Biologically effective UV radiation trend in Florence, Italy as measured at ground station and assessed by remote sensing.

G. Zipoli, L. Fibbi, D. Grifoni e F. Sabatini

Beside some positive effects of solar UV (280-400 nm) radiation (as the stimulation of pre-vitamin D bio-synthesis) it is well documented the risk associated to an overexposure to UV radiation, primarily for what concern skin damages whose first step is the onset of erythema. Based on this consideration, measurements of the amount of UV radiation responsible for erythema (UVery) have been initiated in many countries. Broadband sensors with a spectral sensitivity mimicking the erythema action spectrum made possible the monitoring of this parameter in continuum day after day. On the other hand, satellite-derived data of total O$_3$ and cloud cover associated with radiative transfer model output allow an assessment of daily UVery dose as reported on the web pages of the Tropospheric Emission Monitoring Internet Service, TEMIS (www.temis.nl).

The objective of this study was to compare ground-based and remotely sensed daily UVery data, to analyze the frequency distribution of the daily maximum UV-Index values and the UVery doses to which outdoor workers may be exposed to.

Ground-based data have been recorded in Florence up to now since 2000 with a time step of 15 minutes using a broadband sensor (Solar Light 501A) periodically calibrated during various intercomparison campaigns. Daily erythemal dose have been downloaded also from the TEMIS web pages.

Results indicate that daily doses of UVery remotely sensed are in good agreement with ground-based ones both when considering all the days or only those with clear sky conditions. Nevertheless, TEMIS derived data resulted always higher than ground based ones and average highest difference was reached in June (0.7 KJm$^{-2}$, a 15% less than satellite-derived data). Daily UV-Index maximum (UV$_{\text{I}_{\text{max}}}$) values analyzed according to the WHO classification reported as “protection required”, “moderate” and “high” showed an occurrence respectively of 54.7%, 71.3% and 26.8%. Days classifiable as “very high” accounted for 1.9%. Results are also illustrated in terms of daily UVery doses occurring during the working hours of different months indicating the high level of UVery to which outdoor workers are exposed to respect to 30 Jm$^{-2}$, the limit still proposed by ICNIRP.