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# Projecting the Surface UV Radiation from CMIP6 Models and how Factors Influencing it are Changing

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Links between stratospheric ozone depletion, climate change and UV variability reaching the ground have been established already in a number of studies. Apart from ozone variability and among other factors, aerosol properties, surface reflectivity and clouds are critical for the modulation of the surface UV radiation levels.

In the first part of the study, we examine the evolution of these variables through the years, as derived from simulations by models participating in the 6$^{th}$ Phase of the Coupled Model Intercomparison Project (CMIP6). The period of interest extends from the years before the peak of the ozone depletion (here we selected as reference period the years 1950-1960), up to the end of the 21$^{st}$ century. For a better understanding of future UV radiation levels, we selected three of the IPCC Shared Socioeconomic Pathways (SSPs); SSP1–2.6 as the most sustainable, SSP3–7.0 with high amounts of GHGs and SSP5–8.5 as the most extreme.

In the second part of the study, we provide an overview of the surface UV changes around the globe, with radiative transfer model (RTM) simulations of solar irradiance using libRadtran version 2.0.3. Monthly mean data of ozone, aerosol optical depth (AOD) at 550 nm and surface reflectivity from CMIP6 models are used as input data for the RTM simulations. Here we present changes of the local noon UV-Index (UVI), after weighting the simulations with the Commission Internationale de l'Éclairage (CIE) erythemal action spectra.

Some key changes in drivers and UVI will be discussed. After the middle of the 21$^{st}$ century there is an increasing trend of total ozone column, and more specifically over the Antarctic region, where the depletion is more pronounced, we find that ozone recovery is projected under SSP3–7.0 and SSP5–8.5, while this never fully occurs under SSP1–2.6. According to RTM simulations, reduction of UVI is expected due to the recovery of the ozone layer after the middle of the 21$^{st}$ century. AOD increases over the areas with strong emissions under the three SSPs, which leads to more scatter of irradiance and consequently to lower surface UVI. Finally, surface reflectivity simulations for the end of the 21$^{st}$ century show reductions under all SSPs, mostly over the high latitudes, mainly attributed to ice melt, resulting in decreases of surface UVI.