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Atmospheric Chemistry and Physics Discussions

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 #1

Received and published: 5 July 2017

This paper elaborates the role of fast-response and slow-response in shaping the total equilibrium response of the East Asian summer monsoon (EASM) to SO4 and BC using the Community Earth System Model. This paper states the importance of ocean response to aerosol forcing in driving the changes of the EASM. I recommend for its publication after revision.

Comments: (1) Lack of clarity at a few places in the manuscript. For example: In section 2.2 add details of how an ensemble of five perturbed simulations is obtained. Explain why the averaging time of SO4 (60 yrs) is less than BC (300 yrs).

Section 3

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Discussion paper

Line 1: Do you mean changes in optical depth induced by SO4 or BC?

Lines 4-5: “The aerosol optical depth increases significantly over most of the globe except for some oceans due to the increase in anthropogenic aerosol loading". Mention the region of the oceans.

Lines 22-23: Comparison with previous studies if any.

Figure 3: It is interesting to show opposite response due to SO4 and BC aerosols on SSTs. This discussion should be elaborated.

It will also be interesting to know the simulated annual mean SST changes caused by SO4 and BC for the northern and southern hemisphere separately.

Anomalies in wind should be plotted in Figure 5a-c. It will provide information on circulation changes.

I suggest plotting tropopause anomalies in Figures 5d-f. Drop in geopotential height and tropopause has linkages with suppression on monsoon convection and weakening of the EASM.

I also suggest plotting monsoon Hadley circulations in Figure 7 and 11 along with precipitation. Discussions on subsidence/ascending motion will be helpful.

Add confidence level (95% or 99%) in figures 7 and 11 as hitch lines to show the results are significant.

I think that Figures 7 and 11, both indicate that for BC and SO4 (both) precipitation pattern for the total-response is a sum of the fast-response and the slow-response. If the magnitude of the fast-response is higher than the slow-response, then it dominates. Please verify by quantitative analysis and results should be modified accordingly.

Table-2 suggest that BC induces a weak increase in precipitation due to slow response and decrease due to fast response. While SO4 induces a decrease in precipitation due to both slow and fast response. Figure 7 and 11 suggest that total response induced

by SO4 weakens the EASM but total response by BC aerosols is "wetter-south-dryer-north". Do this wetter-south-dryer-north points to weak increase or decrease in overall precipitation? Does this study conclude that SO4 and BC both cause a decrease in overall precipitation?

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