Review report

"Solar radiometer sensing of multi-year aerosol features over a tropical urban station: Direct sun and inversion products" – Katta et al.

The objective of the manuscript is to report aerosol characteristics over the tropical urban site Pune in India, using 11-yrs of ground-based radiometer measurements and its derived products. The authors presented seasonal, annual variations in the aerosols properties along with the long-term trends and provide an estimate of radiative forcing. Finally the authors compare the ground-based results with MODIS and OMI satellite observations.

Previous studies have well documented the variability in aerosol characteristics over Pune using up to 6 years of a similar version data set. The ONLY NEW contribution from this manuscript to the existing literature is the 11-yr data trends in the aerosol quantities and estimation of radiative forcing. I think the authors should focus more on the new contribution they are making and elaborate on it. However the current version of manuscript is: way too lengthy for its new content, filled with repetitive and/or redundant information about very fundamental aerosol quantities in the results section (please see below comments for more details) and at places discussions of the results should be added and/or need to be improved. The entire manuscript should be corrected for proper English usage. THOROUGH language editing is required.

Comments (in no specific order):

- In all the sub-sections of the 'Results and discussion' from 5.1 – 5.9, the first paragraph defines aerosol quantities and talk about its importance in the climate system. This is just REDUNDANT information. How about just discussing the results?
- All the figures showing seasonal variations in aerosol quantities could be merged as single figure with sub-panels. This would greatly help the reader to relate each quantity and get a holistic view of the regional aerosol characteristics.
- Similarly, for the figures showing long-term trends of all quantities. One could choose a wavelength (say 440 nm) and provide trends of all quantities as sub-panels in a single figure. I think, at least all derived quantities could be merged. Further a tabular form can be presented with all information (fitting line, R, SD, trends, etc.) corresponding to all wavelengths and quantities.
- Even before presenting any results, can you mention what additional quality checks were used in calculating monthly, seasonal means and annual data trends? For example, minimum data points required in counting it as a valid day and the minimum number of days required to calculate monthly mean, etc?
    - L 318: Do you mean 'Holi' celebrations in pre-monsoon caused increase in aerosols? Previous studies have also reported increase in aerosol loadings during 'Diwali' (post-monsoon) for several sites in India. However, there is no such evidence in post-monsoon data, how do you explain it?
    - L 323 – 325: Do you mean cloud contamination is reported as aerosol loading in the observations here?

- L 760: daily variability of AOD is high in monsoon months, could it be possible cloud contamination?

- From fig 6 and fig 16, there is an increasing trend in non-absorbing nature and total aerosol amounts over the region. However, the long-range transport of dust or marine events is seasonal, but the data trends do not capture the increase in vehicle emissions (more absorbing aerosols) over the decade. Can you explain this?
- It will be helpful to present an envelope of the data trends accounting for the uncertainties in AERONET products?
- Since the primary contribution of this paper is long-term trends in aerosol quantities. Can you also provide a consistency exercise with version 3 products? Or provide a discussion on how the changes in different versions reflect on the data trends for the derived quantities presented here?
- Aerosol radiative forcing:
  - This section is just incomplete without mentioning the actual methodology on which of the radiative transfer (RT) model is used, what specific inputs from AERONET observations is provided to the model, etc?
- Comparison with satellite observations:
  - What spatial and temporal colocations of satellite observations were used in the comparison? The complete methodology is missing here!
  - Is it a MODIS Dark Target or Deep Blue product? Similarly there are two different aerosol products from OMI observations. Please use specific product names in the main text and figures.
  - Can you also add trend lines (equation and %-amount per year) in the figure 28 and explain the observed differences?
  - In figure 28-a, the observed differences are significant for the initial five years and later both observations merged. What caused that feature?
  - In figure 28-b, the differences are quite substantial – the wavelength difference (2 nm) is NOT the right answer!
- Based on the results of comparison with satellite observations (presented here) and model simulations (in the literature), could you add some discussion on what improvements could be needed by these communities? I am aware this not a complete assessment paper, but some comments or discussion could be helpful.

Few more comments

L 98: What are the colors coded regions in fig 1(b)? It is nowhere described or cited in the main text.

L 146: 'The diffuse sky radiances, called almucantar…..'? Please rewrite this sentence.

L 164 – 165: remove 'revised' and brackets. Please cite the appropriate reference for Ver-2 Level 2 AOD products.

L 167: 'which confirm to the standards ……'. Is it 'conform'?

L 319: 'long-range transport values…..'. What are those?