



Quantification of the direct aerosol effect for Cabauw, the Netherlands

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Ground-based measurements of direct and diffuse solar irradiances in combination with radiative transfer calculations for cloudless skies were used to quantify the direct aerosol effect for the BSRN station of Cabauw, the Netherlands. The radiative transfer calculations were performed for atmospheres containing all constituents except aerosols. The direct aerosol effect was then calculated as the difference between the measured and simulated solar irradiance. Cloudless situations were selected using different shortwave and longwave cloud detection algorithms. For 2006 the mean direct aerosol effect for global irradiance appeared to be -30 W m^{-2} . A highly linear correlation between the direct effect and the aerosol optical thickness (AOT) was found with a slope of 12 W m^{-2} per 0.1 unit of AOT. On the basis of trajectory analyses we show that the highly variable AOT and dimming effect on global irradiance shows a clear correlation with the origin of the air mass arriving in the measurement area.