

Interactive comment on “Disentangling fast and slow responses of the East Asian summer monsoon to reflecting and absorbing aerosol forcings” by Zhili Wang et al.

Anonymous Referee #2

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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 (SO₂) and black carbon (BC) from preindustrial to present day. While the topic is an interesting one. However, results in current version of paper is not very well presented and some conclusions are lack

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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. 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 SO₂ 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 SO₂ change are misleading by using large areal average. 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. 3. It is worth of discussing the JJA SST responses since the paper is about EASM. 1. There are detailed analyses of zonal averaged temperature and zonal wind over sector 100E-140E in response to different forcings. However, the relation between these sectorial averaged changes with the regional pattern of precipitation changes is not clearly illustrated. Specific comments 1. Lines 24-25 on page 1. “Consequently, the EASM is enhanced north of 30°N but slightly reduced south of 30°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 30N enhances and south of 30N weakens. 2. In several places, it states “pressure drop at 200 hPa” or “drop in pressure at 200 hPa”. This does not make sense. 3. Lines 25-27 on page 6. How does “the southward displacement of the EASJ will result in an anomalous anti-cyclone over the East Asian continent”? Need some explanations. 4. Lines 27-28. It is not clear which season “there is an enhanced NH Hadley cell” since figure 3 is annual SST responses. 5. Lines 5-6 on page 8. “This leads to increase in vertical ascending motion between 20°N and 40°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. 6. Lines 4-5 on page 9. “We emphasize that the SO₄-induced

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slow response plays a more important role in driving the changes of the EASM.” See major comment 1. 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°N (northern China), but a slightly weakening south of 30°N (southern China).” see specific comment 1.

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