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- ensemble techniques
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Estimation of aerosol optical properties and their effect on UV irradiance at Uccle, Belgium

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Aerosols are a major influence in the Earth's energy balance, affecting the incoming radiation by scattering and absorption. This is called the direct effect, while the modifying of cloud optical properties and characteristics makes the aerosol indirect effect. Aerosols have a high temporal and spatial variation and a short lifetime, therefore their various interactions in the atmosphere are difficult to fully understand. Aerosols can have a significant impact on a regional scale, balancing the effect of greenhouse gases, hence their radiative properties are an on-going field of current research projects.

In this study, the effect of aerosols on UV irradiance reaching the ground and the single scattering albedo are derived, at Uccle, Belgium. Measurements of ozone, UV radiation at 320 nm (corrected for the cosine effect) and the AOD (derived through the Langley Plot Method) are provided on a daily basis from the Brewer#178 instrument at Uccle. AOD measurements from a collocated Cimel sunphotometer, part of the Aerosol Robotic Network (AERONET) are also provided. To avoid cloud contamination, only the simultaneous measurements of the two instruments are kept, based on the fact that the Cimel data are already cloud-screened. This results in data processing from July 2006 until May 2010.

Calculations with the radiative transfer code UVSPEC of the LibRadtran package are used in order to estimate the aerosol effect on irradiance at 320 nm from the spectral measurements of the Brewer. Another set of theoretical calculations is performed with UVSPEC to estimate the single scattering albedo of aerosols and the results are compared with those from AERONET. The accuracy of the single scattering albedo estimation depends on the aerosol load and the solar zenith angle at the time of the measurement and is higher for low AOD values and higher zenith angles.