We thank the reviewer for his/her comments and suggestions.

Aeronet sunphotometer measurements have been used extensively for validation of aerosol optical depth (AOD) retrievals from MODIS and MISR. Both MODIS and MISR teams have often been able to improve retrieval performance in regions where extensive sets of Aeronet measurements are available. Many regions of the globe have few (or no) Aeronet stations or other means of aerosol validation, though. This paper intercompares MODIS and MISR AOD retrievals with the purpose of identifying regions with large, spatially-correlated discrepancies. It is suggested that the location of additional Aeronet sites in these regions of large discrepancies would be highly beneficial to further improving the MODIS and MISR retrievals. The motivation and objective of the paper are laid out very clearly. The paper presents a useful summary of the primary reasons for error in passive aerosol retrievals and where they tend to occur. It is important to conduct studies such as this one. However, the paper suffers from a lack of detail and a lack of rigor in a few areas and the value of the paper would benefit from revisions in a few areas.
Since the topic of where additional sunphotometer observations are required is of considerable interest to the small community doing satellite AOD validation, and to the Aeronet team, a more detailed report with more specific recommendations in each region and more detailed justifications would probably be useful.

Thank you for your comments. One of the main purposes of this study is to remind the community of the existence of large variances among satellite AOD retrievals in regions outside of the existing AERONET network. We have provided some suggestions, and we hope the community can dig deeper into this issue in order to move towards an improved method of validating satellite aerosol products. This is especially important for modelers. A precise and detailed regional based report, however, requires the consideration of geographic, economic, and even political perspectives. Such an effort is beyond the scope of this paper and is subject to future study.

To go into the details of all of the areas is going to take many papers. Hence we performed the work in a way that allows regional scientists to look into the details.

For specific comments:

1) *The title asks "Where do we need additional in situ aerosol and sun photometer data?" There is extensive discussion related to sun photometer data, but no real dis- cussion of in situ measurements, unless by 'in situ' the authors are referring to mea- surements of surface reflectance. Either 'in situ' should be removed from the title, or some additional discussion of in situ measurements should be added. For example: What in situ measurements are required? Where have in situ measurements been acquired in the past, or are now being acquired, and have they been useful? Are long-term in situ data records required, as is discussed for sunphotometers?*

   We have changed the name of this paper to "A critical examination of spatial biases between MODIS and MISR aerosol products—application for potential AERONET deployment" and removed "in situ" from the title.

2) *The authors draw significant inferences from the linear regressions shown in Figures 1 and 4. Inspection of Figure 1, however, shows that in many cases the assumptions underlying standard linear regression are violated (Wilks, 2011: Statistical methods in the atmospheric sciences, Chapter 7). In many of the cases shown (MISR over Banizoumbou for example) the error characteristics of the data clearly change with increasing optical depth. In these cases, linear regression may give misleading results, particularly in the location of the intercept. The small number of MISR samples at large AOD are probably not statistically significant yet have a large influence on the regression, which is not resistant to outliers. The authors attempt to account for a reported low bias in MISR AOD by restricting the regression analysis to AOD less than 0.5. A separate regression should be applied to AOD greater than 0.5 as well. Applying the regression to clusters of points selected for uniform error characteristics would yield more reliable results.*

We totally agree with the linear regression comments, and we are well aware of this issue. Here, however, the purpose of using linear regression is to examine spatially correlated bias. We have included the number of points in the linear regression study, and we have also provided the confidence interval of the correlation. Again, to reinforce our position, the purpose of the present paper is to map regions of large spatially correlated bias. This is one of the few cases, in fact, where the use of linear regression is justified. This is plaid out in our data processing. For example, statistics for AOD > 0.5 are not provided. First and foremost, once AODs exceeds this amount multiple scattering issues becomes significant. This leads to strong nonlinearities in regressions. From a mapping of an individual region point of view, this is not an issue. But from an inter-comparison point of view between regions, restricting observations to the linear regime allows for inter-compatibility. Further, over most of the world, most retrievals have AOD < 0.4. So in the end, the use of regressions in this manner and purpose is justified. Where it is not justified, is quite frankly, how most of the community does satellite verification, where a number of site are binned together, and r2 is used as an indicator of quality of data rather than an explication of variance which it physically is.

3) *Given the evident problems in Figure 1, where the regression lines often do not appear to represent the relation of the data points very well, it is difficult to know how much confidence should be placed in the results shown in Figure 4. Examples of regressions to the MODIS and MISR data should be presented in the format of Figure 1 to establish whether the regression results fairly represent the underlying data.*

We have provided the number of data points in table 1, as well as the 95% confidence interval for the correlation analysis (in table 1 and Figure 4). But, such retrogressions cannot be presented for each and every point in a single paper. But again, for the purposes of this paper-to map regions of spatially correlated bias, the regressions speak for themselves-especially in areas of higher AOD. In regions with

low AODs, we expect no correlation as there is no variance, and this was stated in the paper.

4) *p. 4201, line 10-11. In section 3, eight Aeronet sites are chosen to be "representative" of a region. In fact, the regions described are much too large and heterogeneous for any one site to be representative of the entire region. The intention here is to select Aeronet sites with long data records in diverse locations. The authors should be more specific about what exactly each of these sites is representative of, in terms of aerosol and surface types.*

   Again, the purpose of this paper is to remind the community of the spatial variances of the data uncertainty, and to suggest means of reducing the sampling bias in the current AERONET network. To go into the details of all of these areas is going to take many papers. Hence we performed the work in a way that allows regional scientists to look into the details. By "representative" we picked key sites over the globe that are commonly used for satellite verification purposes to demonstrate a wide range of aerosol regimes. These are, as clearly described in the paper, presented as examples to demonstrate variability over the globe. Given your comment 2, we would hope you would appreciate the fact that we use such examples in the paper. Indeed, as part of the overall Navy aerosol assimilation effort, we have regressions for MODIS and MISR against every single AERONET site in existence. For MODIS, the regression statistics in fact are provided in the supplemental material in Hyer et al., (2011)

5) *p. 4303, line 9-15. The language used here implies the aerosol type or composition is being retrieved. For example, saying something like "high aerosol loading is seen in regions characteristic of smoke ..." would be better than "heavy smoke aerosol plumes are found . . ."*

   Agreed. We have changed "Heavy smoke aerosol plumes are found over regions of South America, South Africa and Indonesia; dust plumes are visible over North Africa" to "Regions of high AOD that are likely associated with heavy smoke aerosol plumes are seen over South America, South Africa, and Indonesia, and dust plumes are visible over North Africa"

6) *page 4305, line 21-22. It is not clear to me what is meant by "uncertainties in the microphysical models used in these retrievals are amplified . . ." What is the mechanism in mind here? What is meant, quantitatively, by the "multiple scattering regimes"?*

   As suggested by Hyer et al., [2011] as well as by Zhang et al., [2007], multiple scattering becomes visible when AOD > 0.2, and important for AOD>0.5. To avoid misunderstanding, we have rewritten the sentence as "Furthermore, uncertainties in the microphysical models used in these retrievals are amplified at higher aerosol loading regions due to multiple scattering [Zhang et al., 2007; Hyer et al., 2011]."

7) *page 4310, line 22. Identification of Greenland as one of the key regions needing additional AERONET sites seems an odd choice, given the lack of satellite retrievals over Greenland. There seem to currently be three AERONET sites on the coast. Is the recommendation for sites on the plateau?*

   For the satellite products that we used in this paper, there is no quality assured data that is reported in Greenland. None of the three AERONET sites that are located near the coast have more than 2 years worth of observations. And for large region of the Greenland plateau, there are no AERONET sites at all. As for satellite retrievals, we should not rule out the possibility of valid satellite retrievals over this region from future sensors with much improved sampling techniques.

8) *For the benefit of those not so familiar with the Aeronet network, it would be useful to add the location (lat/lon) of each of the sites in Table 1.*

   Done, we added this information in the articles.