14 years of broadband ground based solar UV index observations in Barcelona: effects of clouds and aerosols

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This study presents an analysis of a 14-year data set of thirty-minute averaged experimental UVI values derived from ground-based broadband irradiance measurements, satellite-derived total ozone observations and total solar radiation recorded in Barcelona (NE Spain). Most maximum daily UVI values do occur at noon (82% of cases between 11:30 to 13:00 UTC). Considering all seasons, the maximum daily UVI presents a bimodal, approximately symmetrical, frequency distribution with a maximum around UVI class 2 (22%) and UVI 7 and 8 classes (23%) while June median presents a value of 8.2. According to attenuation criteria there is a preponderance of Clear sky days (77%) compared to Broken (22%) and Overcast (8%) conditions, which concentrate mostly in October, November and December (reaching 20% of days). An additional classification in terms of World Health Organisation UVI intensity categories indicates that 40% of days exceeded the lower threshold of UVI category Moderate (UVI values above 5.5), from them 21% of days had UVI values considered Very High (above 9.5) and one single case was classified as Extreme (UVI above 10.5). UVI values above 7.5 were found under Broken sky conditions in June, July and August. Additionally UVI diurnal daily cycles have also been analyzed in terms of selected percentile values and maximum levels. Under all sky-conditions UVI median values exceed the lower threshold of category High (5.5) from April to late August around noon (in June from 10:00 to 14:30 UTC). These results provide an exhaustive quantitative description of average and extreme values of experimental UVI values observed in the region and can be of interest for a wide range of applications, including ground-based UV modelling through the use of radiative transfer models, trend analysis or verification of UVI forecasts.