

# Effect of altitude and surface albedo variability on global UV-B and total radiation under clear-sky condition

A. Pribullová

Geophysical Institute of the Slovak Academy of Sciences<sup>1</sup>

M. Chmelík

Slovak Hydrometeorological Institute<sup>2</sup>

**Abstract:** Effects of snow cover and altitude on clear-sky global ultraviolet (UV-B) and total (G) solar radiation were studied at two positions in the High Tatras (Slovakia) in the period 2002–2004. The investigated sites are located at altitudes 810 m a.s.l. (Stará Lesná - SL) and 1778 m a.s.l. (Skalnaté Pleso – SP).

The UV-B irradiance corrected for equal total ozone content 300 DU was used to compare UV-B data observed during a period with snow cover and without any snow. The radiative transfer model TUV (Total ultraviolet-visible model) was used for UV-B data correction to uniform total ozone value. A relative increase in the UV-B irradiance caused by snow cover of 12-13% was found at SP, and of 13-16% at SL for SZA in the range of 55° - 65°. The total irradiance increase induced by snow of 12-18% and of 10-14% was determined at SP and SL respectively (SZA in range 55° - 65°).

To isolate the effect of remote snow area on investigated irradiances, the condition with continuous snow cover at SP and that of no snow at foothill position were studied separately. An increase in global irradiance of 7-10% was determined at SL in comparison with situations with snow-free surface at both observatories. No significant increase in the UV-B irradiance was found in this case at SL.

The dependence of studied irradiances on altitude was determined separately with respect to snow presence at compared places. For no-snow condition, the UV-B irradiance increase of 15% /1000 m was found, while the altitudinal gradient of total irradiance was only 6% /1000 m. The UV-B fraction in the total solar radiation increases with altitude – the ratio UV-B/G is of 9% higher at SP by no-snow condition. During the spring months, when continuous snow persists at high altitudes, vertical gradient of the UV-B irradiances increased to 23% /1000 m.

<sup>1</sup> Meteorological observatory of the GPI SAS, Stará Lesná, 059 60 Tatranská Lomnica, Slovak Republic; e-mail: apribull@ta3.sk

<sup>2</sup> Department of distance measurements, 058 01 Poprad-Gánovce, Slovak republic; e-mail: miroslav.chmelik@shmu.sk

**Key words:** global UV-B irradiance, global total irradiance, scattered radiation, reflected radiation, snow cover, altitude, total ozone