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Modeling of optical properties of aerosol ensembles: MOPSMAP, a flexible tool for online calculations

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The spatiotemporal distribution and characterization of aerosol particles are usually determined by remote sensing and optical in-situ measurements. These measurements are indirect with respect to microphysical properties and require inversion techniques. Scattering theory provides the link between microphysical and optical properties; it is not only needed for such inversions, but also for radiative budget calculations and climate modeling. However, optical modeling can be very time consuming, in particular if non-spherical particles or complex ensembles are involved.

In this contribution we present the MOPSMAP-package (modeled optical properties of ensembles of aerosol particles) which requires only very little computation time for optical modeling even in case of complex aerosols. The package consists of a data set of pre-calculated optical properties of single aerosol particles, a Fortran program which calculates the properties of user-defined aerosol ensembles, and a user-friendly web interface for online calculations. The latter is designed to be intuitive for expert and non-expert users. To support users a large set of default settings is available, e.g. several wavelength-dependent refractive indices, climatologically representative size distributions, and a parameterization of hygroscopic growth. Calculations are possible for single wavelength or user-defined sets (e.g. appropriate to a specific instrument). More options for the size distribution or number of components are available for expert-users. The MOPSMAP-package is also available on request for offline calculations when large numbers of different runs for sensitivity studies shall be made.

MOPSMAP provides the most basic optical properties, especially the scattering matrix for the selected wavelengths. Moreover, the output includes tables (in ascii or netCDF format) of frequently used properties such as the single scattering albedo, the asymmetry parameter or the lidar ratio. The web interface shows plots for immediate visualization of the results. The complete output can be downloaded for further applications. All input parameters and results are stored in the user's personal folder so that calculations can easily be reproduced.