



Effects of stratocumulus clouds and a low-ozone event on ultraviolet erythemal radiation exposure

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Measurements of the basic meteorological parameters and ultraviolet (UV) erythemal radiation (UVER) were performed in Didcot, England, on 6 and 7 April 2017. The UVER data was collected by dosimeters, which consist of two sensors (named UVA and UVBC) collecting the erythemally weighted UV-A (320 - 400 nm) and UVBC (UV-B and UV-C, 250 - 320 nm) radiation parts, respectively. Both measurement days were characterized by clear conditions during the morning and afternoon hours. Around noon of both days, however, development of shallow stratocumulus clouds (SSC) occurred. In addition, a low-ozone event (ozone mini-hole) took place on 7 April being characterized by a 34 DU (Dobson Unit) drop in total stratospheric ozone content. Compared to 6 April, the UVER increase as a result of the low-ozone event amounts to 2.67 standard erythema dose (SED) for diffuse and 4.32 SED for global radiation. The corresponding radiation amplification factors (RAF) amount to 1.62 and 1.52 for diffuse and global UVER, respectively. The SSC coverage caused reductions for the total global UVER doses amounting to 2.33 SED (6 April) and 2.81 SED (7 April).

As innovation, we present a decomposition of the RAF into two parts, called cloud ozone factor (COF) and radiation amplification factor based on measured data (RAF_m). The goal of this decomposition is to quantify the low-ozone event's effect and the SSC influence in independently modifying the UVER doses. Hereby the newly introduced COF expresses the weight of each of these two effects acting during the same low-ozone event. For the case presented, the COF values range between -0.13 and -0.11 for diffuse UVER and -0.03 to -0.07 for the global UV and UV-B parts. A positive COF value (0.18) results for the global UV-A range. Negative (positive) COF values correspond to a decreased (increased) cloud influence on the second of both reference days.