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Detection of desert dust aerosol using S5P DOAS observations

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In many arid parts of the world, dust from deserts and other dry surfaces can be uplifted into the air and become the largest fraction of atmospheric aerosols. Dust aerosol outbreaks can affect large areas, and have important effects on air quality, visibility, human health, and also on the transport of trace elements towards remote ocean regions.

Desert dust outbreaks can be observed from space in visible satellite images and quantified by aerosol retrieval methods which separate the contributions from surface reflection, scattering on air molecules and scattering by particles on the observed top of atmosphere reflectance based on the analysis of discrete wavelength bands.

A few years ago, a spectral interference of the surface spectral reflectance of deserts was found in GOME-2 satellite retrievals of atmospheric nitrogen dioxide (NO_2) from space borne observations in the wavelength region 450 - 497 nm. This spectral signature which appears to be unique to certain desert soils was subsequently also identified in measurements of other satellites and in airborne data.

Here, we use measurements of the TROPOMI instrument on the recently launched S5P satellite to investigate the global distribution of the spectral sand signal and show that it is not only found over deserts, but can also be used to detect large desert dust aerosol events, mainly over the ocean but also over land.