

Atmos. Chem. Phys. Discuss., referee comment RC1  
<https://doi.org/10.5194/acp-2022-555-RC1>, 2022  
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## **Comment on acp-2022-555**

Anonymous Referee #1

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Referee comment on "Satellite (GOSAT-2 CAI-2) retrieval and surface (ARFINET) observations of aerosol black carbon over India" by Mukunda M. Gogoi et al., Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2022-555-RC1>, 2022

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Reviewers' comments:

The authors use extensive measurements to retrieve BC mass concentrations and compare them with satellite-retrieved BC mass concentrations. This paper contributes to better understanding of spatial and temporal distributions of BC concentrations over the Indian regions. I believe the paper should be considered for publication only after addressing the concerned expressed below.

Major Issues:

1.

At first, it is difficult to read this paper because of unclear and unappropriated sentences.

For readers to understand clearly, many sentences need to be polished with clear and concise structure including appropriate English.

2.

Secondly, this paper mostly describes how much satellite and ground-based measurement agree or not. The authors need more descriptions about why they are different and what science is behind it. For example, you may investigate less consistency between satellite-retrieved and ground-based BC concentrations in JJA compared to DJF and MAM due to the cloud contamination or a deficit of data availability during monsoon.

Minor Issues and specific comments:

Page1 L11: Is the acronym of ARFINET correctly located and explained?

Aerosol Radiation Forcing over India NETWORK (ARFINET)

P1 L12: revealed -> reveals

P1 L17: that of other in-situ -> those of other in-situ

P1 L18: satellite retrieval shows -> satellite retrievals show

P1 L33: However, the very challenging task is to accurately retrieve

-> However, it is challenging is to accurately retrieve

P2 L42: have not addressed so far -> have not been addressed so far

P2 L50: 10-sepctral bands -> 10-spectral bands

P2 L50-51: use full word and abbreviation of UV, VIS, and NIR

P2 L59: to develop periodic and accurate estimates of aerosol radiative forcing over India and assess their impacts on regional and global climate, taking into account their heterogeneous properties in space, time and spectral domains

->

to develop periodic and accurate estimates of aerosol radiative forcing over India, assess their impacts on regional and global climate, and take into account their heterogeneous properties in space, time and spectral domains

P2 L71: remove etc.

P3 L95: the surface albedo is derived by performing a correction removing the influence of atmospheric 95 molecular scattering (Rayleigh scattering) ->

the surface albedo is derived by removing the influence of atmospheric 95 molecular scattering (Rayleigh scattering)

P3 L98: single scattering and multiple scattering -> single- and multiple-scattering

P3 L101: inversion algorithm developed by Hashimoto and Nakajima (2017) is used.

-> inversion algorithm (Hashimoto and Nakajima, 2017) is used.

P3 L108: This sentence should be clearly stated.

aerosol light absorption (or single scattering albedo - SSA) -> aerosol light scattering (or single scattering albedo - SSA)

If you want to describe aerosol light absorption, you can use co-albedo or 1-SSA instead of SSA.

P4 L131: Does "several sensitivity studies" means studies you performed? If not, add references.

P4 L148: Detail about the aethalometer uncertainty and correction of raw-data is available in Gogoi et al., (2017). The overall uncertainty in BC mass measured by the Aethalometer is estimated at about 10%.

-> The overall uncertainty in BC mass measured by the aethalometer is estimated at about 10% and more details are available in Gogoi et al., (2017).

P5 L161:  $MAE = 10 \text{ m}^2\text{g}^{-1}$  is used. ->  $MAE = 10 \text{ m}^2\text{g}^{-1}$  is assumed (add references).

P5 L167:

You mentioned, "As the ambient BC in the atmosphere is mostly aged in nature"

It is a vague sentence for the reason of "a value of MAE =  $10 \text{ m}^2\text{g}^{-1}$  is used" since BC is not aged in nature if it is just released from biomass burning.

P5 L175: winter, pre-monsoon, and monsoon respectively. -> winter, pre-monsoon, and monsoon, respectively.

P5 L177:

You should add one more figure or add text into Fig. 1 to indicate each region like HIM, IGP, NEI, NWI and so on. Although it is written in the supplement, this straightforward figure would help readers to understand your figure better.

P5 L195-197:

You mentioned satellite retrievals and surface observations of BC are more consistent in DJF and MAM than JJA. Is less consistency in JJA caused by cloud contamination during monsoon? Or how many data used for this analysis for each season? Are the number of data used during monsoon fewer compared to other seasons?

P6 L204:

better associations -> better agreement

P6 L205:

the association between the two data sets -> the correlation between the two data sets

P6 L205:

Thus, despite satellite retrievals during winter and pre-monsoon months showing the regional hotspots of BC over India fairly well, there appears to be a lack of consistent associations between the two datasets in winter at some of the ARFINET observational sites.

->

Thus, satellite retrievals and surface observations show good agreement at the regional hotspots of BC over India during winter and pre-monsoon months. However, there are a lack of consistency between the two datasets in winter.

P6 L208: The above observations point to

-> The discrepancies between satellite retrievals and ground-based observations can be

attributed to

P6 L215: Do not use "Despite this" and use specific words

P6 L215: the satellite retrievals differ from surface measured BC -> the satellite-retrieved BC differ from surface-measured BC

P6 L228:

we will now examine simultaneous day-to-day values -> we examine simultaneous day-to-day concentrations

P6 L223-L225:

This sentence needs to be polished.

P7 L239: play important role -> play an important role

P7 L242: Add references of ERA5

P7 L246:

in all three periods of DJF, MAM and JJA -> during all periods

P7 L249:

It has also been observed that absolute differences between the two data sets ->

Absolute differences between the two data sets

P7 L249: peninsular Indian locations -> PI

P7 L251: It is further evident from the figure -> It is further evident from Fig. 6

P7 L259:

Provide the reason of the sentence "Especially, the association between the two data sets significantly improves in JJA."

P7 L261: add references

P7 L267: show -> shows

P7 L276: more wet soils -> wetter soils

P8 L288: The forgone observation -> The prior observation

P8 L298: Based on in-situ vertical profiling of aerosol scattering and absorption properties on a research aircraft, Babu et al., (2016) have reported the values of SSA between 0.86 and 0.94 over different West Indian and IGP locations during the pre-monsoon (April-May) period.

->

Babu et al., (2016) have reported the values of SSA between 0.86 and 0.94 over different West Indian and IGP locations during the pre-monsoon (April-May) period using aircraft measurements.

P8 L305:

Over the oceanic regions, the values of SSA are, in general, high

-> Over the oceanic regions, the values of SSA are generally high

P8 L310-311: Mar -> Mar.

Jun -> Jun.

You may use abbreviations of the months consistently: decide full name or abbreviations of the months.

P8 L315:

duringMar/Apr/May -> during March to May

P9 L319: Figs. 8, 9 and 10 -> Figs. 8, 9 and 10, respectively

P9 L322: day time FRP -> day-time FRP

P9 L343: add references after "Several studies"

P9 L345: evaluate and validate -> evaluate

P9 L349: remove unnecessary sentence (The main findings are as follows:)

P9 L351: do not use "fairly". It sounds informal.

P9 L354:

for > 60% of the observations (for all the locations considered in this study) the absolute difference between the two data sets is <  $2 \mu\text{g m}^{-3}$ .

->

the absolute difference between the two data sets is less than  $2 \mu\text{g m}^{-3}$  for over 60% of the locations in this study.

P10 L365:

during times of biomass burning -> during the biomass burning season

P22 L654:

Need more description about the plot (e.g., upper, center, and bottom panels indicate what) in the caption

P24-26:

Need more description about the plot (e.g., upper, center, and bottom panels indicate what) in the caption