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UV Aerosol Indices from SCIAMACHY: introducing the SCattering Index (SCI)

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Abstract. The Absorbing Aerosol Index (AAI) is a useful tool for detecting aerosols that absorb UV radiation – especially in cases where other aerosol retrievals fail, such as over bright surfaces (e.g. desert) and in the presence of clouds. The AAI does not, however, consider contributions from scattering (hardly absorbing) aerosols and clouds: they cause negative AAI values and are usually disregarded. In this paper, we demonstrate the use of the AAI's negative counterpart, the SCattering Index (SCI) to detect scattering aerosols. Consideration of the full UV Aerosol Index scale is of importance if the Aerosol Index is to be used for the quantification of aerosol absorption in the future.

Maps of seasonally averaged SCI show significantly enhanced values in summer in Southeast USA and Southeast Asia, pointing to a high production of scattering aerosols (presumably mainly sulphate aerosols and secondary organic aerosols) in this season. The application of a cloud filter makes the presence of scattering aerosols even more clear. Radiative transfer calculations were performed to investigate the sensitivity of AAI and SCI to cloud parameters, and it is demonstrated that clouds cause significant SCI, in some special cases even small AAI values. The results from cloud modelling imply that cloud effects need to be taken into account when AAI and SCI are used in a quantitative manner.

The paper concludes with a comparison of aerosol parameters from AERONET and our Aerosol Indices (AAI and SCI) from SCIAMACHY, where reasonable agreement was found for six AERONET stations in Southeast USA, Southeast Asia, and Africa. These findings corroborate the suitability of SCI as a tool to detect scattering aerosols.

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