

***Interactive comment on* “Solar radiometer sensing of multi-year aerosol features over a tropical urban station: Direct Sun and inversion products” by Katta Vijayakumar et al.**

Katta Vijayakumar et al.

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Authors’ replies to Referee 1 comments on the manuscript titled “Solar radiometer sensing of multi-year aerosol features over a tropical urban station: Direct Sun and inversion products by Katta Vijayakumar et al.”

1. The use of some verbal forms are not appropriate. Proper spaces is missing in the manuscript. A comprehensive revision of English Language throughout is needed to ensure the quality of manuscript.

The authors are very grateful to the Referee for valuable comments and suggestions

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which aided to improve the quality of the original manuscript. The corrections in the revised manuscript have been indicated in BLUE color.

2. Line No 77, Pune is the ninth largest. . . . As per recent data, it is 8th largest municipal corporation. Please provide the reference.

Reply: Revised as suggested.

3. Line No 81, as per 2016 census. The last census was conducted in 2011. Please provide the reference.

Reply: Revised as suggested.

4. Line No 82, the sentence “The City is situated centrally between.air”. The meaning of this sentence is not clear. Remove this sentence or provide the reference.

Reply: Revised as suggested.

5. Line No 109, insert “for” after daily data.

Reply: Revised as suggested.

6. Line No 110, the word “plotted” to be deleted.

Reply: Revised as suggested.

7. Line No 163-164 to be rewrite for the improvement of the sentence.

Reply: Revised as suggested.

8. Line No 178 remove “a” before 1:30 PM.

Reply: Revised as suggested.

9. Line No 184, to be write as AOD at 550 nm and water vapour observation used.

Reply: Revised as suggested.

10. Line No 223, Add more references like Kaskaoutis et al., 2009; Pathak et al., 2012;

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Verma et al., 2015 etc. . .

Reply: Revised as suggested. New references have been included in the revised manuscript.

11. Line No 260, This Criteria is based upon fine mode fraction (FMF). It could not be modified due to fractional value. Therefore, this aerosol classification to be done on the basis of Lee et al., 2010.

Reply: Revised as suggested. The aerosol classification has been re-done, following the work reported by Lee et al., 2010. The earlier reported diagram has been replaced with the revised diagram.

12. Line 274, the aerosol type graph should be scatter plot to show the complete range of different AOD, AE, FMF and SSA for different aerosols. Please redraw these graphs.

Reply: As suggested, the graph has been redrawn as suggested, and is incorporated in the revised version.

13. Line No 303, Is standard deviation same for all AOD at different wavelength? Please check it.

Reply: The calculation of standard deviation has been verified. It is almost same (variation is very small in decimal places only) for all AODs at different wavelengths.

14. Line No 320, What is the meaning of “decreasing from winter to pre-monsoon”? It gives contradictory information. Please check and correct it.

Reply: Authors thank the Referee. The sentence has been corrected in the light of the comment.

15. Line No 321, the reference to be written as per prescribed format. Sumit et al., 2011 to be written as Kumar et al., 2011.

Reply: Revised as suggested. Further, the reference Sumit et al., 2011 has been

replaced with Kumar et al., 2011, throughout manuscript.

16. Line No 323, due to festive celebrations. Which festive celebration in pre-monsoon season is responsible for abundant of anthropogenic aerosols?

Reply: In India, we celebrate a festival called 'HOLI' every year during the pre-monsoon season. More popularly, this festival is also known as 'Festival of Colors'. During this festival, people play with colored powder and paste. The associated Holika Dahan (fire burning) activities will enhance the particle concentration and alter chemistry of the local environment. A reference (Vijayakumar, K. and Devara, P.C.S., 2012: Variations in aerosol optical and microphysical properties during an Indian festival observed with space-borne and ground-based observations, *Atmosfera*, 25 (4), 381-395) on these activities has been included in the revised manuscript.

17. Line No 325, "Cloudy in nature". In previous paragraph, it was mentioned that all observations are taken during clear sky days. It is providing the contradictory meaning. Is the data collected in overcast condition?

Reply: Authors thank the Referee. The sentence has been corrected.

18. Line 354, Before this line the sub-heading "Columnar Water Vapor" to be included instead at Line No 366.

Reply: Revised as suggested. The sub-section heading 'Columnar Water Vapor (CWV)' has been shifted in the revised version.

19. In the manuscript, the word shown plotted has used. Please correct the word in complete manuscript. It should be only shown or plotted.

Reply: Revised as suggested. The word 'shown plotted' has been changed to either 'shown' or 'plotted' throughout the revised manuscript.

20. Line No 394, the reference to be written as per prescribed format. Sumit et al., 2011 to be written as Kumar et al., 2011.

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Reply: Revised as suggested.

21. Line No 418, the reference to be written as per prescribed format. Sumit et al., 2011 to be written as Kumar et al., 2011.

Reply: Revised as suggested.

22. Line No 455, atmospheric element. ...It is not clear. Write clearly.

Reply: The sentence has been re-written.

23. Line No 504-505, Write the correct explanation of SSA increase.

Reply: The increase in SSA during the monsoon season is mainly due to natural aerosols such as sea-salt particles. The sentence has been altered accordingly.

24. Line No 598-599, Write the explanation of increase of imaginary part with wavelength increases.

Reply: The increase of imaginary part, especially at smaller wavelengths during post-monsoon season could be due to increase in relative humidity and resultant particle growth.

25. Line No 619-620, Is it the only reason? Provide the explanation of this increase and decrease.

Reply: The increase of Reff during post-monsoon season is due to higher humidity associated with wet surface and decrease of Reff during winter season is due to low-level suspensions of absorbing particles.

26. Line No 631-634, this sentence to be rewrite for better understanding.

Reply: Revised as suggested.

27. In Radiative Forcing section, Methodology is not mentioned. Which model used for this study and write the procedure in brief. Compare these radiative forcing results with other Indian sites.

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Reply: The methodology followed for computing Radiative Forcing (RF) is explained. The results of the present study have been compared with those of other important locations in India. Additional references have been added in the revised version.

In the present study, the aerosol radiative forcing (RF) at BOA, ATM and TOA has been estimated by following the method reported by Yisong et al. (2018). The method involves forcing calculations from broadband fluxes between 0.2 and 4.0 micron from aerosol size distribution, spectral AOD, single scattering albedo and phase function by using the radiative transfer module integrated in the AERONET inversions (Garcia et al., 2008; 2012). In this method, the AERONET-defined RFTOA and RFBOA have been directly used to calculate $RF_{ATM} = RFTOA - RFBOA$. The above references have been incorporated in the revised manuscript. 28. Seasonal variation of aerosol types, the criteria of Lee et al, 2010 is not followed for FMF and SSA. These results are not accepted. Do the complete aerosol type again and the comparison to be done with other Indian sites i.e. Hyderabad, Jaipur, Varanasi etc.

Reply: The figure relating to aerosol types has been re-drawn in the light of Referee's comment. The results have been compared with those obtained at other Indian sites in a table.

29. Line No 743, The correlation between AERONET AOD and OMI AOD is very less. What is the reason of low correlation?

Reply: The possible reasons for relatively less correlation observed between the AODs recorded by AERONET and OMI have been explained. Higher AOD values by AERONET and relatively lower values by OMI have also been reported by Humera et al. (2015) due to anthropogenic activity and biomass burning. Now the correlation has been improved by reducing the scatter (eliminating the significant out-layered data points) between the observations.

Humera, B., Khan, A., Farrukh, C., Samina, B., Imran, S., and Thomas, B.: Inter-comparison of MODIS, MISR, OMI and CALIPSO aerosol optical depth retrievals for

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four locations on the IndoGangetic plains and validation against AERONET data, Atmos. Environ., 111, 113-126, 2015.

Interactive comment on Atmos. Meas. Tech. Discuss., doi:10.5194/amt-2019-437, 2019.

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