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Validation of UV-visible aerosol optical thickness retrieved from spectroradiometer measurements

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Abstract. Global and diffuse UV-visible solar irradiances are routinely measured since 2003 with a spectroradiometer operated by the Laboratoire d'Optique Atmosphérique (LOA) located in Villeneuve d'Ascq, France. The analysis of the direct irradiance derived by cloudless conditions enables retrieving the aerosol optical thickness (AOT) spectrum in the 330–450 nm range. The site hosts also sunphotometers from the AERONET/PHOTONS network performing routinely measurements of the AOT at several wavelengths. On one hand, comparisons between the spectroradiometer and the sunphotometer AOT at 440 nm as well as, when available, at 340 and 380 nm, show good agreement: in 2003–2005 at 440 nm the correlation coefficient, the slope and the intercept of the regression line are [0.97, 0.95, 0.025], and in 2006 at 440, 380 and 340 nm they are [0.97, 1.00, –0.013], [0.97, 0.98, –0.007], and [0.98, 0.98, –0.002] respectively. On the other hand, the AOT's spectral variations have been compared using the Angström exponents derived from AOT data at 340 and 440 nm for both instruments. The comparisons show that this parameter is difficult to retrieve accurately due to the small wavelength range and due to the weak AOT values. Thus, AOT derived at wavelengths outside the spectroradiometer range by means of an extrapolation using the Angström parameter would have large uncertainties, whereas spectroradiometer's spectral AOT could be used for direct validation of other AOT, such as those provided by satellite instruments.

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