**Response to Referee #2**

*(Original reviewer comments in italics)*

*General comments*
*The paper present the feasibility of using a sky-imager with polarization capabilities to determine atmospheric aerosol features. The use of this approach seems promising by different reasons; including the way it can elude the requirement of absolute calibration. In this way the paper is within the scope of AMT, presenting a novel idea that addresses a relevant scientific topic like that associated with the atmospheric aerosol.*
*In general the paper is well written and the different steps of the procedure are presented. Nevertheless the results can be improved in order to support the conclusion about the feasibility of the proposed technique, see below.*

*Detailed comments*
*According to the simulations performed, it could be possible distinguish different types of atmospheric aerosols using a procedure design to compress the relevant information content of the sky-imager to a reduced number of variables. Nevertheless, according to the results obtained with the first choice of feature vector the procedure is ambiguous in the separation of some aerosol mixtures and is clearly no sensitive to the presence of absorbing aerosol in the atmospheric mixture.*
*The second feature vector proposed by the authors looks for a characterization of the atmospheric aerosol in terms of a combination of two bimodal size distributions with different scattering and absorbing properties. According to figure 7 and 8 the two components*
*of the mixture are clearly separated in the 2-D space defined by the two first PCs. Nevertheless, in order to show the feasibility of this technique to obtain quantitative information about the atmospheric aerosol properties it would be necessary to do additional tests. Thus it is necessary to test the success in retrieving the aerosol features of other mixtures representative of real conditions. Why the authors use several mixtures in figure 6 to test the limitations of their first choice of feature vector, while they only test the success of the second one with a test case? It is necessary to determine how other aerosol mixtures can be represented by means of this approach of two bimodal size distributions with different single scattering values.*

This is a very valid and valuable comment and helps improving the manuscript. The representations of OPAC mixtures *continental polluted* and *continental clean* have been included in Figures 7 and 8. OPAC mixtures *desert* and *urban* (as shown in Fig.6) are the basis for the FV space and do not help in showing the success of the retrieval.

Accordingly, the text in section 2.3 has been amended:

The OPAC continental polluted aerosol mixture contains more soot and has a lower SSA of 0.89. The retrieved SSA from Fig. 7 would be 0.9.

……

Again, the simulated OPAC continental average and polluted aerosol mixtures appear close to the fine mode dominated (urban) size distribution with SSA 0.95 and 0.9, respectively.

Also the SSA scalings of the FV-space have been slightly modified to accommodate a more realistic SSA range of 0.8 – 0.99 (formerly 0.7 – 0.95).

*Some rewording would be necessary to improve clarity: Page 8820. Paragraph in lines 9-16. This paragraph must be merged with the previous one. The statement in the paragraph must be reformulated in order to clearly state that the processing applied eludes the requirement of absolute calibration and reduces the impact of undesired aureole artifacts.*

Paragraphs have been merged and an additional statement has been amended. See respective comment to Referee #1.