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Discussions

Interactive comment on "Exploring systematic offsets between aerosol products from the two MODIS sensors" *by* Robert C. Levy et al.

Robert C. Levy et al.

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Thank you, Andy Sayer for your thoughtful and useful comments and suggestions. Also, thank you for discussions in person. Note, since you also commented on Gupta et al. (amt-2018-44), we are partially recycling the response from that paper.

We understand your concerns, and we agree that many datasets probably do not follow all assumptions needed for linear-regression analysis. Clearly, AOD are not normally distributed (believed to be closer to lognormal in nature), and thus violates the basic assumption for inferring causal relationship to the results. Nonetheless, linear-regression is a very useful tool to describe the data at hand, compare with previous studies, and generally provide a first sanity check to the relationships. What's really most important

are the scatterplots, and the regression line is drawn in to focus your eye. Although in this paper, we did not show the scatterplots and only listed the regression equation (robust fitting, e.g. IDL's "LadFit" routines).

Of course, if a relationship is not close to linear, a scatterplot would show a cloud of points or that the points lie far from the one-to-one line. In this case, we provided slope, intercept and correlation coefficients to compare relationships with each other, and with similar exercises in previous studies. Yet, we did not focus on the actual linear regression, and instead provided additional statistics in the form of biases, expected errors and other useful parameters. We used Figure 2 to demonstrate the differences between Terra and Aqua MODIS (as compared to AERONET). We feel strongly that ALL analyses provided in the manuscript are of value in evaluating the satellite product, and we respectfully prefer to include results of linear regression in the paper. For Table 1, we will re-order the columns, so that slope and y-intercept are the last two columns and the reader can focus on relative bias of MODIS compared to AERONET.

We note that the rules and assumptions concerning linear regression analysis become more important when we intend to PREDICT a dependent variable with the help of an INDEPENDENT variable. For example, linear regression is insufficient when converting AOD into surface PM2.5. But, here in this study, we do not expect any reader to apply measured AERONET values of AOD to the calculated linear regression equations to predict MODIS values. Linear regression is a very poor model for such a purpose, but there is no practical reason why somebody would want to do so when AERONET makes much more accurate and precise measurements than MODIS. Thus, the linear regression we present in this manuscript is an aid in understanding, not a statistical model for prediction.