

Preliminary results on the operative cosine correction in EUBREWNET

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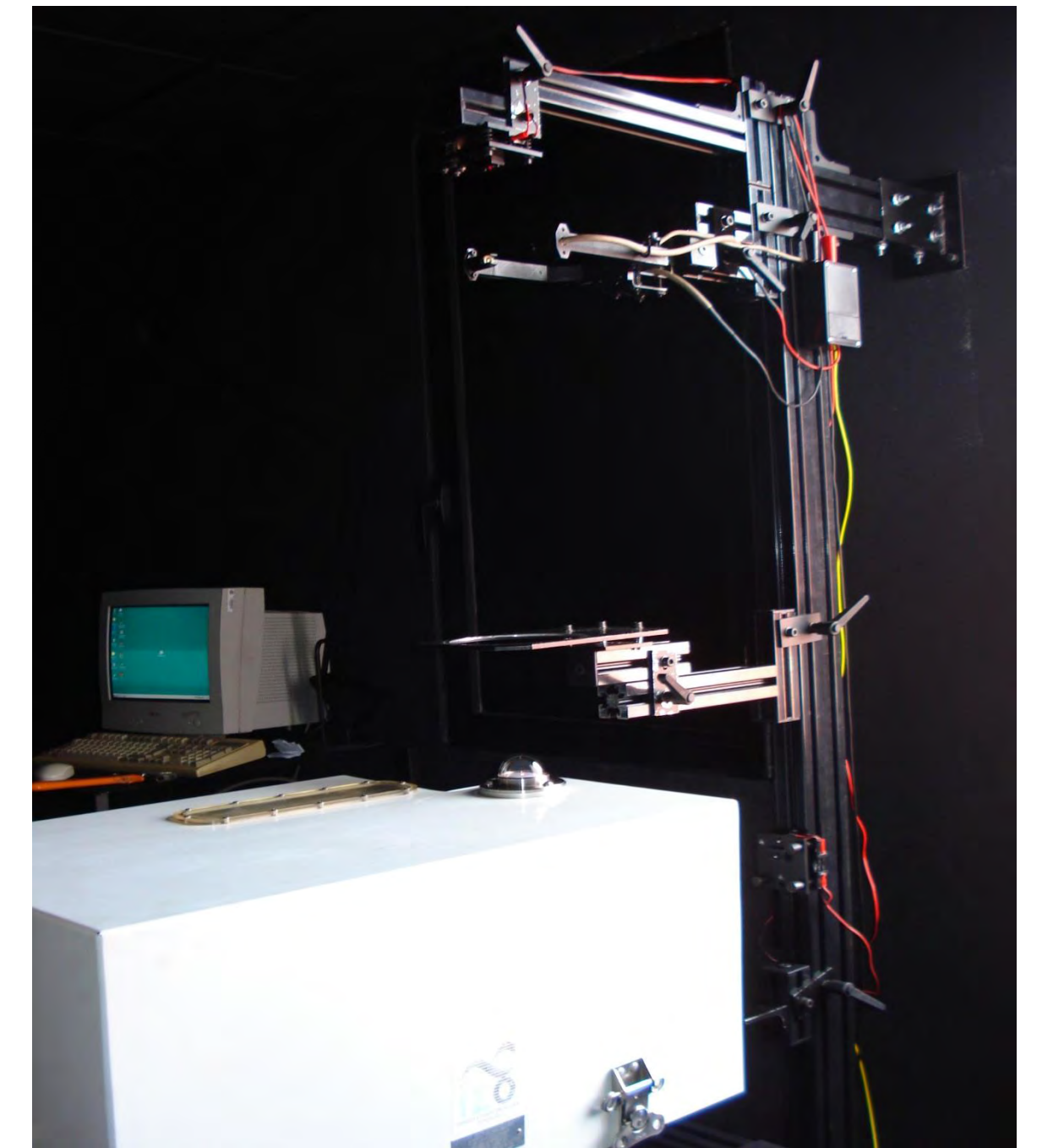
Introduction

The amount of Solar UV radiation reaching the Earth's surface is constantly changing due to the contribution of different factors of very different nature. On the one hand, the distance between the Earth and the Sun is not constant but varies on annual cycle which can be observed analyzing the average values of UV radiation measurements. On the other hand, the UV radiation varies daily due to the presence of external variables such as ozone, aerosols or clouds, which can absorb or scatter the UV radiation [1].

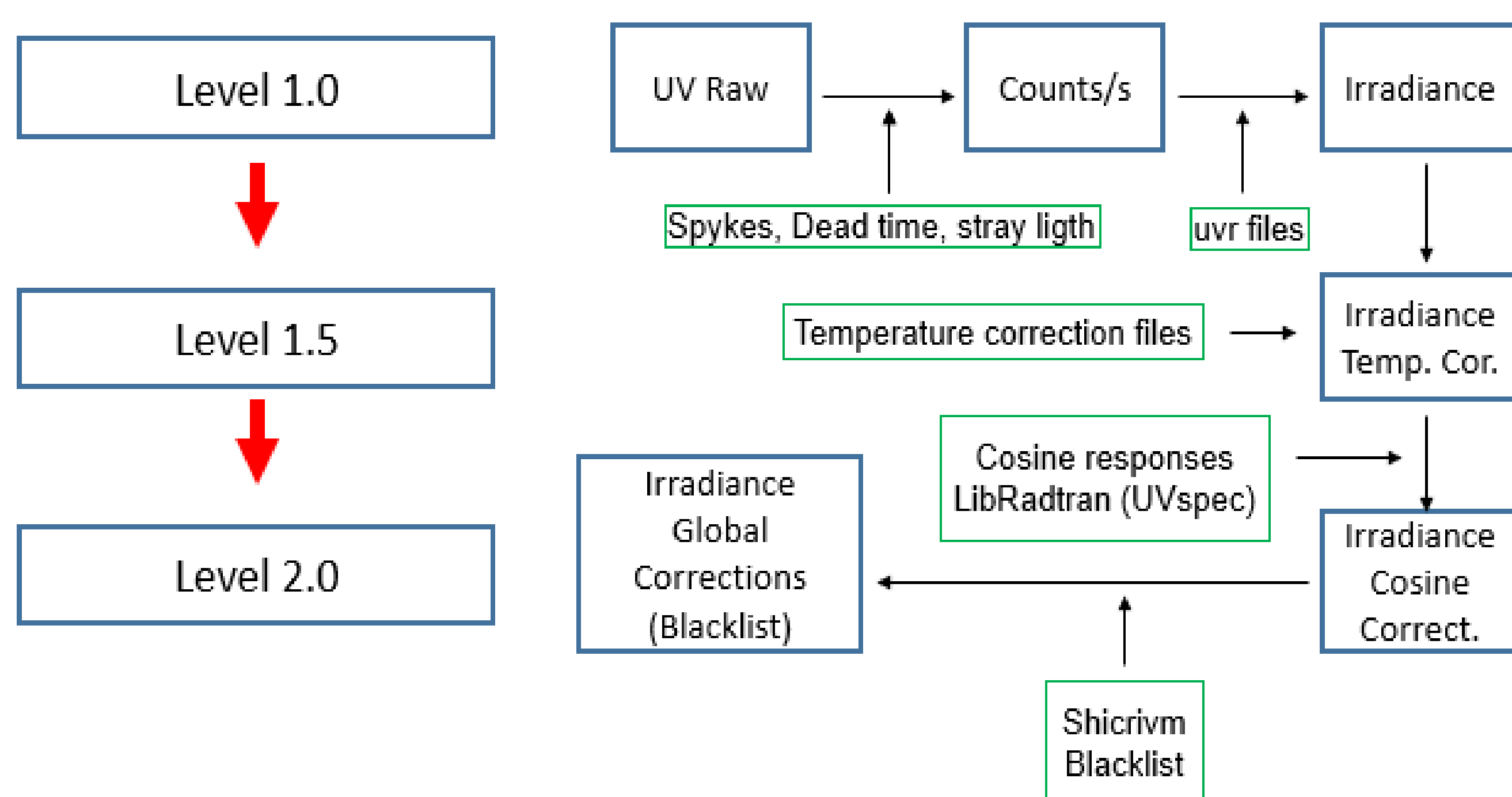
In addition, all the equipment used to measure the solar radiation must be corrected for their instrumental errors. In particular, the Brewer spectroradiometers have a non ideal angular response. In this work, we show the initial results obtained when the UV measurement are corrected regarding the cosine error. The dataset used was collected by different Brewer instruments integrated in the Eubrewnet network [2].

UV Calibration

In order to guarantee the validity of the UV measurements, the Brewers are calibrated each six months with 1000W lamps in the optical laboratory facilities and monthly using a portable calibration system with 200W lamps. Moreover, the Brewer #185 is calibrated annually in respect to the reference of the World Radiation Centre. (PMOD-WRC)



UV data processing levels in Eubrewnet



The UV data processing in Eubrewnet has been configured in a structure of three levels. In the first one, the counts per second and the irradiance, using the UV response file, are calculated. In the second level the temperature correction factor is applied. Finally, the cosine correction factor for global spectral irradiance and the correction for wavelength shifts are introduced in the last level.

Different input parameters in the UV configuration

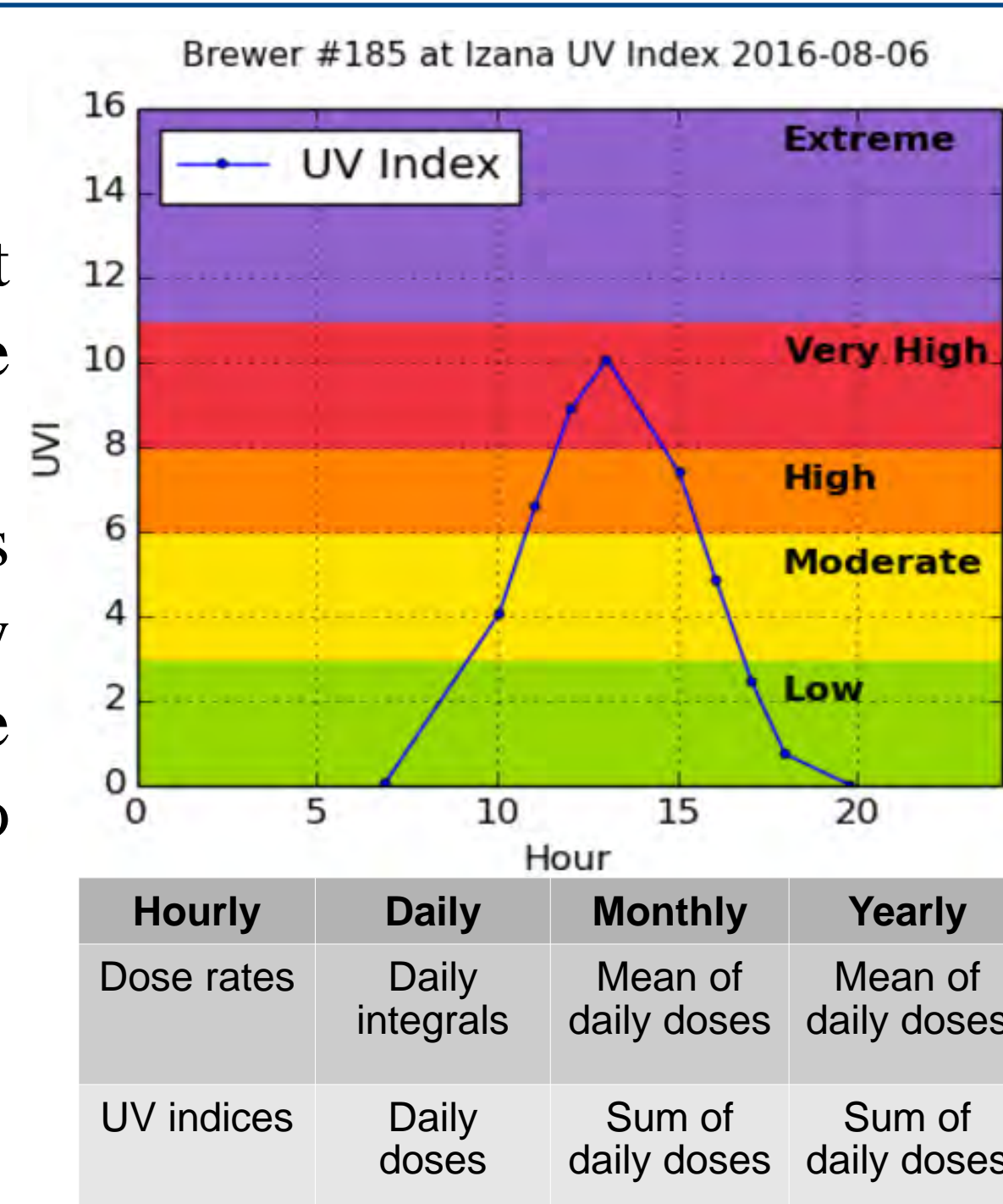
- Upper stray light limit (nm)
- Response file
- UVA reference file
- Temperature correction coefficients
- Reference temperature for T-correction
- Slit function
- Spike correction
- Method of interpolation
- T-circuit coefficient
- Cosine response

UV plots at Eubrewnet

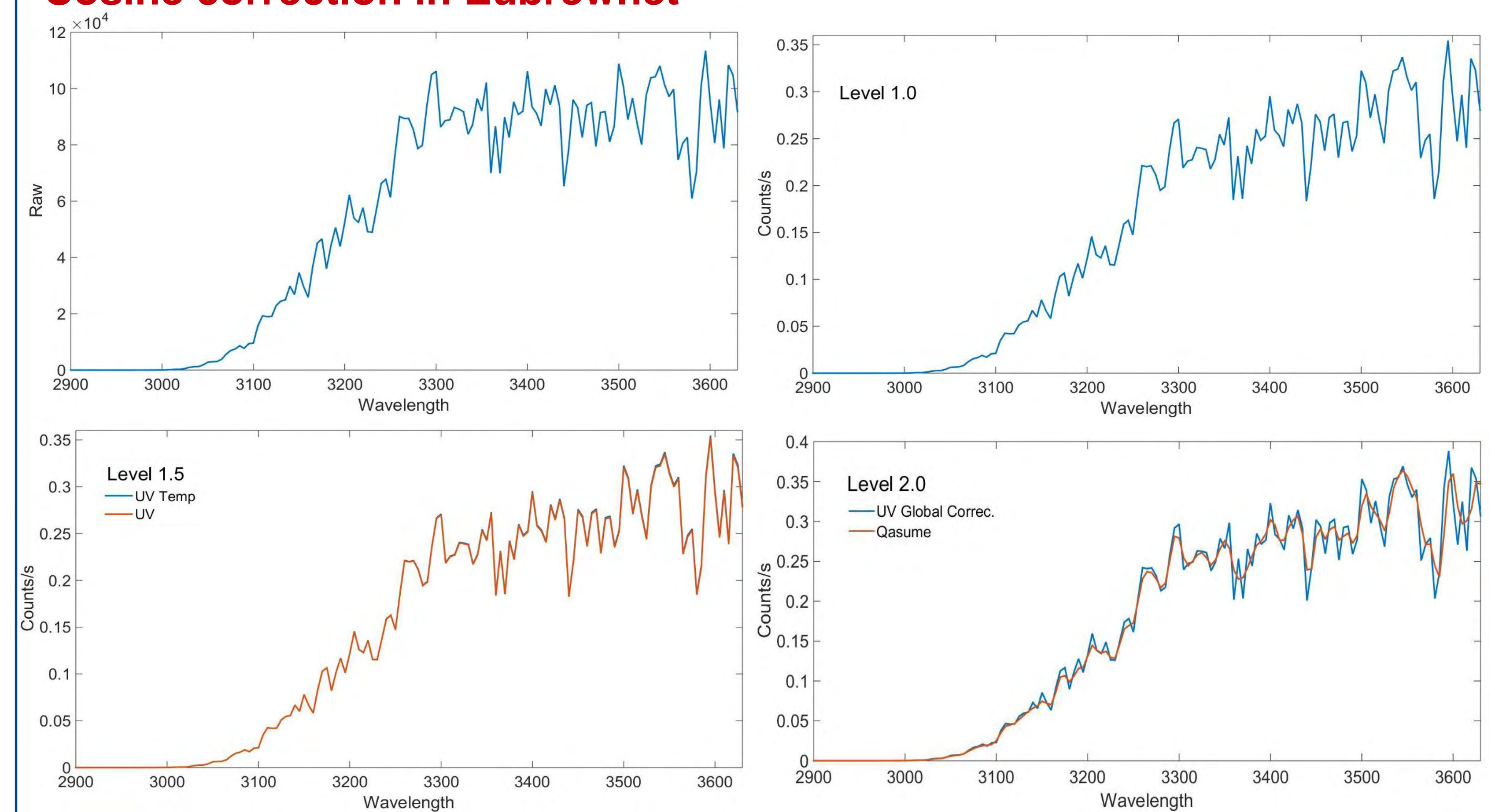
In Eubrewnet, we are working in a set of real-time plots obtained from the UV measurements.

For example, the erythema dose rates (ultraviolet index) are calculated daily for each Brewer station. However, we want to introduce new plots related to other UV measurements:

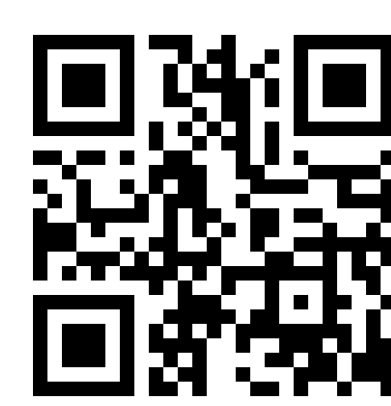
- Vitamin D production.
- DNA Damage.
- UVB
- UVA



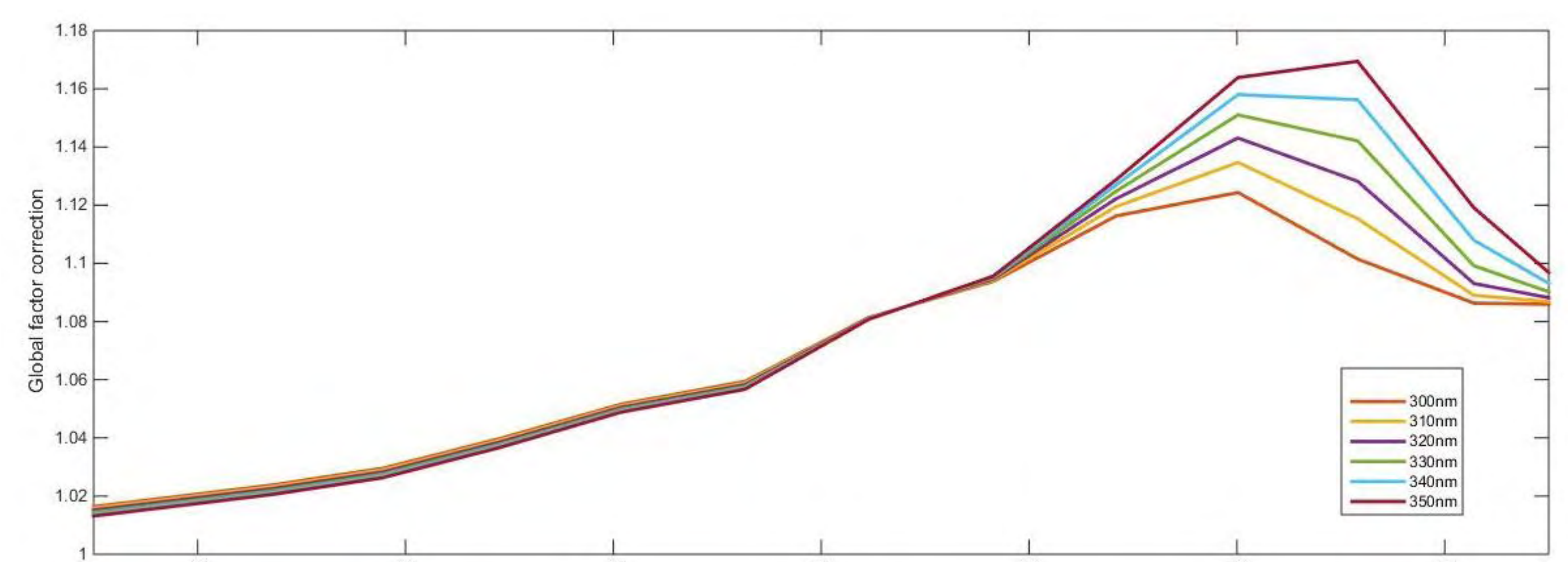
Cosine correction in Eubrewnet



The upper figure shows the UV data processing from raw counts up to Level 2.0. The measurements were obtained during the Huelva Brewer Intercomparison Campaign 2015. The figure below shows the global correction factor obtained from the cosine correction and LibRadtran model. Actually, we are working to obtain a better agreement between the Qasume and Brewer UV measurements, refining the values of other parameters (cloud, solar flux, spectral resolution, etc.) in the input file of the LibRadtran and Shicrivm models.



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Summary

- ▶ We have developed different UV products for the European Brewer Network (EUBREWNET), COST action 1207.
- ▶ All the data required for the UV calibration is available from the RBCCE intercomparison campaigns of the Brewer spectrophotometers.
- ▶ The UV data level 1.0 is available at <http://rbce.aemet.es/eubrewnet>
- ▶ We are working to find the best input parameters for the LibRadtran model to be used in the cosine correction in function of the brewer station.
- ▶ Once fully operational in the EUBREWNET data server, this UV product will be available near-real time for more than 20 Brewer stations.

Acknowledgments

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References

- [1] Ilias Fountoulakis, Alkiviadis F. Bais, Konstantinos Fragkos, Charikleia Meleti, Kleareti Tourpali, and Melina Maria Zempila, "Short and long term variability of spectral solar UV irradiance at Thessaloniki, Greece: effects of changes in aerosols, total ozone and clouds", Atmos. Chem. Phys., 16, 2493–2505, 2016. doi:10.5194/acp1624932016.
- [2] EUBREWNET <http://rbce.aemet.es/eubrewnet>