Atmos. Chem. Phys. Discuss., 10, C11013–C11016, 2010
www.atmos-chem-phys-discuss.net/10/C11013/2010/

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.

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Received and published: 13 December 2010

Response to Anonymous Referee #1 Comments:

General comments

We thank the reviewer for bringing to our attention the Koch 2010 publication. We do mention in the discussion section the Chen et al. 2010 study in the context of papers that suggest a possible overall warming influence if BC and other aerosol emissions are controlled. We have added text to the end of section 3.1 to point out that some studies suggest BC forcing may be negative overall and reference the Chen 2010 and Koch 2010 papers. We have also added to the comment in the conclusions that this is

not a robust conclusive detection of fBC '...especially considering the discussed uncertainties, ...', but it is the first time fBC has been detected separately from other aerosols.

Minor comments

P20922 L5: We have replaced the text as suggested.

P20922 L18: The main analysis choice that the result is sensitive to was the choice of period. So we have re-written the sentence to reflect that. The fBC is robustly detected in the 1950-1999 period but is not detected in the 1957-2006 period. Whilst this can be interpreted to mean that the overall conclusion of detecting fBC is not strongly robust, it is the first time that fBC has been detected separately from other aerosols in any period and shows the difficulties in attempting to detect its influence. We hope that the abstract does not over-emphasize the conclusions as we state "This study suggests that there is a possible significant influence from fBC on global temperatures, but its influence is small compared to that from greenhouse gas emissions."

L20923 L14: We have added to the text that stabilisation of the atmosphere is also a contributing factor of warming at the surface.

L20923 L24-25: We prefer to use the term "troposphere temperature gradient" as it is used by the Meehl 2008 study we reference.

P20927 L24-29: We thank the reviewer for bringing to our attention the Lamarque 2010 publication. The Lamarque 2010 study was published around the same time our paper was submitted so we were unable to refer to it. The dataset is updated from Bond 2007 and includes all anthropogenic sources. We have added text given the emissions of BC for 2000 from the Lamarque 2010 study.

P20928 L4-7: We have added text to expand on the statement of similarity between fBC and SO2 up to the 1950s to say they then subsequently differ due to changes in fuel sources.

P20930 L5: This has been corrected

L20931 L1-2: It is unclear what the reviewer is referring to here. How the forcing values described in L1-2 (P20931) are calculated is defined in P20929. The efficacy for BC forcing given in lines 23-26 (P20931) are calculated with forcing estimates for BC and CO2 deduced from "double radiation calls" within the climate models. The details of the calculations can be found in the Roberts 2004 and Jones 2007 references. We amend the text to make it clear that the forcing for fBC deduced with equation (1) is the "effective" forcing (+0.25Wm-2) and that the forcing for fBC when the BC efficacy (0.62) is allowed for is an estimate of the "true" forcing (+0.40Wm-2).

L20933 L14-15: In this section we are just highlighting similarities and differences between the observed and simulated global near surface changes and not attributing observed changes. Internal natural variability undoubtedly played a role in the observed climate changes on different timescales. Other contributing factors are the forcing factors that were included in the model. Other forcings not included or insufficiently simulated may be important during different periods. Observational uncertainty is also an important issue, for instance part of the 1940-1970s trend may be due to errors in the observed datasets (Thompson 2010). We have added some text to describe in general that some of the differences and similarities between the series may be due to uncertainties in the forcings, internal climate variability and observational error.

L20936 L9-10: Our research does not question the conclusions of Murphy 2009, indeed our estimate of other anthropogenic forcings (dominated by sulfate aerosols) is consistent with their estimate of aerosol forcing. The Murphy 2009 studied 50 years of data to deduce the negative forcing from aerosols based on estimates of radiative forcing and observed ocean heat content changes. Our point in this part of the paper is that short periods (10-20 years) are too short to deduce significant conclusions about long term trends in climate parameters, which is consistent with Murphy 2009.

References

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