







Projected changes in solar radiation in high latitudes may have impacts on many sectors of society, and the findings of this study can be used, e.g., in assessing future climate change induced risks. We did not study changes in the spectrum of solar radiation, but changes in the short-wavelength part, ultraviolet (UV) radiation, reaching the surface may have a significant effect on living organisms, as the UV radiation is well-known for its biological effectiveness in both aquatic and terrestrial ecosystems (EEAP, 2023). Ultraviolet radiation is highly correlated with changes in total incident solar radiation, especially if changes are due to cloudiness, aerosols or surface reflection. In addition, changes in the short-wavelength portion of UV radiation depends on changes in atmospheric ozone.

Changes in solar radiation have direct impacts on human health. Decreasing solar radiation together with shortening snow and ice cover period in winter may lead to more severe symptoms related to seasonal affective disorders (Burenby et al., 2021). In areas of increasing solar radiation where no significant ozone increase is projected, the risks related to excessive UV exposure may increase, in particular, if people spend more time outdoors than nowadays. Changes in radiation also contribute to the thermal sensation that people experience. The climate change induced temperature increase might change dressing habits towards less protective clothes, e.g., longer time periods spent in shorts and T-shirts. The risk of getting skin cancer can then increase. Eye diseases like cataract may also become more common in prolonged UV exposure without adequate UV protection (Lucas et al., 2019).

Arctic ecosystems are very sensitive to changes in climate variables and their compound effects. For instance, rapidly increasing temperatures and decreasing snow and ice cover may lead to unprecedented exposure of aquatic ecosystem to solar radiation in cl. UV-radiation, also in seasons that in past climates used to be well protected from radiation under the snow. That may affect, for example, small aquatic organisms that lack a shell structure as well as fish eggs which are especially vulnerable to UV radiation. UV radiation also acts as a driver for chemical reactions in the atmosphere which affect air quality, e.g., altering the production and decomposition of O<sub>3</sub> at ground level. In addition, UV radiation is known to degrade materials, which can be observed as fading, yellowing, and embrittlement (UNEP, 2023).

We conclude that future changes in incident solar radiation in high latitude areas are substantial and should be taken into account more comprehensively in climate change impact studies and in the adaptation plans in these regions.

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