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The influence of additional environmental parameters on the calibration of broadband radiometers for erythemally effective UV irradiance.

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Measurements of spectrally weighted UV radiation by broadband radiometers are widely performed. The quality of the resulting UV irradiances strongly depends on the complexity and accuracy of the applied calibration procedure. Using broadband instruments, deviations of the detectors from ideal behaviour with respect to cosine response and spectral sensitivity, complicate the transformation of signal output into irradiance. Thus, following just the recommendations of the manufactures, i. e. the application of a constant calibration factor or a calibration function depending only on solar elevation, results in poor absolute accuracy and potential errors in derived irradiances in the order of +/- 30 %. Significant improvement can be obtained by the application of a calibration matrix considering total ozone content and solar elevation during the measurement, which should be state of the art. These method demands an accurate laboratory characterisation of the spectral sensitivity and the angular response with respect to the angle of radiation incidence. With this an absolute accuracy better than +/- 5 % can be achieved, at least for cloud free conditions necessary for a calibration.

Several years of measurements in the Zugspitz region of the German Alps (summit 2965 m; environmental research station UFS 2650 m) indicate that the application of the calibration matrices derived for cloud free conditions at Innsbruck (ca. 400 m) can lead to systematic deviations up to +/- 15 % between different instruments at the same location in the presence of clouds. These differences are probably caused by changes in the ratio of diffuse and direct radiation. For a quantification of such effects

a sensitivity study has been performed using radiation transfer calculations.