Harmonization of the assumptions of atmospheric aerosol properties in climate models and remote sensing approaches

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The assimilation and reanalysis efforts have essentially advanced in last decades benefiting from the progress in both modeling and observations. However, there is an essential gap between aerosol modelling approaches used in remote sensing algorithms and in the global climate models. This complicates the utilization of the remote sensing data in the reanalysis for constraining global climate models and improving their forecast capabilities. This gap also has a restraining effect on the evolution of remote sensing. For example, the predicted or climatological aerosol information from global climate models (e.g., aerosol type, vertical profiles, etc.) can be a valuable source of a priori information to constrain the retrievals, while some inconsistences in aerosol representations complicate the use of this information in the remote sensing algorithms.

The presentation discusses the harmonization and aligning aerosol modeling assumptions used in CAMS and MERRA-2 model and aerosol retrieval from multi-angular polarimetric data realized by the GRASP/Components approach. The GRASP/Components approach uses quite similar aerosol modeling concept to that of aerosol transport models. Indeed, it considers aerosol as a mixture of aerosol components with known index of refraction and derives particle size distribution and fractions of different aerosol components. The aerosol components used in CAMS and MERRA-2 and were compared with GRASP and analyzed by outlining possible advantages and shortcoming in both concepts. As a result, several modifications were recommended for both models and GRASP in order to improve consistency of two approaches. It is expected that once the suggested modifications are realized the aerosol parameters derived from remote sensing are more adapted for the assimilation of the observation and the use of model forecast data (e.g., aerosol vertical distribution, changes in aerosol properties due to humidity variations, etc.) are straight forward for constraining the remote sensing retrieval.