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Links between extreme UV-radiation, total ozone, surface albedo and cloudiness: An analysis of 30 years of data from Switzerland and Austria

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Since the discovery of anthropogenic ozone depletion in the early 1970s (e.g. Molina and Rowland, 1974; Farman et al., 1985) the interest in stratospheric ozone trends and solar UV-B increased within the scientific community and the general public because of the link between reduced total column ozone and increased UV-radiation doses. Stratospheric ozone (e.g. Koch et al., 2005) and erythemal UV-radiation (e.g. Rieder et al., 2008) in the northern mid-latitudes are characterized by strong temporal variability. Long-term measurements of UV-B radiation are rare and datasets are only available for few locations and most of these measurements do not provide spectral information on the UV part of the spectra. During strong efforts in the reconstruction of erythemal UV, datasets of past UV-radiation doses became available for several measurement sites all over the globe. For Switzerland and Austria reconstructed UV datasets are available for 3 measurement sites (Davos, Sonnblick and Vienna) (Lindfors and Vuilleumier, 2005; Rieder et al., 2008). The world's longest ozone time series dating back to 1926 is available from Arosa, Switzerland, and is discussed in detail by Staehelin et al. (1998a,b). Recently new tools from extreme value theory have been applied to the Arosa time series to describe extreme events in low and high total ozone (Rieder et al., 2009). In our study we address the question of how much of the extremes in UV-radiation can be attributed to extremes in total ozone, high surface albedo and cloudiness. An analysis of the frequency distributions of such extreme events for the last decades is presented to gain a better understanding of the links between extreme erythemal UV-radiation, total ozone, surface albedo and clouds.

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