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Extensive reduction of surface UV radiation since 1750 in world's populated regions

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Abstract. Human activity influences a wide range of components that affect the surface UV radiation levels, among them ozone at high latitudes. We calculate the effect of human-induced changes in the surface erythemally weighted ultra-violet radiation (UV-E) since 1750. We compare results from a radiative transfer model to surface UV-E radiation for year 2000 derived by satellite observations (from Total Ozone Mapping Spectroradiometer) and to ground based measurements at 14 sites. The model correlates well with the observations; the correlation coefficients are 0.97 and 0.98 for satellite and ground based measurements, respectively. In addition to the effect of changes in ozone, we also investigate the effect of changes in SO₂, NO₂, the direct and indirect effects of aerosols, albedo changes and aviation-induced contrails and cirrus. The results show an increase of surface UV-E in polar regions, most strongly in the Southern Hemisphere. Furthermore, our study also shows an extensive surface UV-E reduction over most land areas; a reduction up to 20% since 1750 is found in some industrialized regions. This reduction in UV-E over the industrial period is particularly large in highly populated regions.

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