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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Black carbon emissions from biomass and fossil fuels in rural India" *by* I. H. Rehman et al.

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We thank the reviewer for their constructive comments. In our response, we have addressed all of the concerns of the reviewer and revised the paper accordingly, which has improved the clarity of the presentation. We have incorporated all of the suggested corrections, except for one issue, which is addressed in detail below. This issue concerns the relevance of our findings to the larger Indo Gangetic plains region.

Relevance to the large scale Indo-Gangetic Plains (IGP) region:

Reviewer #2 also raised this issue. This issue is outside the scope of this paper, for it involves a detailed examination of how the local measurements are related to the larger scales. But we do agree with both the reviewers that it is an important issue. We

have taken up this issue in a third paper of this series. This paper, by Praveen et al., 2011, titled "Link between local scale BC emission and large scale atmospheric solar absorption" was submitted two weeks ago to Atmos. Chem. Phys. Discuss, and is the third in series of 4 papers on the field experiment. In the Praveen et al paper, we have compared the observed surface aerosol characteristics at Surya village (SVI_1) with column averaged aerosol properties inferred by the AERONET station at Kanpur (about 100 km away) and with MODIS data for the IGP region. These correlative studies were done on diurnal, daily and seasonal time scales to document the link between local scale aerosol properties and column averaged regional aerosol optical properties and atmospheric radiative forcing. AERONET data from six stations located within the IGP region along with satellite observation were used to compare aerosol optical depth (AOD), single scattering albedo (SSA), aerosol absorption optical depth (AAOD), and absorption Angstrom exponent (AAE) between SVI_1 and IGP region. As inferred by Praveen et al (2011), the Surya village measurements yield insights to the larger scale aerosol properties, such as SSA and AODs.

We would like to point out that, as documented by several studies; biomass burning is the major source ($\sim$70%) of BC and OC emission in India (Venkataraman et al., 2005; Bond et al., 2007; Gustafsson et al., 2009). Hence, our measurements at SVI_1 village (located in the IGP region) dominated by biomass burning have significant implication in understanding the BC/OC concentrations over the larger scale.

As suggested, we have compared the OC/BC ratio from the gridded biomass burning emission data from Lamarque et al. (2011) for the grid (26-27N, 81-82E) that includes our sampling location. For the year 2005, the monthly gridded biomass burning OC/BC ratio data in Lamarque et al. (2011) ranged from 5 to 10, which is in close agreement with the ratio observed in this study.

All other issues raised by the reviewer have been addressed in the revised text and we point it out below, item by item.

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Specific comments:

P 10847 L 1: As suggested, this sentence is deleted and replaced with “It contributes significantly to global warming after long-lived greenhouse gases (Forster et al., 2007; Ramanathan and Carmichael, 2008; Jacobson, 2010)”.

P 10847 L 9: As suggested, the statement is replaced with “reduction in BC emissions has been increasingly proposed as one of the mitigation measures for limiting climate warming (Ramanathan and Carmichael, 2008; Grieshop et al., 2009; Kopp and Mauzerall, 2010)”.

P 10848 L 8: As suggested, the statement is replaced with “and presents an opportunity to reduce warming on short-time scale (Grieshop et al., 2009)”.

P 10850 L 10: As suggested, local map is included.

P 10852 L 10: As suggested, location of Kanpur is included in Fig. 1.

P 10852 L 20: A local map showing Surya village (SVI_1) is included in Fig. 1. The distance between indoor and outdoor measurements points is mentioned in the paper (Please see P 8 L 10-11 in Revised Manuscript). However we have not shown the indoor and outdoor measurements points on the local map because of the IRB (Internal Review Board) concern of identification of subjects.

P 10855 L1: As suggested ‘Outdoor (normal)’ data is included in Fig. 4.

P 10856: Again, this issue is discussed in detail in Praveen et al. (2011) by looking the vertical aerosol extinction profile from CALIPSO satellite.

Interactive comment on Atmos. Chem. Phys. Discuss., 11, 10845, 2011.

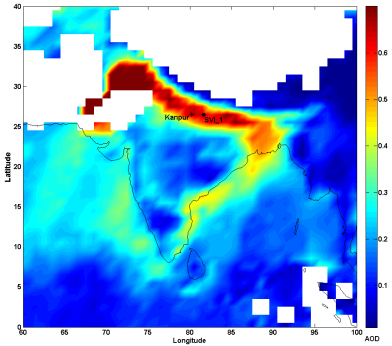

Figure 1

Fig. 1.

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