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Clear sky UV simulations for the 21st century based on ozone and temperature projections from Chemistry-Climate Models

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Abstract. We have estimated changes in surface solar ultraviolet (UV) radiation under cloud free conditions in the 21st century based on simulations of 11 coupled Chemistry-Climate Models (CCMs). The total ozone columns and vertical profiles of ozone and temperature projected from CCMs were used as input to a radiative transfer model in order to calculate the corresponding erythemal irradiance levels. Time series of monthly erythemal irradiance received at the surface during local noon are presented for the period 1960 to 2100. Starting from the first decade of the 21st century, the surface erythemal irradiance decreases globally as a result of the projected stratospheric ozone recovery at rates that are larger in the first half of the 21st century and smaller towards its end. This decreasing tendency varies with latitude, being more pronounced over areas where stratospheric ozone has been depleted the most after 1980. Between 2000 and 2100 surface erythemal irradiance is projected to decrease over midlatitudes by 5 to 15%, while at the southern high latitudes the decrease is twice as much. In this study we have not included effects from changes in cloudiness, surface reflectivity and tropospheric aerosol loading, which will likely be affected in the future due to climate change. Consequently, over some areas the actual changes in future UV radiation may be different depending on the evolution of these parameters.

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