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Modelling the impact of satellite retrieved scaled cloud optical thickness on surface UV irradiance and photolysis frequencies for NO2, using Tropospheric Ultraviolet and Visible radiation model

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Clouds affect surface solar irradiance, hence, UV irradiance and also photodissociation, as it mainly occurs under UV range of solar spectrum. In order to investigate this effect, Tropospheric Ultraviolet and Visible radiation (TUV) modelling study is conducted over two stations in Belgium, Ostende (51° 14′N, 2° 56′E) and Redu (50° 00′N, 5° 09′E),.for June 2006

Tropospheric Ultraviolet and Visible(TUV) radiation model is a state-of-the-art designed for studying, among others, the effect of clouds on surface UV radiation and photolysis frequencies for a range of photolytic dissociation reactions.

Remotely sensed scaled cloud optical thickness (scot) retrieved from Spinning Enhanced Visible & Infrared Imager (SEVIRI) and solar zenith angle (θ) are major inputs for this study.

Parametric functions are proposed for UV irradiance under clear sky condition and under cloudy condition as a function of scot & θ. Photolysis frequency for NO_2, as a function of scot & θ, based on TUV results, is parameterised as well.

Modelling results of UV irradiance are compared with station based measurements. The comparison is also done with total solar irradiance at the surface. A good agreement between modelled UV-A and observed UV-A approves the proposed parameterisation. Calculated photolysis frequencies are also very promising as they were never larger than a few percent of the typical daytime value of $J_{NO2} \sim 0.01\ s^{-1}$ when compared to that of earlier studies.