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Applications of UV Scattering and Absorbing Aerosol Indices

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Aerosols cause a substantial amount of radiative forcing, but quantifying this amount is difficult: determining aerosol concentrations in the atmosphere and, especially, characterizing their (optical) properties, has proved to be quite a challenge.
A good way to monitor aerosol characteristics on a global scale is to perform satellite remote sensing. Most satellite aerosol retrieval algorithms are based on fitting of aerosol-induced changes in earth reflectance, which are usually subtle and have a smooth wavelength dependence. In such algorithms certain aerosol models are assumed, where optical parameters such as single scattering albedo, asymmetry parameter and size parameter (or Angstrom exponent) are defined.
Another, semi-quantitative technique for detecting aerosols is the calculation of UV Aerosol Indices (UVAI). The Absorbing and Scattering Aerosol Indices detect "UV-absorbing" aerosols (most notably mineral dust, black and brown carbon particles) and "scattering" aerosols (sulfate and secondary organic aerosol particles), respectively.
UVAI are essentially a measure of the contrast between two wavelengths in the UV range. The advantages of UVAI are: they can be determined in the presence of clouds, they are rather insensitive to surface type, and they are very sensitive to aerosols. The Absorbing Aerosol Index (AAI) has been in use for over a decade, and the Scattering Aerosol Index (SAI) was recently introduced by our group. Whereas the AAI is mainly used to detect desert dust and biomass burning plumes, the SAI can be used to study regions with high concentrations of non-absorbing aerosols, either anthropogenic (e.g. sulfate aerosols in eastern China) or biogenic (e.g. secondary organic aerosols formed from VOCs emitted by plants).
Here we will present our recent UVAI results from SCIAMACHY: we will discuss the seasonal trend of SAI, and correlate our UVAI data with other datasets such as trace gases (HCHO, NO2, CO) and fire counts from the (A)ATSR instrument. In addition, our UVAI are qualitatively compared to ground-based AERONET measurements of aerosols.