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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.

Anonymous Referee #2

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This is a well written manuscript, and provides black carbon emission measurements from biomass and fossil fuels in the rural sector of the Indo-Gangetic Plain (IGP). While the results presented might have broad implications for both climate change and health effects, I feel the authors have over-stretched their findings to give a more biased view to the readers about the major sources of air pollution in the IGP region. Below, please find my more specific comments:

1) My first major concern is similar to Reviewer 1's comment "How representative is the Surya village for the IGP?". A quick literature survey shows that IGP consists of four subregions: the Trans-Gangetic Plains (TGP: Punjab and Haryana), the Gangetic Plains of Uttar Pradesh (UP), Bihar, and West Bengal. There is significant variation in the lifestyles of people in the different sectors of IGP. For instance, approx 84% of farm

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households in the TGP and UP regions of IGP use tractors for crop production, while in Bihar and West Bengal draft animals are preferred. Did the authors miss out on factoring in the contributions from tractor emissions in their report? At the least, they should have mentioned it as a possible major player in rural outdoor emissions. Dung cakes are the most preferred form of cooking in the rural regions of IGP, while this paper extrapolates their cook stove emission findings to represent the household emissions from the entire IGP. A discussion on potential emission from dung cakes in the IGP region, especially in the context of their role played in climate and epidemiological impacts is needed. Additionally, I suggest the authors to limit the scope of their findings to only a portion of IGP (and not the whole of IGP).

2) In Fig. 4, can the authors explain the possible sources giving rise to a BC peak in the Indoor (altered) plot between 6am and 9am? Were there any significant vehicular emissions during that time period (e.g. tractors, interference from the nearby highways etc.)?

3) In this study, did the authors investigate the possibility of emissions from incense, rituals and religious practices - which are routinely conducted early mornings and evenings in Indian households - interfering with the cook stove measurements?

4) The authors definition of Brown Carbon (BrC) in the manuscript is incomplete. On page 10858, the authors define BrC as "organic carbon which absorb solar radiation." This sentence should be corrected as "organic carbon which strongly absorb in the near-UV region of the solar spectrum". Further, the authors mention that BrC absorption increases as approx (lambda)ˆ-2. This is incorrect. The Angstrom Absorption Exponent of BrC goes with approx. (lambda)ˆ-5. It could be that when pure BrC is mixed with BC, one gets a (lambda)ˆ-2 expression. These clarifications should be mentioned in the manuscript.

References: 1) Erenstein, O. et al.(2007):Crop-Livestock Interactions and Livelihoods in the Indo-Gangetic Plains: A regional synthesis. 2) J.J. Jetter et al. (2002): Charac-

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