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Atmospheric Chemistry and Physics Discussions

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 #1

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Review on Jones et al.

This was a detection and attribution (D&A) study of the climate impact of black carbon from burning fossil fuels and bio-fuels (fBC). It made use of a set of historical climate simulations, conducted with the same coupled atmosphere-ocean general circulation model (HadGEM1) but driven by different forcings, to discern possible signature of fBC in the observed change in surface temperature, and found that fBC had a detectable contribution to the warming over the second half of the 20th century, a conclusion with important policy implications. However, I think that it remains to be seen if the conclusion is robust, especially given the uncertainty in the radiative forcing of BC (see

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below), and this point should be emphasized to avoid over-interpretation of the results. The paper is very well written, and thorough in referencing the literature. Therefore, I recommend it be accepted after the following comments are addressed.

Major Comment

The radiative forcing of BC still suffers from large uncertainty, which stems mainly from the semi-direct effect (Koch and Del Genio, 2010) and indirect effects (Chen et al., 2010). The latter study even suggested that the total effect of BC could be cooling when it accounted for the indirect effects. Although by no means definitive, it highlights how poorly the BC forcing is constrained now. This would make a reliable D&A effort particularly difficult. It is important for the paper to acknowledge that.

Minor Comments

P20922 L5: Replace “the aerosol’s control” with “controlling black carbon”;

L18: Be more specific about “a number of analysis choices”. Does it imply that the conclusion may not be robust?

L20923 L14: It is important to note that the LW cooling is not the only means to offset the enhanced SW heating caused by BC. Large-scale ascent and weaker convective heating can also achieve that.

L24-25: “troposphere temperature gradients” Do you mean actually “lapse rate”? If so, the latter is used more commonly.

P20927 L24-29: How does the BC emission used in this study compare with the IPCC emission (Lamarque et al., 2010)?

P20928 L4-7: Please explain why the trends of sulfate and BC diverged after 1950’s (fuel switching?).

P20930 L5: Should be Fig. 3, instead of Fig. 6.

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L20931 L1-2: Which definition of forcing was the efficacy based on?

L20933 L14-15: Note that the lack of warming could be due to natural variation.

L20936 L9-10: Does it mean that one cannot trust the forcing estimate in Murphy et al. (2009) (L20931 L9)?

References

Koch, D., and A.D. Del Genio, 2010: Black carbon absorption effects on cloud cover: Review and synthesis. Atmos. Chem. Phys., 10, 7685-7696, doi:10.5194/acp-10-7685-2010.

Chen, W.-T., Y. H. Lee, P. J. Adams, A. Nenes, and J. H. Seinfeld (2010), Will black carbon mitigation dampen aerosol indirect forcing?, Geophys. Res. Lett., 37, L09801, doi:10.1029/2010GL042886.

Lamarque, J.-F., T. C. Bond, V. Eyring, C. Granier, A. Heil, Z. Klimont, D. Lee, C. Liousse, A. Mieville, B. Owen, M. G. Schultz, D. Shindell, S. J. Smith, E. Stehfest, J. Van Aardenne, O. R. Cooper, M. Kainuma, N. Mahowald, J. R. McConnell, V. Naik, K. Riahi, and D. P. van Vuuren, Historical (1850–2000) gridded anthropogenic and biomass burning emissions of reactive gases and aerosols: methodology and application, Atmos. Chem. Phys., 10, 7017–7039, 2010.

Interactive comment on Atmos. Chem. Phys. Discuss., 10, 20921, 2010.