

Measurements of solar UV irradiance in high mountains (1999)

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Within a long-term project since 1980 variability and trend of solar UV irradiance as a consequence of short- and long-term variations of atmospheric ozone and of the other atmospheric parameters have been observed at the High Alpine Research Station Jungfraujoch. Annual campaigns of about 8 weeks duration each have been carried out in such a way that the whole seasonal course is covered after a few years. In 1999, the period of measurements covered the months June and July. This time of the year is characterised by the highest solar elevations, and consequently the highest instantaneous values of solar radiation, but it suffers from frequent local cloud formation around noon, so that full days with a clear sky happen very rarely.

The instrumentation of our group is not installed permanently at the High Alpine Research Station Jungfraujoch but is brought up every year for the campaign only. Besides broadband UVB- and UVA-detectors for continuous observations, a double-monochromator spectroradiometer is in use during clear weather conditions, which allows spectral measurements of global and direct solar irradiance between 280 nm and 600 nm with steps of 0.25 nm. The spectral bandwidth of this instrument is 0.42 nm. Total ozone column and spectral extinction by aerosols is derived from spectral measurements of direct sun irradiance and from ancillary sun-photometric measurements. The necessary high quality of the UV measurements is achieved through close international cooperation.

The long-term variation of the biologically significant erythemally weighted UV-irradiance is of special interest because it can be taken as an indicator of harmful reactions of solar UV radiation on humans. From an analysis of UV-measurements on cloudless days at Jungfraujoch during the last 20 years it was possible to derive a small increase of erythemally weighted UVB irradiance by a few percent per decade, which has to be understood in correlation with the observed slight ozone reduction over mid-northern latitudes during the same time. It is now of particular interest to see if this trend might be stopped and possibly even inverted in the next decade as a consequence of the international efforts to preserve the atmospheric ozone layer. Therefore the continuation of the long-term measurements at the High Alpine Research Station Jungfraujoch is planned also for the next years.

References:

Blumthaler M., Haferl D.: Effects of albedo on spectral UV irradiance in high mountains; 24th General Assembly of European Geophysical Society, The Hague (Netherlands), 1999; Geophysical Research Abstracts, Vol. 1, 2, p 475.

