

## ***Interactive comment on “Detecting the influence of fossil fuel and bio-fuel black carbon aerosols on near surface temperature changes” by G. S. Jones et al.***

### **Anonymous Referee #2**

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#### General comment:

This manuscript tries to detect the effect of fossil- and bio-fuel BC (fBC) on the surface temperature increase in the recent-past years. The authors show long-term variations of radiative forcing due to fBC and its effect on the surface temperature with a suite of climate model simulations, and try to formally detect the influence of fBC in the observation by using the well-established detection and attribution (D/A) method. My major concern is that the results of D/A analysis, 50 year analysis in particular, should be further explained and clarified. The figures and the explanations in the current manuscript can not sufficiently show the robust evidences that fBC have a detectable

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contribution to the temperature rise over the last 50 years.

#### Specific Comments:

Abstract (P20922 L20), “unscaled simulation” should be explained.

L20927 L8-L11, How the climatology and variability of aerosols itself calculated in HadGEM1 have been validated? Have any literatures on such validation already published?

Figure 2 can move to supplementary information because the switch of emission center of fBC from North America and Europe to Asia is evident from Figure 1.

Figure 3, It seems that the SW radiative forcing (RF) in GHG run slightly decrease during 20th century. Is this decrease in SW RF statistically significant? If so, what is the reason for that?

P20930 L13, For the increasing magnitude of SW forcing in ANTHRO run, how is the importance of carbonaceous aerosols compared to sulfate aerosols?

Figure 4, What is the cause of LW warming after volcanic eruptions apparent in LW RF in NATURAL.

P20933 L12-L14, Why does the model fail to represent the observed surface temperature variations in the late 19 century to the early 20th century? If you have any explanations for that, please describe it, because the discrepancy between the observation and model results during this period is the most significant in the whole simulation period.

P20933 L24-25, When does the strong warming occurred in the stratosphere? And the relation between this sentence and the subsequent sentence is unclear.

P20934 L29-P20935 L2, Although the emission of aerosols are largest in the northern mid latitude, why does the center of cooling exist in the northern high latitude?

P20935 L2-L3, I can't see much resemblance between the temporal evolutions of fBC

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emission in Figure 1 and temperature change due to fBC in Figure 8 (also in Figure 7). Therefore, this sentence should be rephrased or removed.

Figures 9 (also Figure 10), More explanation of how to interpret the figure is needed. For example, why you can conclude that the A+N signal is robustly detectable (P20939 L20-L21), although in the case of 1907-2006 with failing to pass the consistency test at almost the half of truncations of EOF? If an analysis failed to pass the consistency test at many truncation numbers but pass the test at a couple of truncation numbers within the degrees of freedom, can you conclude that the signal is detected robustly? If you can, the reason for that should be described.

P20939 L29, This sentence is inconsistent with the description in the previous section (P20931 L13-L15) which point out that the solar reconstruction data used in this study have too much long term variation than currently thought.

P20940 L8, It would be useful to provide concise explanation of the method to estimate SNR, not only citing the previous literature, since the values of SNRs play an important role to understand the model behavior in the following sections.

P20943 L20-L22, Is this statement valid for both periods?

P20943 L23-L26 (also P20941 L25-L27), The sensitivity of 50 year analysis to the choice of period is clearly shown by Figures 12, 13, and 14. However, the explanation why this sensitivity arises is insufficient. Whether fBC have detectable contribution or not is the focal point of this paper, therefore some more discussions about the sensitivity are appropriate. In particular, some concrete remarks on why the contribution of B can not be detected in the latter period are needed, not just suggesting aliasing errors. Is repeating 50 year analysis for the different periods, e.g. 1953-2002, useful?

Technical Comments:

Numbers at the beginning of every section but Abstract and Conclusions should be removed.

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P20923 L6, Typo: carbonaceo us → carbonaceous

P20930 L5, Typo: Fig. 6 → Fig. 3

P20931 L18-L19, This sentence should be more specific. The climate feedback factor used in the analysis is same as for "CO<sub>2</sub>".

P20934 L12, Typo: Fig. 6 → Fig. 7

Figure 8, The difference between the far right plot and the next one should be clearly explained in the caption.

P20939 L28, Is the 'natural forcings' more suitable than 'natural influence' here?

Figure 10, Green thin lines are hard to see.

P20945 L20, Is a comma here correct?

P20946 L6, A parentheses is needed for citation of Shindell and Faluvegi (2009).

P20946 L7, Typo: dispropoortante → disproportionate?

P20946 L19, The value of warming trend,  $0.47 \pm 0.31$  K/century, is abruptly appeared here. Is this value previously seen in the manuscript?

References (P20952 L28), Typo: Nozawu → Nozawa

References (P20954 L28) , Typo: Prdiction → Prediction?

References (P20955 L12) , Typo: 20033a → 2003a

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