work would be further improved by isolating the radiative forcing just caused by straw fires during this biomass burning case. Quantitative comparisons between radiative effects induced by agricultural fires and anthropogenic pollutants could make more sense.

Response: Accepted. Another experiment without biomass burning emissions will be conducted and discussed in detail in the revised manuscript.

Some of the detailed descriptions on the method part need to be clarified, for instance, how the estimated emissions were allocated using MODIS detections. It should be noted that detected fire spots could be caused by forest or grassland fires, rather than crop straw burning.

Response: Accepted. We will add more detailed descriptions on the method of development of the emission inventory and how the crop straw burning was identified.

Another deficiency of this paper is that while discussing the precipitation redistribution in Section 3.3, there is a lack of an in-depth analysis of how or through which processes the fire plumes influence the temperature stratification and moisture conditions. It is can be further improved by adding some diagnoses like CAPE (convective available

potential energy) or MSE (moist static energy), which may provide more direct evidence (Fan et al., 2015).

Response: Accepted. We will add diagnostic parameter MSE to further analyze the modifications in precipitation.

In addition to the main concerns above, additional minor comments are given below.

Minor comments:

1) Line 173 and 174: Define ARI and CCN when they first appeared.

Response: Accepted. The definition of the abbreviation will be added.

2) Line 214: Change Air Pollution Index (API) to Air Quality Index (AQI)

Response: Before the year of 2013, the ministry of environmental protection of China reported API data instead of AQI. Since the study period of this work is 2012, the data we can acquire was API.

3) Caption of Fig.10: the unit of cloud water mixing ratio should be "g kg-1".

Response: Accepted.

4) Line 360: the sentence "For the humidity perturbations" is better to be rephrased to "the perturbations in humidity".

Response: Accepted.