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

The paper by Y. Shi et al. suggests tracing spatial discrepancies between MODIS DB, DT and MISR AOT products in order to improve the quality of the retrieval over corresponding areas. The paper is definitely suitable for AMT and well-written, and should be published after addressing a number of comments and technical corrections suggested by the other reviewers. A general comment on the concept of the paper may be added to the previous comments, as the paper currently gives a misleading impression about the status of the AOT retrieval problem: One of the purposes of the paper is to show the benefit of local measurements for satellite retrievals, namely, MODIS DT, MODIS DB and MISR. However, the initial concept of building more ground based stations to improve satellite retrievals seems to be not feasible. Satellite retrievals do not correspond to each other even for simple simulated cases (Kokhanovsky, A. A., et al., 2010: The intercomparison of major aerosol retrieval algorithms using simulated intensity and polarization characteristics of reflected light, Atmos. Meas. Techniques, 3, 909-932). The authors should be careful to clearly express the idea behind the paper. At the moment it seems like all what is needed for resolving the discrepancies between MODIS and MISR is more AERONET sites, which is a wrong impression. The title of the paper and corresponding parts of the text should be therefore changed. Also, AERONET network is a unique source of ground truth aerosol data, but its proper maintenance cannot yet be considered a solved task. Suggestion to install additional stations in the areas where the station density is already above average is not convincing and seems to be an unaffordable luxury. Especially when one takes into account e.g. only about 15 stations for the whole Arctic, operating without proper calibration for years.

This is an excellent point and one that we fully recognized. We totally agree that adding more AERONET sites alone does not resolve the discrepancies among satellite products. On the other hand, we know there are regions of large spatially correlated bias which is not easily attributable to any given microphysical or lower boundary condition deficiency. AERONET data are being used as a golden standard for validating most, if not all, satellite aerosol products, is a good place to start. To rephrase the question, perhaps, is given the limited supply of AERONET sites, where would you put one? How would you justify placement? We would think that large areas of spatially correlated bias would be areas of high priority of placement. However, the performance of the satellite products could be dramatically different from their performance over the AERONET sites (sampling bias of the AERONET network), as demonstrated by this study. A study like this is necessary not only to remind users and modelers of the limitations of validating products with only point measurements, but also to identify regions where large discrepancies are found among satellite products and where there are not enough AERONET sites for the satellite aerosol community. By identifying problematic regions; we hope that a solid validation plan can be developed by the community so that the sampling bias from the current AERONET network can be reduced.

We have added the following paragraph:
"Adding more AERONET sites in and of themselves will not resolve the discrepancies among satellite products. However, if AERONET data is used properly, it will help developers and data users alike understand the true nature of uncertainty in important regions of the globe. Already,

AERONET data are being used as a golden standard to validate most, if not all, satellite aerosol products, especially AOD. We show that the performance of the satellite products could be dramatically different from their performance over the AERONET sites (sampling bias of the AERONET network). This study identifies regions where large discrepancies are found among satellite products and where no coverage exists from existing AERONET sites. What we now have is an estimate of diversity among commonly used products, but little information about true uncertainty in any of the products. We hope this study will aid in future decisions of constructing ground based and in situ aerosol observing network stations."

On one specific point we take exception to the reviewer's claim that AERONET sites in the Arctic have been operating without calibration for years. See the papers of Saha et al. (2010) and Eck et al. (2009) for analysis of AERONET data in Arctic sites that have been fully calibrated and as a result have Level 2 data.

Saha, A. et al. (2010), Pan□Arctic sunphotometry during the ARCTAS□A campaign of April 2008, *Geophys. Res. Lett.*, *37*, L05803, doi:10.1029/2009GL041375.

Eck, T. F. et al. (2009), Optical properties of boreal region biomass burning aerosols in central Alaska and seasonal variation of aerosol optical depth at an Arctic coastal site, *J. Geophys. Res.*, *114*, D11201, doi:10.1029/2008JD010870.

A very important point is the need of full quotation of the corresponding literature on the subject. Comparison of MODIS, MISR and AERONET, as well as integrating the three for better quality of AOT product is not a new idea and the previous experience in the area cannot be ignored. The manuscript needs to be refocused: while it is of course not incorrect to discuss the use of more ground-based data, the use of other approaches (comparison with AOT products from yet another sensors or simulation studies) should also be discussed for the sake of clarity of the context.

We have added the references mentioned by this response as well as the references from the responses of other reviewers. We have added a discussion of other approaches as mentioned in our response to the previous question.