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Retrieval of Aerosol Height with TROPOMI

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The Tropospheric Monitoring Instrument (TROPOMI), to be launched in 2015, will feature a new aerosol product providing the height of aerosol layers. Aerosol Layer Height will be one of two aerosol products, the other one being the Absorbing Aerosol Index. TROPOMI is a UV-VIS-NIR imaging spectrometer with daily global coverage. It will be part of ESA's Sentinel-5 Precursor mission. Algorithm development for the aerosol height product is currently underway at KNMI.
In this presentation we will introduce the algorithm, highlight some of the development issues and discuss possible applications and example aerosol cases.
Aerosol height observations from the near-infrared wavelength range will improve retrieval of other aerosol properties, particularly retrieval of absorption optical thickness. An increase in absorption in the ultraviolet wavelength range can be due to a higher imaginary part of the refractive index or to the aerosol layer being at a higher altitude. Independent height observations will therefore further constrain retrieval of the single scattering albedo.
Furthermore, aerosol profile information is an important parameter when estimating radiative forcings and climate impacts of aerosol, it is a significant source of uncertainty in trace gas retrieval and it helps in understanding atmospheric transport mechanisms. Finally, timely available, global observations of aerosol height will be of interest to aviation safety agencies.
The retrieval algorithm for aerosol height will be based on absorption by oxygen in the A-band (759-770 nm). Aerosols are assumed to be contained in a single layer. A spectral fit of reflectance (resolution 0.5 nm) across the absorption band provides layer height. The retrieval method will be optimal estimation to ensure a proper error analysis.
Sensitivity studies have indicated that accuracy and precision of retrieved height for cloud-free scenes will be well below the TROPOMI science requirements (1 km). They have also shown that retrieval is robust against inaccurate knowledge of the single scattering albedo and that precise knowledge of the phase function or the surface albedo is not needed.