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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Quantifying immediate radiative forcing by black carbon and organic matter with the Specific Forcing Pulse" *by* T. C. Bond et al.

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Reviewer's original text appears in italics; our responses are in normal font.

The authors proposed a new metric, called SFP (Specific Forcing Pulse). I don't know if the naming is appropriate since the meaning can not be easily drawn intuitively as common concepts such as radiative forcing, forcing efficacy. Nevertheless, there is a value in the SFP concept, and for that reason alone this paper should be published. Ultimately, the usefulness of SFP will be determined by the science community later on.

Thank you for the positive words. As requested later in the review, we have added some

figures and discussion which we hope will communicate more of an intuitive feeling.

The authors also applied the SFP metric to black carbon (BC) and organic carbon (OC) calculated by CAM. Including an example of application is desirable, but the paper is dominated by CAM-based BC and OC SFP estimates. The authors perhaps wanted to strike the accurate BC/OC SFP estimates by first starting with CAM simulation and making some adjustments.

As Prof. Ramanathan pointed out, there are so many approximations and assumptions (some of them being implicit) in the authors' BC/OC estimates. Instead of presenting the authors' estimates as one set of estimates, the authors presented them as the most accurate ones, as the ABSTRACT indicates. I advise the authors to either re-calculate BC/OC SFP or re-write the paper to better reflect the work done.

In fact, we did not present our estimates as the most accurate ones. The abstract presented our estimates, adjusted by the median of forcing from 13 separate models. We have now put in the abstract the uncertainty generated with this model comparison, and identified the value presented there as an ensemble value.

In the original paper, 3700 words described the CAM-based result, and 5100 words discussed the comparison with and adjustment by multiple model results. This does not seem overly dominated by CAM results. We conclude that we needed to explain the use of multiple models and have added a description of the multi-model adjustment both in the introduction to the paper and in the introduction to Section 4.

In case the authors decide to re-write, I also advise them to change the paper title.

We would be willing to consider the reviewer's suggestion to change the paper title if we understood better how the title did not reflect the content. However, as we wrote in our first response to Reviewer 1, the words in the title were all chosen to reflect the content ("Quantifying" = providing best estimates and uncertainties; "BC and OM" reflects the application, and "using the SFP" covers the measure we use to reflect

immediate, regional forcing and the development required to use that measure.) We don't promote SFP for any other use, although do we hope that others might find the idea useful, so it seems unwise to emphasize SFP any more in the title.

Furthermore, I advise the authors to expand the paper to establish the SFP concept more firmly so that the readers can fully understand SFP in comparison with radiative forcing and warming potential. For example, include enough visual illustrations to help readers to understand and appreciate SFP in comparison with other forcing concepts. If the authors can sell the SFP concept through this paper, I would say they made significant contribution to science.

We have added new Figures 1 and 2 and several paragraphs of discussion to clarify the pulse concept, and the regional forcing concept.

1. Abstract was too difficult to understand. Do not use ";" too much. Spend more sentences explaining aspects of SFP, and reduce the SFP concept application example part. Make sure that the authors' BC/OC SFP estimates is simply one set of estimates. If I were to write the abstract, I would make two clearly-separated equally-weighted parts: part 1 related to the SFP concept and part 2 related to an example.

Abstract has been rewritten, and discusses SFP first and values last. As stated above, the SFP value given here incorporates all published estimates that we know of, not just one estimate.

2. As the first reviewer said, the paper was overall very difficult to understand. I had to read it multiple times to digest the overall work. To illustrate my point, see the following sentences in the paper:. . . [Reviewer refers to Section 2]. Do not think that readers will have enough patience to repeatedly read the paper until they digest the paper."

This section has been rewritten, and the terms in the equation more clearly tied to the figure and discussion.

4. Some of terms are confusing. "atmosphere forcing" in Fig. 2 should mean "TOA

forcing due to atmospheric processes." Since some people give radiative forcing estimates at TOA, in the atmosphere and at the surface separately, I advise the authors to make their terms clearer.

The figure originally numbered 2 has been re-labeled "direct forcing." That term has a history of meaning "direct interaction of aerosol in the atmosphere with solar radiation" (which is too long to put on a graph). It is foreseeable that the community will have some general terminology problems, since the term "TOA forcing" could include forcing on snow, atmospheric processes could include those in clouds, and so on. When these processes were discussed in separate papers, there was no problem, but we expect that practice to change.

Interactive comment on Atmos. Chem. Phys. Discuss., 10, 15713, 2010.