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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Evaluation of VIIRS, GOCI, and MODIS Collection 6 AOD retrievals against ground sunphotometer measurements over East Asia" *by* Q. Xiao et al.

Anonymous Referee #1

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1 General Comments

This manuscript presents an evaluation of several aerosol-optical depth products derived from satellite sensor data with ground-based observations in a region of East Asia. The text is well-structured and mostly well-written. However, in my view, two major items remain to be addressed in a revision:

- Several choices in study design are not fully explained and require additional justification (see below).

- It appeared to me that not all numerical preconditions for correlation and regression analyses, both central to the presented study, were met in all situations. Also, statistical significance of regression was not tested for. Details below.

2 Individual Issues/Questions

- 20710-24 (henceforth "10-24" etc.): Is the bias systematic?
- 13-12: what does a value of -0.1 indicate? This should probably not be reffered to as a "value".
- 14-7: All AERONET observations are point observations. In evaluating the accuracy of the satellite products, why would there be a need for spatially continuous ground-based observations? I would expect a multi-temporal evalution using a wide range of AERONET stations to allow for a fairly representative assessment of product quality. Or do you expect distinct spatial patterns in the satellite products? As this point is the central motivation for this study as I understand it, I suggest that you elaborate your argument in this respect.
- 14-8: A point observation at the ground does not have a 'spatial resolution' at all. You may be referring to the distance between observations. Please clarify, and change the terminology here and elsewhere.
- 15-14: What does "high quality" refer to in EDR/IP?
- 16-3: "AERONET stations" do not "measure AOD". Please increase precision of statement.
- 16-9: How can anyone "assure" the quality? Did you perchance mean "quality-assessed"?

ACPD
15, C6437–C6442, 2015

- 16-27: Why did you reproject the data? This will certainly lead to sampling-induced errors!
- 16-27: Please give details of the averaging/pixel combination method used in the reprojection process
- 16-28: What do you mean by "data integration"?
- 16-28: Why would "data integration" be necessary? Why not leave all data at their original aspects and resolutions and compare them based on location alone?
- 17-12: "maximum sample size" - in what respect?
- 17-17: Why did you average 3x3 grid cell environments if your main aim was to assess the quality of high-spatial-resolution data?
- 18-6: How do you choose a 4x4 pixel window? Do you use the coordinates of the point between the four central pixels for comparison with other data sets?
- 18-8: "due to the lack of..." - I don't understand this argument. What do you mean by fine-resolution ground-based observations here? What would you ideal ground-based comparison data look like?
- 18-25: If the distortion towards the fringes of the pass impedes study results, why not use a dynamic spatial averaging approach that takes pixel size into account and tries to keep averaging area approximately constant, regardless of location and satellite system?
- 19-9: "grid cell centered on the ground stations" - how does this apply to the 4x4 pixel averaging described above?
- 19-28: Your figure 5 suggests that the data were used 'as-is'. A correlation analysis assumes normally distributed data, so in the case of AOD a logarithmic transformation would be required. Did you perform this? If not, what is the rationale?

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15, C6437–C6442, 2015

- 21-25: I suggest moving this sentence to the discussion/conclusions section Results/analysis section: You analyse regression slopes and intercepts. I see two potential problems:

  1. Like correlation, regression analysis assumes normally distributed date. If no log transformation of the AOD data was performed this condition is probably not met, statistically invalidating the analysis.
  2. In regression analysis, a p value is always computed, indicating the probability that the results were purely due to random variation. It is commonly accepted practice to set a significance level before the analysis (e.g. 90%, 95% etc. probability of the relationship NOT being random) and then to discard all relationships outside that frame (p value gt; 0.1, 0.05 etc.) as not statistically significant. A slope and intercept could be the result of random variation in your data set, or they could be statistically significant. Without a p value, no one can tell.

- 25-20: "cautious" - how?
- Tables 3 and 4: Why are no p values given?
- Figure 5: Since AOD is not normally distributed, it should be shown on a log scale or another suitable transformation

3 Technical Details

- 11-15: ground-based
- 12-1 and 12-16: different time formats. Please harmonize throughout manuscript in accordance with journal requirements.

ACPD
15, C6437–C6442, 2015

- 13-8 replace "that were" by a comma
- 13-12 remove "range"
- 14-5: small-scale
- 14-7: remove "required"
- 15-3: The size/extent etc. of the study area...
- 15-21: Ground-based measurements (here and elsewhere)
- 15-25: were/are distributed
- 16-2: approximately 10km apart -> with an averate distance of about 10km between two stations (surely 10 km isn't the distance between Osaka and Seoul...)
- 16-2: which can be... check wording
- 16-6: in THE Japan-South Korea region
- 16-17: "that distributed" -> selected sites roughly 6km apart from each other along
- 17-14: cells -> cell
- 20-5: metrics -> metric
- 21-5: results ... suggest
- 21-6: among -> between
- 23-8: over THE Japan-...
- 23-10: DRAGON

ACPD
15, C6437–C6442, 2015

- Tables 3 and 4: The "Spatial Comparison" part should be more clearly visually distinct from the "Temporal Comparison" part.
- Figure 3, line 3: observations -> observation
- Figure 3, line 4: retrievals -> retrieval
- Figure 3: red and green are hard to impossible to distinguish for a sizable portion of humanity (including me :). I suggest using a different pair of colours (e.g. red and blue)
- Figure 5: In their current form, the individual figures seem too small.
- Figure 5: in dash line -> as a dashed line
- Figure 5: in gray solid -> as gray solid

Interactive comment on Atmos. Chem. Phys. Discuss., 15, 20709, 2015.