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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 #1

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The paper investigates black carbon emissions from biomass and fossil fuels in India. Field measurements taken inside rural households, ambient air and vehicle emissions are used to estimate impacts of biomass and fossil fuels on BC and OC loads and solar absorption. The study finds that emissions peak twice a day during morning and evening cooking hours and that BC emissions estimated from satellite retrievals might underestimate emissions due to the diurnal cycle.

This is a nice study and I have only some minor comments and suggestions:

The paper shows the diurnal cycles of indoor and outdoor BC concentrations. In regard to climate relevance it would be interesting to understand how important these local emission characteristics are for the larger scale, e.g. a GCM grid box of 1 x 1 degree resolution. In the detailed comments further below I ask to include a local map

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to better understand the spatial scale of the observations. However it would be very interesting to connect the discussed times series with surrounding AeroNet observations. This is somehow included in Fig.2, but here only the general statement is made how representative Surya village is for the Indo-Gangetic Plain region. It would be interesting at the end of the paper to revisit the AeroNet comparison, eventually including more stations and to compare the daily cycles with the datasets. Yes, AeroNet sees all aerosols and BC is not necessarily contributing much to extinction, but if absorption could be used from AeroNet that could give a hint. My general question is, how important are the near emission source characteristics to the evolvement of BC/OC concentrations after mixing and transport on the regional scale?

Current climate models use the CMIP5 (Lamarque et al 2010) dataset, in comparison to your observations, how would you comment on the bio-fuel and fossil-fuel BC/OC data for the IGP region in there?

P 10847 L 1: The statement that BC is estimated to contribute 25% to 50% of CO2 warming only cites the most extreme BC studies. A much lesser number is assumed by most other BC modeling studies.

P 10847 L 9: The statement that BC can be effective for short term reduction in global warming is not a matter of fact, but controversially discussed currently in the literature, especially when including aerosol-cloud interactions. Please discuss a broader view of the literature.

P 10848 L: 8: Again, it is stated that BC emission reductions would lead to less global warming. Due to the diverse nature of aerosol climate interactions and large uncertainties, this is not a fact that can simply be stated. The paper also doesn't investigate the question 'how does BC influence climate' therefore if you make statements like that please put them as citations, and please cite more diverse studies on this topic.

P 10850 L:10 A local map may be informative.

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P10852 L10: You could include the location of Kanpur in Fig.1

P10852 L20: Again (same comment as above), it would help to have a local map indicating the measurement location, in order to better understand the distances between indoor and outdoor measurement points.

P 10855 L1: Can you include as well the data for 'Outdoor(normal)' in Fig.4?

P 10856: Are there any large scale influences of BC concentrations? Local sources versus transport, biomass burning etc.

Reference: 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, 2010: Historical (1850-2000) gridded anthropogenic and biomass burning emissions of reactive gases and aerosols: Methodology and application. Atmos. Chem. Phys., 10, 7017-7039, doi:10.5194/acp-10-7017-2010.

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