

Reply on RC2

Lei Li et al.

Author comment on "Climatology of aerosol component concentrations derived from multi-angular polarimetric POLDER-3 observations using GRASP algorithm" by Lei Li et al., Earth Syst. Sci. Data Discuss., <https://doi.org/10.5194/essd-2022-108-AC2>, 2022

This study presents the dataset for the climatology of aerosol components globally, which was derived by GRASP (Generalized Retrieval of Atmosphere and Surface Properties algorithm) component approach from POLDER-3 satellite observations. The spatial and temporal distributions of satellite-based aerosol components on a global scale are discussed and show reasonable agreement with general expectation, as well as the comparisons of BC and Dust between GRASP component retrievals and MERRA-2 products. The dataset of aerosol components presented in this study provides additional inside information about aerosol properties that is much difficult to be obtained but imperative information for improving the estimation of chemical transport models. The dataset and its more applications in future will be interesting for the scientific community. The manuscript is well-written and well-organized. Therefore, I have some minor comments before it could be accepted for publication.

Response: Thank you very much for the time and efforts you have put into reviewing the manuscript. We are very grateful for your positive evaluations and helpful comments on our work, which have enabled us to improve the manuscript. Here are our point-by-point responses to the comments:

Minor comments:

- The full name of abbreviations should be provided when it is mentioned at the first time. Such as, POLDER-3 in Line 21, AERONET in Line 34, IPCC in Line 45 etc. Please check it in the whole manuscript.

Response: We thank the reviewer for the attention and pointing this out. We added these abbreviation meanings in the revised version, as well as for AE, AODC, AAOD, and SSA in lines 176-177.

- Line 75: "Ganguly et al. (2009b, 2009a)" should be "Ganguly et al., (2009a, 2009b)"

Response: Done.

- Line 99: "look-up table (LUT)" should be "Look-Up Table (LUT)"

Response: Done.

- Lines 145-147: Please add references to "This GRASP/Component approach derives fractions of aerosol components together with size distribution and non-spherical fraction of aerosol particle directly from the measured radiances without an intermediate step of optical aerosol properties retrieval."

Response: Done.

- Line 166: Please add references to "based on preliminary sparse analysis of derived aerosol component information". Please clarify what you could obtain from the study of Zhang et al. (2021b) in Line 167.

Response: We added references and more descriptions in the revision (Lines 185-187): "based on preliminary sparse analysis of derived aerosol component information (Li et al., 2019, 2020a, 2020b) and on the results of study by Zhang et al. (2021b) demonstrating component approach can provide comparable and sometime even better aerosol optical products".

- Line 273: "(Li et al., 2020b, 2020a; Zhang et al., 2021)" should be "(Li et al., 2020a, 2020b; Zhang et al., 2021)"

Response: Done.

- Line 350: The reference of "(Schuster et al., 2016b)" in Line 350 is same to the reference of "Schuster et al. (2016)" in Line 63. Please modify and remove one from the reference list.

Response: Done.

- Please clarify what 6 components are in the Line 244 and "the retrieval of fractions of 6 components" should be "the retrieval of 6 components fractions"

Response: We added more descriptions and explanations in the revised version (Lines 267-272): "Thus, the main conceptual difference of GRASP/Component from GRASP Optimized and High Precision is the retrieval of volume fractions of six components (black carbon, brown carbon, fine- and coarse-mode non-absorbing insoluble, coarse-mode insoluble absorbing, mainly representing iron oxides in mineral dust, and relative humidity for the host calculation) instead of direct retrieval of the real and imaginary parts of complex refractive index at each wavelength (12 parameters in GRASP Optimized and

High Precision)”).

- Lines 263-266: “Thus, using fractions of the components and relative humidity as variable parameters, the refractive index of a particle composed by several insoluble components (e.g., BC, BrC, mineral dust etc.) suspended in such host were determined by the MG equations based on the calculation of electric fields”. I do not understand this sentence. Please clarify.

Response: The sentence is rephrased and clarified as follows (Lines 294-298): “First, the complex dielectric constant of each aerosol component is computed from the corresponding complex refractive index. Then, the Maxwell Garnett dielectric functions are used for calculating the dielectric constant of the aerosol mixture from component fractions and their dielectric constants. At last, the complex refractive index of aerosol mixture can be obtained from the complex dielectric constant of aerosol mixture.”.