Atmos. Chem. Phys. Discuss., 15, C6712–C6714, 2015
www.atmos-chem-phys-discuss.net/15/C6712/2015/

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.

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Received and published: 9 September 2015

Thank you very much for your comments on our paper. While we are still working on revising this manuscript based on your comments, we would like to explain some major items you highlighted in your comments. Below please find our reply.

>13-12: what does a value of -0.1 indicate? This should probably not be referred to as a "value".

From the MODIS Collection 5 algorithm, negative retrieval values have been allowed. In this study, both MODIS C6 3 km and GOCI aerosol products have negative retrievals.

Though such a negative AOD value is not physically possible, it statistically represents small positive AOD values in the overall data distribution. In other words, removing these negative values would in fact truncate the lower tail of the AOD distribution. Most previous evaluation studies include these negative retrievals as valid values (Levy et al., 2013;Munchak et al., 2013;Remer et al., 2013). Thus, we also included these negative values in our analyses.

>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.

Regarding your first comment that the non-normal distribution of AOD data violates the assumption of linear regression, there are a few important issues that go against log-transformation in the context of this study. First, due to the existence of valid negative and zero AOD values, log transformation cannot be applied to MODIS and GOCI products directly. One solution is to add a fixed small positive number, i.e. 0.05, to both satellite retrievals and AERONET values; however, doing so changed the reference range of EE ($\pm 0.05 \pm 0.15$AOD) and made the evaluation metrics incomparable across different satellite aerosol products. Moreover, with log-transformation, linear regression intercept and slope lack clear physical meanings. Second, the distributions of AOD values from different sensors, as shown in Figure 4, were not significantly skewed. Due to the existence of small positive AOD values, log-transformation actually

introduced slight skewness to the left. Third, previous evaluation studies rarely used log-transformation (Levy et al., 2013;Liu et al., 2014;Munchak et al., 2013). Since one of the objectives of this study is to compare the performance of these emerging finer resolution products to products at lower resolution, log-transformation made the evaluation metrics incomparable with previous studies. All things considered, we decided to use the original data in this analysis. Regarding your second comment, we added p-value of the slope and intercept in the revised manuscript.

References:

Levy, R., Mattoo, S., Munchak, L., Remer, L., Sayer, A., Patadia, F., and Hsu, N.: The Collection 6 MODIS aerosol products over land and ocean, Atmospheric Measurement Techniques, 6, 2989-3034, 2013. Liu, H., Remer, L. A., Huang, J., Huang, H. C., Kondragunta, S., Laszlo, I., Oo, M., and Jackson, J. M.: Preliminary evaluation of SâĂŘNPP VIIRS aerosol optical thickness, Journal of Geophysical Research: Atmospheres, 119, 3942-3962, 2014. Munchak, L., Levy, R., Mattoo, S., Remer, L., Holben, B., Schafer, J., Hostetler, C., and Ferrare, R.: MODIS 3 km aerosol product: applications over land in an urban/suburban region, Atmospheric Measurement Techniques Discussions, 6, 1683-1716, 2013. Remer, L., Mattoo, S., Levy, R., and Munchak, L.: MODIS 3 km aerosol product: algorithm and global perspective, Atmospheric Measurement Techniques Discussions, 6, 69-112, 2013.

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