Response to Referee #2:

We first thank the helpful comments of the reviewer. We have taken reviewer's comments into consideration and revised the manuscript accordingly. All the changes have been highlighted in the revised manuscript. Our detailed responses are as follows.

Reviewer's comments for the paper (ACP-2017-464), entitled "Disentangling fast and slow responses of the East Asian summer monsoon to reflecting and absorbing aerosol forcings" by Wang et al., submitted to ACP.

Recommendation, Major revision.

General comments

By performing some time slice experiments using an AGCM and a coupled GCM, this paper investigates the fact and slow responses of East Asian summer monsoon to changes of sulphur dioxide (SO_2) and black carbon (BC) from preindustrial to present day. While the topic is an interesting one. However, results in current version of paper are not very well presented and some conclusions are lack of evidence to support them. Therefore, paper needs a major revision by addressing some major and specific comments listed below before it can be accepted for publication.

Response: We have addressed all the comments and revised the manuscript. Please see the specific description below.

Major comment

1. Some conclusions for precipitation changes over East Asia are based on areal average over a large domain including both land and ocean. The precipitation responses to different forcings show some clear contrast features over land over East Asia and adjacent ocean. For example, Fig. 7 shows that the decrease of precipitation over land over East Asia in total response to SO_4 change is dominated by the fast response while changes over adjacent ocean might be dominated by slow response. Therefore, some statements about fast response and slow response of EASM to the SO_4 change are misleading by using large areal average.

Response: Thanks for the reviewer's comment. We have improved these statements. Please see the last paragraph in page 7, the first paragraph in page 8, and line 25 – 31 in page 9 in the revised manuscript.

2. The current version of the paper lacks quantitative statements when either the fast or slow responses to different forcings are described. This aspect needs to be improved.

Response: Accepted. We have improved this aspect. Please see the revised manuscript.

3. It is worth of discussing the JJA SST responses since the paper is about EASM.

Response: Accepted. We have added the figures of JJA SST responses in the supplement material and the corresponding discussions. Please see the Figure S1,

line 21 – 23 in page 6, and line 3 – 5 in page 9 in the revised manuscript.

4. There are detailed analyses of zonal averaged temperature and zonal wind over sector 100^{o}E-140^{o}E in response to different forcings. However, the relation between these sectorial averaged changes with the regional pattern of precipitation changes is not clearly illustrated.

Response: Accepted. We have added the illustration about the relation between the changes in zonal averaged temperature and zonal wind with the regional pattern of precipitation changes. Please see the last paragraph in page 7, the first paragraph in page 8, and line 25 – 31 in page 9 in the revised manuscript.

Specific comments

1. Lines 24-25 on page 1. "Consequently, the EASM is enhanced north of 30^{o}N but slightly reduced south of 30^{o}N in the total response to BC.". This statement is very confusing. EASM is a summer climate system over East Asia. It is difficulty to follow your argument that EASM north of 30^{o}N enhances and south of 30^{o}N weakens.

Response: We have corrected this sentence in the revised manuscript.

2. In several places, it states "pressure drop at 200 hPa" or "drop in pressure at 200 hPa". This does not make sense.

Response: We have removed it in the revised manuscript.

3. Lines 25-27 on page 6. How does "the southward displacement of the EASJ will result in an anomalous anticyclone over the East Asian continent"? Need some explanations.

Response: Accepted. We have added the explanations. Please see the line 6 – 8 in page 7 in the revised manuscript.

4. Lines 27-28. It is not clear which season "there is an enhanced NH Hadley cell" since figure 3 is annual SST responses.

Response: Here is the response of Hadley cell in the summer. We have improved this statement. Please see the line 11 – 12 in page 7 in the revised manuscript.

5. Lines 5-6 on page 8. "This leads to increase in vertical ascending motion between 20^{o}N and 40^{o}N (the position of subsiding branch of the NH Hadley cell)". This is confusing. Subsiding branch of local Hadley Cell shall be in southern hemisphere in JJA.

Response: Yes, it should be the ascending branch of local Hadley Cell. We have corrected it. Please see the line 9 – 10 in page 9 in the revised manuscript.

6. Lines 4-5 on page 9. "We emphasize that the SO_4-induced slow response plays a more important role in driving the changes of the EASM." See major comment 1.

Response: This has been revised. Please see the line 16 – 18 in page 10 in the revised manuscript.

7. Lines 10-11 on page 9. "the EASM in the total response to BC is weaker and less significant, with an enhancement north of 30^{o}N (northern China), but a slightly weakening south of 30^{o}N (southern China)." . see specific comment 1.

Response: This has been revised. Please see the line 23 – 24 in page 10 in the revised manuscript.