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Definition of typical spherical and non-spherical aerosol classes from AERONET data for optical thickness retrieval from space observations

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Aerosol optical thickness retrieval from space imager observations fundamentally relies on the inversion of the radiative transfer equation. Such inversion is supported by a wide range of different approaches, ranging from simple empirical methods up to sophisticated algorithms based on optimal estimation. Within the radiative transfer equation, aerosols absorption and scattering effects are represented by the single scattering albedo and phase function. Hence, these two parameters represent the fundamental variables that characterise aerosols radiative properties within a retrieval system. In this framework, an aerosol class could be defined as an ensemble of particles with similar single scattering albedo and phase function spectral variations.

An original method has thus been developed to systematically analyse AERONET observations following this concept of aerosol class, discriminating between spherical and non-spherical particles. This analysis reveals that spherical particles are primarily organised as a function of the single scattering albedo whereas non-spherical particles are essentially organised according to the ratio between the fine and the coarse mode.

Such type of aerosol classes has been used in an optimal estimation retrieval scheme designed to derive aerosol optical thickness from MSG/SEVIRI observations over land surfaces. The results are compared with retrievals made by using existing classes found in the literature.