Reviewer 1

1. The revised manuscript has been greatly improved in presentation quality and science merit. I thereby would recommend accepting it for publication after a few comments are addressed. I notice that there is a change in the author list and would recommend other proper changes are made if any.

   Response: Thanks for the reviewer's comments. Dr. T. F. Eck gave many constructive suggestions and comments, so we added him as one of co-authors. Before re-submitting the revised manuscript, we have clarified this with the Co-Editor.

2. L55, clarify the time-scale for DARF, is it monthly or annual mean? Remove " which indicates cooling at the surface and top of the atmosphere". This is obvi ous from the DRAF values, and more importantly, could be misleading becaus e the DRAF is calculated assuming cloud-free conditions.

   Response: According to the reviewer's suggestion, the incorrect descriptions have been modified.

   (1) "The annual mean DARF was ……"

   (2) The sentence of "… which indicates cooling at the surface and top of the atmosphere" has been removed in the revised manuscript.

3. L188, DARF is defined based on the net flux change at TOA or surface, howev er, equations 4 and 5 do not speak so. In both equations only upward or down ward fluxes are used, which are inconsistent with the definitions. You may arg ue solar down flux could be dropped in Eq. 4; but Eq.5 is simply wrong. Just s tay consistent in your definitions and equations. Also, by convention, dF (delta _F) is more often used to represent net flux, not DARF.

   Response: Thanks for the reviewer's suggestions. The incorrect description has been modified to keep the definitions and equations consistently in the revised manuscript. We also changed "ΔF" to "*DARF*" to avoid misunderstanding.

   "The DARF is defined as the difference in the shortwave radiative fluxes between the two energy levels including and excluding aerosol effects at the Earth's surface (bottom of the atmosphere, BOA) and the top of the atmosphere (TOA) in equations (4) and (5) as follows:"

$$\mathrm{DARF}_{TOA} = F_{TOA}^{\uparrow 0} - F_{TOA}^{\uparrow}$$
$$\mathrm{DARF}_{BOA} = F_{BOA}^{\downarrow} - F_{BOA}^{\downarrow 0}$$

Reviewer 3

I found the revised manuscript is significantly improved. I have a few minor comments in below that author should consider to address.

Response: Thanks for the reviewer's comment.

Specific comments:

1. It maybe necessary to include one additional important assumption in AERONET inversion products. That is, the complex refractive index is assumed independent of particle size. In other words, the inversion algorithm [Dubovik et al., 2000, 2006] gives the same refractive for both fine and coarse modes. This assumption valid for fine or coarse-dominated cases, however, could cause error in SSA and even particle size for mixed aerosol scenarios. This issue has been discussed by Xu and Wang [2015] and Xu et al [2015]. The same studies also made efforts to retrieve mode-dependent aerosol complex refractive indices and SSA.

   Response: Thanks for the reviewer's suggestion. The reviewer's comments have been considered in the revised manuscript. "The complex refractive index is assumed independent of particle size. This assumption is valid for fine or coarse-dominated cases, however, could cause some errors in SSA and particle size retrievals for mixed aerosol scenarios (Xu and Wang, 2015; Xu et al 2015)."

2. The quality of most figures needs improvements. In particular, the font size of plots and legends should be enlarged.

   Response: The quality of most figures has been improved. And the font size of plots and legends has been enlarged.

3. Line 161-162: The description of fine and coarse mode separation may be incorrect here. Please verify. According to the official description of AERONET inversion Products, "the inversion code finds the minimum withinthe size interval from 0.439 to 0.992 μm. This minimum is used as a separation point between fine and coarse mode particles. Using that separation, the code simulates optical thickness, phase function and single scattering albedo of fine and coarse mode separately. Furthermore, the retrieval provides estimates of Effective Radius reff, Volume Median Radius reff, Standard Deviation σ and Volume concentrationsCv (μm3/μm2) for both fine and coarse modes of the retrieved size distribution." Source:
   https://aeronet.gsfc.nasa.gov/new_web/Documents/Inversion_products_V2.pdf

   Response: The incorrect description has been modified in the revised manuscript. "Following the procedures of Dubovik et al. (2002, 2006), all particles smaller than 0.992 μm were considered fine mode particles while those larger than 0.992 μm were considered coarse mode."

4. Line 242-244: ".., but the range of effective radii was greater, possibly due in part to the lower retrieval accuracy for coarse particles compared with the fine-mode." This confuses me, as coarse-mode effective radius seems not quite dispersed among different sites (according to Table 1). Please double check.

Response: The description has been corrected as “The coarse-mode aerosol volumes also showed small differences among site, but the range of effective radii varied 2.16–2.30 μm.”.

5. Line 322: The abbreviation “FMF” needs to be defined. And, is the FMF in terms of parti cle volume?
   Response: The abbreviation “FMF” has been defined as fine mode particle AOD fraction ($AOD_{fine(440nm)}/AOD_{440nm}$) in the revised paper.

6. References:
   Xu, X., and J. Wang (2015), Retrieval of aerosol microphysical properties from AERON ET photopolarimetric measurements: 1. Information content analysis, Journal of Geoph ysical Research: Atmospheres, 120, 7059–7078, doi:10.1002/2015JD023108.
   Xu, X., et al. (2015), Retrieval of aerosol microphysical properties from AERONET phot opolarimetric measurements: 2. A new research algorithm and case demonstration, Jo urnal of Geophysical Research: Atmospheres, 120, 7079–
   7098, doi:10.1002/2015JD023113.
   Response: The above two references have been considered in the revised manuscript.