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Long-term trends in spectral surface UV irradiance at Hoher Sonnblick (3106 m a.s.l.)

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Continuous measurements of spectral UV according to the quality requirements of NDACC (Network for the Detection of Atmospheric Composition Change) as well as total ozone measurements are performed by BOKU-Met at Hoher Sonnblick since 1994. The uninterrupted dataset is among the longest in Europe, and unique because of the clean, undisturbed air at the high-altitude mountain observatory. Based on these data-series, long-term trends in surface UV levels are investigated for the time period 1994-2011, accounting for several wavelengths, sub-periods, solar zenith angles and different levels of cloudiness, using parametric trend tests and regression models, further expanding and extending an existing analysis with the newest data sets. Trends that are identified are tested for significance on various levels. The trends are examined in detail to identify changes due to trends in e.g. ozone, albedo, sunshine duration and cloudiness, which could, in the course of a changing global climate, significantly contribute to changing surface UV levels and consequently potential risks to the biosphere.

Throughout the year, significant upward trends are found at wavelengths of 315 nm and longer. The magnitudes at 315 nm range from about +10 %/dec to +14 %/dec for all-sky conditions, depending on solar zenith angle. At 305 nm the trend estimates are considerably smaller and less significant, yielding between +5 %/dec about +8 %/dec. Seasonally, the largest increases are found during winter and spring.

Total ozone has significantly increased by approximately year-round +2 %/dec since 1997 and therefore cannot explain these significant increases. They are rather attributed to decreasing total cloud cover and increased effective albedo through enhanced cloudiness below the observatory over the investigated period.