Response to Dr. Kalashnikova - Reviewer's comments are *italicized*; response are not.

The manuscript provides an extensive evaluation of MODIS collection 5 and selected samples of collection 6 Deep Blue (DB) aerosol products with the goal of identifying and quantifying product uncertainties for potential usage of the DB products in model aerosol assimilation. Based on their data uncertainty evaluation the authors develop new quality assured DB level 3 AOD products.
The paper brings up the important topic of satellite data uncertainty requirements for aerosol product usage in model assimilation, and it builds on the previous work done by the group. The paper is well written, the motivations are clear, and it is relevant for AMT. The authors demonstrate deep understanding of satellite data (that is not trivial in the case of the DB algorithm) and potential retrieval artifacts. The methods and the product developed in this study are useful for the wider modeling community.

Thank you very much for your comments and compliments.
Question/Comment: 1. The authors claim that the regional dependence of the DB retrieval performance is suggestive of microphysical biases. It is not clear why that is the main reason. The major limitation of MODIS Deep Blue Collection 5 is that the surface reflectance database is static (it is essentially the minimum reflectance observed over the length of the MODIS mission, with a few adjustments, for a given season). I suspect that this may also be an important source of regionally/seasonally-dependent error.

Answer: Agreed. We have modified the text to reflect the comment. We added "but since the DB algorithm utilizes a recalculated surface reflectance database that is based on a minimum reflectivity technique (Hsu et al., 2004), it is possible that regional dependence of the DB retrieval performance could also be a function of surface albedo as suggested from this study as well."

Question/Comment: 2. The potential sources of uncertainty are identified in this work as angular dependence, aerosol microphysics, surface albedo, and cloud contamination. The authors do not consider another important source of uncertainty, which is the surface elevation. The retrievals at UV and "deep-blue" wavelengths are very sensitive to the height of aerosol and surface because the Rayleigh contribution to the radiance is large at short wavelengths. Elevated terrain is expected to lead to biases as pressure is not accounted for explicitly (only via the observed reflectance from the database), nor is aerosol elevation.

Answer: Agreed. We have added a paragraph to explain the influence of aerosol height on aerosol retrievals after the first sentence of section 3.2. "Aerosol layer height and surface elevation are possible uncertainty sources for retrieving aerosol using shorter wavelengths. For example, Hsu et al., 2004 mentioned that a ±2 km variation in aerosol plume height can introduce a 25% uncertainty in AOD at 412 nm and 5% at 490 nm." To identify the influence of surface elevation on the retrieval bias, surface elevation values from the AERONET data were used. Although a significant trend was found between the surface elevation and the differences in the AERONET and DB AOD values, an in-depth investigation suggests that this trend is introduced by a lack of retrievals with AOD larger than 1.0 over regions with an elevation higher than 400 meters. In section 3.2.4 we added: "Surface elevation is another potential source of

uncertainties when using the blue wavelength for retrieving. The relationship between $\Delta\tau_{A\text{-}M}$ and the surface elevation of the AERONET stations was studied as a function of AERONET AOD. However, no significant trend was found between surface elevation and $\Delta\tau_{A\text{-}M}$. Yet such a study may be biased, as only a limited number of AERONET sites are located at high elevation."

Question/Comment: 3. The DB Angstrom exponent is pre-defined by the aerosol models contained in the look up table. Therefore the DB Angstrom exponent will not necessarily relate to the AERONET fine mode fraction.

Answer: Agreed. We have added the following discussions: "Note that the DB Angstrom exponent is pre-defined by the aerosol models contained in the look up table. Therefore the DB Angstrom exponent will not necessarily relate to the AERONET fine mode fraction" in section 3.2.2.