

## WOUDC data sponsorship statement document – PMOD/WRC EUVC

Date: 29 April 2011

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Measured quantities: Erythemally weighted solar UV irradiance

### **Contact Information:**

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### **Platform List and description**

PMOD/WRC Davos, lat, long, height 46.82 N ,9.85 E ,1590 m above sea level

Three broadband UV radiometers from Kipp&Zonen, SolarLight, and Yankee, are permanently installed at PMOD/WRC and measure continuously solar UV irradiances as 1 minute averages. They are calibrated yearly relative to the QASUME reference spectroradiometer. Their spectral and angular response is determined yearly in the laboratory. The calibration procedure is described in [1].

### **Data homogenisation:**

The submitted data has been reprocessed, taking into account the calibrations performed before and after the measurement period. The calibrations are linearly interpolated between the two calibration periods for each day in the measurement period.

### **Uncertainties:**

The uncertainties of the UV Radiometers are based on the calibration uncertainty itself, and on the drift of the calibration between two subsequent yearly calibrations. The short and long-term uncertainty is estimated to be between 6% and 9% respectively, depending slightly on the type of Radiometer. A detailed investigation is published in [2] and is appended below:

The European UV Calibration Center (EUVC) at PMOD/WRC maintains a triad of reference broadband radiometers: Solar Light 501 (SL 1493), Kipp & Zonen UV-S-E-T (KZ 560) and Yankee UVB-1 (YES 010938). The radiometers have been installed since January 2007 on the PMOD/WRC roof and record Erythema weighted UV irradiance. The instrument raw data is first processed using the calibration factors obtained in summer 2006 (level3-2006). A second dataset is calculated using all calibrations since then – with a linear interpolation between the calibration periods (level3).

The instruments are calibrated at least annually. The spectral and angular responses are determined in the laboratory and the absolute calibration is obtained outdoors by measurements relative to the reference spectroradiometer QASUME [1]. The uncertainty of the radiometers during the calibration periods is around 6 % (see table 1).

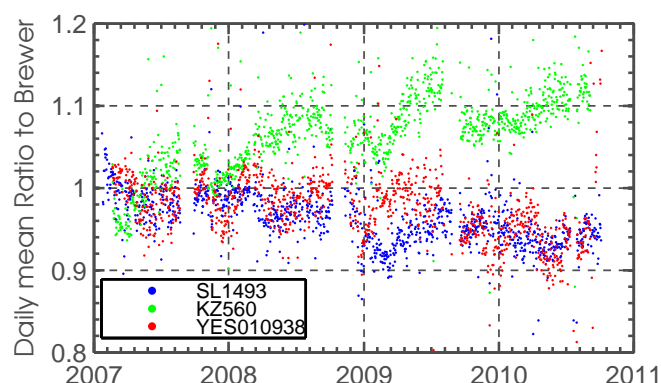
The level3 and level3-2006 datasets are compared with the UV irradiance data recorded by spectrophotometer Brewer #163 since 2007. The Brewer is calibrated relative to the EUVC irradiance scale using 1000W DXW lamps once per year. Outdoor re-calibrations are performed monthly using 250W travel standard lamps.

Figure 1 shows the ratio of the radiometer measurements relative to the reference spectrophotometer measurements as daily means, where only the first calibration in the year 2006 was used. The 95 % variability is listed in Table 1. The sensitivity of the KZ has increased by about 10 % whereas the other two instruments decreased in sensitivity by about 5 %.

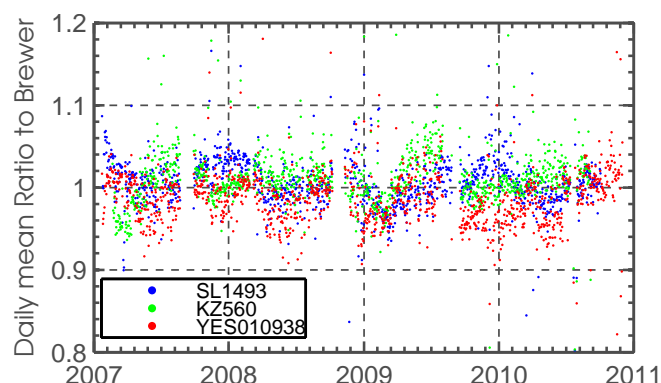
Figure 2 shows the performance of the radiometers using all calibrations in the selected period. As shown in Table 1, the instruments show a short-term expanded uncertainty (90 days) after the calibration of 6.1 % to 6.5%. Using annual recalibrations the expanded uncertainty is on the order of 9 %.

**Table 1.** Variability of Broadband radiometer measurements for the two datasets, the uncertainty of the calibration, the expanded uncertainty for the first 90 days after calibration and the annual uncertainty.

	U(Level3-2006) [%]	U(Level3) [%]	U(Certificate) [%]	U(90) [%]	U(annual) [%]
SL	6.9	6.1	5.7	6.6	8.3
KZ	9.6	6.5	5.9	7.0	8.8
YES	8.2	6.4	6.7	7.4	9.2



**Figure 1.** Broadband radiometer data relative to the Brewer spectrophotometer measurements (level3-2006 dataset).



**Figure 2.** Broadband radiometer data relative to the Brewer spectrophotometer measurements (level3 dataset).

**References:**

[1] Hülsen G., Gröbner J.: 2007, Characterization and calibration of ultraviolet broadband radiometers measuring erythemally weighted irradiance, *Appl. Optics* 46, 5877-5886.  
 [2] Hülsen G, and J. Gröbner, Stability and Accuracy of UV broadband Radiometers, PMOD Annual report 2010, [www.pmodwrc.ch](http://www.pmodwrc.ch), 2011.

**Data use Policy**

Data can be used without restrictions as long as it is acknowledged. If the data has a significant impact on a study or publication, co-authorship should be offered to the responsible scientist.