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Retrieval of single scattering albedo from satellite and in-situ observations

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Three different methods of retrieval of single scattering albedo of atmospheric aerosols (SSA) are presented.
First algorithm derive single scattering albedo from synergy of the satellite and ground-based observations. The Spinning Enhanced Visible Infrared Radiometer (SEVIRI) and sun photometer data is used. SEVIRI, on board MSG2, offers new capabilities to monitor aerosol loading over land at high temporal and spatial resolution. In order to retrieve single scattering albedo inverse methods are applied. For simulations of satellite observations 6S (Second Simulation of a Satellite Signal in the Solar Spectrum) radiative transfer model is used. First of all algorithm provide surface reflectance based on the cost function minimization. To estimate this parameter, which is the main difficulty in determination of aerosol optical properties over land, surface observations of aerosol optical thickness from sun photometer during a day with low aerosol content in the atmosphere are used. Assuming that surface reflectance at SEVIRI resolution change slowly with time previous result can be used to calculate single scattering albedo for next's or previous days.
Second way to retrieve values of single scattering albedo is to use Multi-Filter Rotating Shadowband Radiometer (MFR-7 model) observations. MFR is a field instrument that simultaneously measures global, diffuse, and direct normal components of spectral solar irradiance. The SSA is retrieved based on the diffuse-to direct ratio measured at 415 and 870 nm and simulated by (MODerate resolution atmospheric TRANsmission code (MODTRAN). In both described techniques SSA in the vertical column of the atmosphere is estimated.
Last method is based on joint use of polar nephelometer and aethalometer data, and derive SSA at the surface. Aethalometer is filter-based instrument that provide information about absorbing aerosols in the atmosphere. These measurements allow to calculate aerosol absorption coefficient if a couple of correction factors is taken into account. Among others, in order to include information about aerosol scattering data from nephelometer is needed. Moreover, because polar nephelometer (Aurora 4000) measure scattering and backscattering at different angles it's possible to perform better estimation of asymmetry parameter and improve the scattering correction in the aethalometer data.