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# Aerosol models for the retrieval of aerosol properties from satellite observations

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The retrieval of aerosol properties from satellite observations is an underdetermined problem, i.e. the number of independent observations is smaller than the number of physical parameters (degrees of freedom) needed to describe the aerosol properties. Therefore a number of assumptions needs to be made to constrain the problem and derive a set of equations that can be solved. The most important problems for aerosol retrieval are the detection of clouds, the treatment of surface reflectance and the assumptions on the aerosol models. Assuming that only cloud-free observations are used and that the contributions of the surface and atmospheric gases to the reflectance are adequately handled, the remaining problem is the determination of the aerosol properties. This is usually achieved by comparison of the path radiance, i.e. that radiance due to atmospheric constituents, with radiances computed using a radiative transfer model. The aerosol contribution to the path radiance is modelled using a set of 'effective' aerosol models described by the particle size distribution and the refractive index of the particles. The aerosol optical properties are computed using a Mie code for spherical particles while for other particles, in particular dust, their non-sphericity needs to be taken into account.

The aerosol models used in the various aerosol retrieval codes which are currently used differ in their physical and optical characteristics. Also the number of models and combinations thereof varies between different codes. The aerosol models used in the retrieval determine the outcomes of the retrieval process, i.e. how well the basic parameters such as the aerosol optical depth (AOD) at the available wavelengths are determined, and thus also how well other parameters can be derived.

In the ESA supported Aerosol-cci (climate change initiative) a discussion has been started to formulated a set of aerosol models for use in retrieval algorithms that is supported by the wide community, including experts from outside the Aerosol-cci project. The discussion aims to provide a limited number of models based on current knowledge from a variety of sources (AERONET, laboratory and field measurements) which effectively describes a wide number of situations. The a priori selection of the models to be used in each retrieval may be based on a model-derived climatology.

The current status and conclusions of these investigations will be described.