ULTRAVIOLET EXPOSURE AS A FUNCTION OF WEATHER, OCCUPATION AND 3-D ENVIRONMENT IN VIENNA AND ENVIRONMENT

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Well known effects of Ultraviolet (UV) radiation on human health are among others the premature aging of skin, development of skin cancer, development of eye cataracts, weakening of the immune system. There are also some positive effect of UV on human health such as the production of vitamin D. The UV dose is usually quantified using the erythemal UV irradiance as well as the UV index. Using these quantities it is possible to quantify the stress due to UV radiation.

Within the scope of the present study we investigate the UV exposure as a function of weather, occupation and 3-D environment in Greater Vienna.

Methods

Personal dosimeters:

To determine the dose and the exposure received by our study subjects a Gigahertz X2000 personal dosimeter was worn on the chest. The personal dosimeter allows the determination not only of the exposure but also on the time dependent erythemal UV dose received by the study subject.

Gigahertz X2000 personal dosimeter

### Measurements of erythemal dose as a function of weather, occupation and 3-D environment

Measurements were performed using the personal dosimeters for the following occupations:
- shopping
- walking
- cycling
- sitting in beer garden
- spending time in open air swimming pool

The measurements of the dose and exposure were performed for all the weather conditions for high (>45°) and low (10-30°) solar elevations during two hours. 10 minutes averages of the erythemal dose were obtained. Measurements were performed for each combination of location and solar elevation (= 5 (repetitions) x 6(occupation) x 2 (solar elevation)). All the measurements were performed in the region of Vienna, changes in altitude may therefore not be higher than 100 m. The measurements were performed during the months May, June and July 2006.

Results

We calculated the exposure, the sunburn time, and UV index for each measurement event. The measurements were also referred to the erythemal UV measurements performed at the same time at the nearest stations of the Austrian UVB network
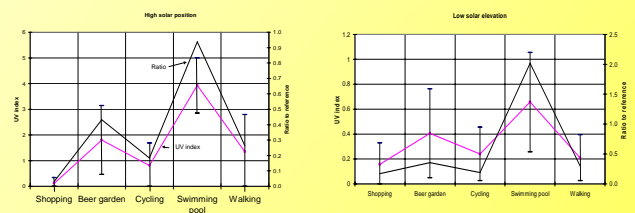
UV index (with respective error bar) and ratio of measured erythemal (dosimeter) UV to UV reference (measured by UV network) for high solar elevations

UV index (with respective error bar) and ratio of measured erythemal (dosimeter) UV to UV reference (measured by UV network) for low solar elevations

Statistical analysis

The significance of the difference between the various occupation was analysed by performing a t-test at a 5% confidence interval

	Shop	Beer	Cycl	Sw im	Walk
Shop	------	sign	sign	sign	sign.
Beer	sign.	------	sign	sign	non
Cycl	sign.	sign	------	sign	non
Sw im	sign.	sign	sign	------	sign.
Walk	sign.	non	non	sign	------

Conclusions

UV exposure is by far the highest when our study subjects were at the outdoor swimming pool. The difference to all other occupations is statistically significant. Here the sun burn time has a mean value around 48 minutes with minimum value around 30 minutes for skin type 2.