

## ***Interactive comment on “Link between local scale BC emissions and large scale atmospheric solar absorption” by P. S. Praveen et al.***

**P. S. Praveen et al.**

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We thank the reviewer for very attentive comments. We have included all of the suggested corrections in revised manuscript. Also, the manuscript is edited extensively for English issues and the necessary corrections have been incorporated. Answers to specific comments are given below.

Based on Reviewer #2 recommendation, “Title” has been modified to “Link between local scale BC emissions in the Indo-Gangetic Plains and large scale atmospheric solar absorption”

p.21320 l.16: As suggested, SSA is defined.

As suggested, appendix is added with a list of abbreviations and acronyms.

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p.21320 I.19: Sentence has been modified to “The statistically significant correlation suggested that in-situ observations can be used to derive spatial mean forcing, at least for the dry season.”

p.21320 I.21: As suggested, “leading to” is replaced by “supporting”.

p.21320 I.24: As suggested, “human” is added before “health”.

p.21321 I.3: As suggested, sentence has been modified to “comprised mainly of black carbon and the condensed fraction of semi-volatile organics”

p.21321 I.13: As suggested, sentence has been modified to “BC significantly impacts global climate as well as regional climate by perturbing the monsoon circulation and contributing to the retreat of mountain glaciers”

p.21321 I.17: As suggested, “more than 100 years” is replaced by “decades to centuries”

p.21321 I.18: As suggested, “the impacts of” has removed.

p.21322 I.10: As suggested, “layer” has removed.

p.21323 I.5: As suggested, sentence is modified to “The Surya village (referred to as SVI\_1 from hereafter) was nearly 3 km from a national highway, approximately 2 km from a state highway.”

p.21323 I.11: As suggested, sentence is modified to “Vehicular and industrial emissions were the fossil fuel related pollution sources in the region”

p.21324 I.13: As suggested, “understand” is replaced by “infer the”

p.21325 I.20: As suggested, sentence has been modified to “A wide range of values has been reported for specific absorption cross section”

p.21328 I.15: “coastal” typo mistake has been corrected.

p.21329 I.10-14: These sentences have been modified to “Biomass burning, because

of its combustion condition, emits significant fraction of volatile organics. Therefore freshly emitted BC particles, which have fractal-like structure, are covered by thin layer of non-absorbing condensed volatile organic. The layer of non-absorbing coating (such as organics) on BC aerosol is known to enhance its absorption characteristics. However in the winter months, we found significant increase in the aerosol scattering coefficient values, even though the winter months are expected to have relatively more burning of biomass (mainly wood for relieve from cold weather). The possible explanation could be the increase in the RH values during the winter months. With increase in the RH values, the radius or the size of the BC particles will grow because of water uptake and collapse of the fractal-like shape to more spherical shape due to surface tension of water. The relatively larger BC particle with thick coating of water vapor will scatter more light (Pereira et al., 2011) that will offset the enhance absorption due to condensed volatile organics.”

p.21332 l.7: As suggested, “propagation” is replaced by “transport”.

p.21334 l.21: As suggested, “symmetrically” is replaced by “homogeneously”.

p.21336 l.7: As suggested, Lawrence and Lelieveld, 2010 reference is added.

p.21336 l.18: As suggested, “proven” is replaced by “shown”

p.21337 l.2-3: As suggested, the sentence “Most of the earlier BC studies in the region dealt with the urban environment and did not accurately represent the rural emission scenario” is removed.

p.21337 l.8: The sentence “suggesting that rural emissions play as significant a role as urban emissions in regional climate” is removed.

p.21337 l.10-11: As suggested, sentence is modified to “This agrees with Rehman et al. (2011) results from aerosol absorption properties and EC/OC fraction.”.

Pereira, S. N., Wagner, F., and Silva, A. M.: Seven years of measurements of aerosol scattering properties, near the surface, in the southwestern Iberia Peninsula, *Atmos.*

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Appendix: List of abbreviations and acronyms.

Abbreviations /Acronyms	Meaning
AAE	Absorption angstrom exponent
AAEc	Angstrom exponent of absorption aerosol optical depth
AAOD	Absorption aerosol optical depth
ABCs	Atmospheric brown clouds
AE	Angstrom exponent of the aerosol optical depth
AE42	Aethalometer model AE42
AE31	Aethalometer model AE31
AE51	MicroAeth model AE51
AERONET	Aerosol robotic network
AOD	Aerosol optical depth
BC	Black carbon
BC_CBM	Cell phone based BC monitoring system
CALIPSO	Cloud-Aerosol Lidar and Infrared Pathfinder Satellite Observation
CALIOP	Cloud-Aerosol Lidar with Orthogonal Polarization
CO <sub>2</sub>	Carbon dioxide
EC	Elemental carbon
IGP	Indo-Gangetic Plains
INDOEX	Indian Ocean Experiment
LIDAR	Light Detection And Ranging
MACR	Monte Carlo Aerosol Cloud Radiation
MODIS	Moderate-resolution Imaging Spectroradiometer
NASA	National Aeronautics and Space Administration
NEV	North-East corner of the Surya village
OC	Organic carbon
RH	Relative humidity
SSA	Single scattering albedo
SVI_1	Surya village
TOA	Top-of-the-atmosphere
UV	Ultraviolet
VC	Center of the Surya village
$\sigma$	Absorption coefficient
$\lambda$	Wavelength

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Fig. 1.