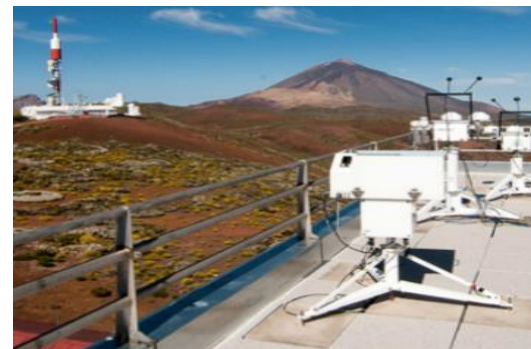# SUV, the new series of Smart UV radiometers

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EMS Budapest, September 5, 2018

Since 1830

Present

Meteorology & Solar Energy

Atmospheric Science

Passion for Precision

Overview

- Introduction UV irradiance
- The new Smart UV sensor
- Lab tests
- Sensitivity matrix
- Outdoor measurements
- Conclusions

SOLAR RADIATION

< 280 nm UV-C	280-315 nm UV-B	315-400 nm UV-A	400-780 nm Visible	780-4000 nm Near Infrared	4-50 µm Far Infrared

UV radiation:

- UV-A: 315 nm – 400 nm : 0 – 90 W/m^2

- UV-B: 280 nm – 315 nm : 0 – 6 W/m^2

- UV-C: 100 nm – 280 nm : blocked by atmosphere

- UV Erythema: erythema weighted dose: 0 – 0.6 W/m^2

Stratosphere

Ozone

uvc

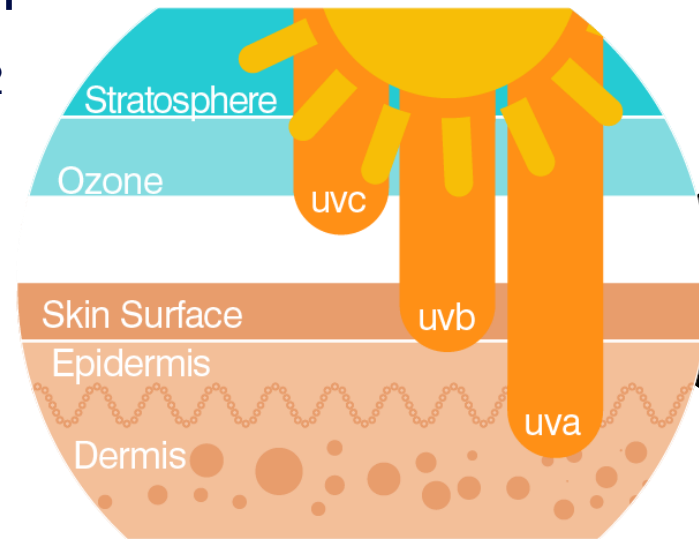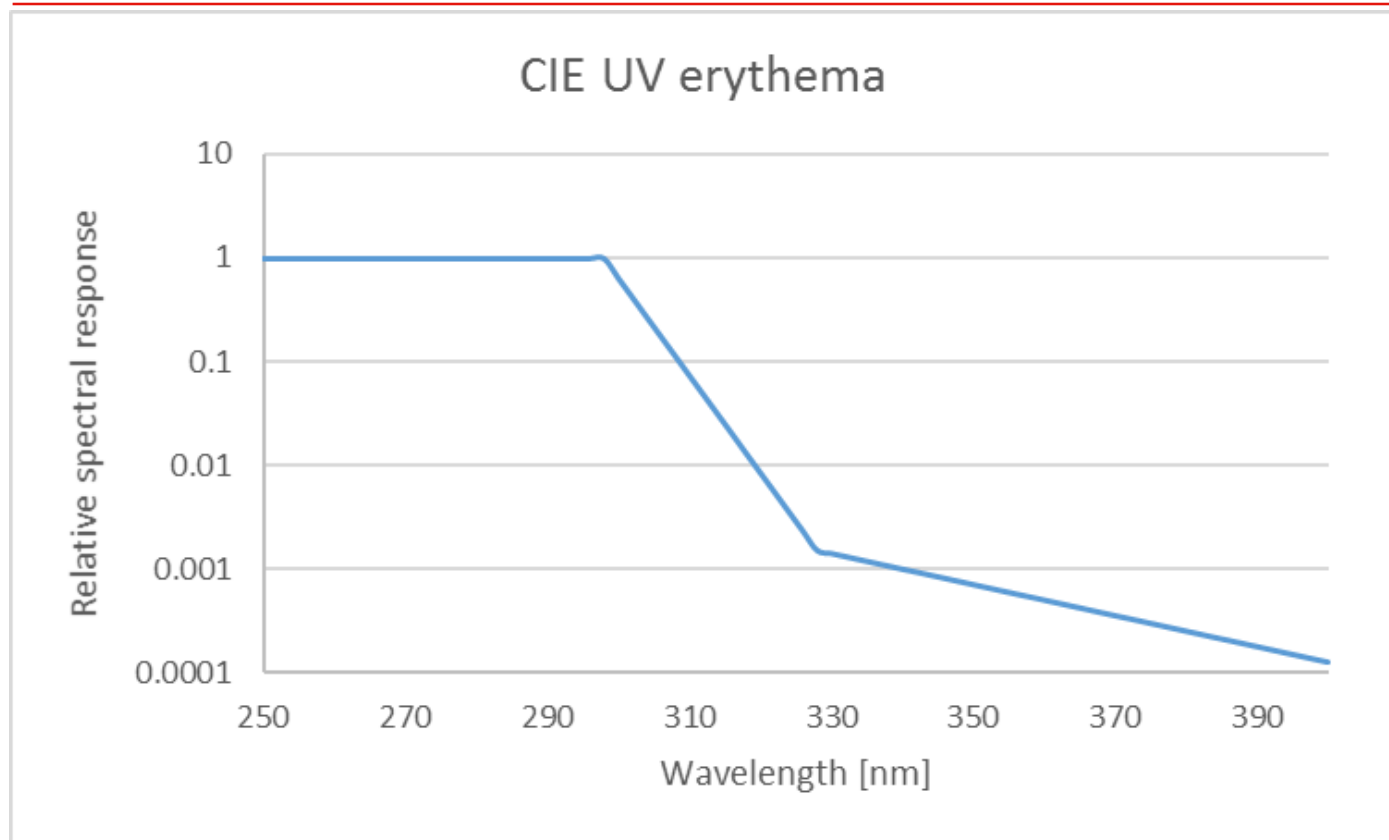Skin Surface

uvb

Epidermis

uva

Dermis

Image courtesy Coolasuncare

UV Erythema curve

Proposed by McKinlay & Diffey (1987)

Model of susceptibility of skin to sunburn

UV-B much more weight than UV-A

UV Index

UV irradiance weighted by CIE UV Erythema curve

UV index: 1 unit equals 25 mW/m^2

UV Index gives risk of harm from sun exposure

UV index	Color	UV-E Irr. [mW/m^2]	Risk
0-2.9	Green	0-74	Low
3-5.9	Yellow	75-149	Moderate
6-7.9	Orange	150-199	High
8-10.9	Red	200-274	Very high
11+	Violet	275+	Extreme

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SUV A
SUV B
SUV E

Quartz diffuser (more stable than Teflon[1])

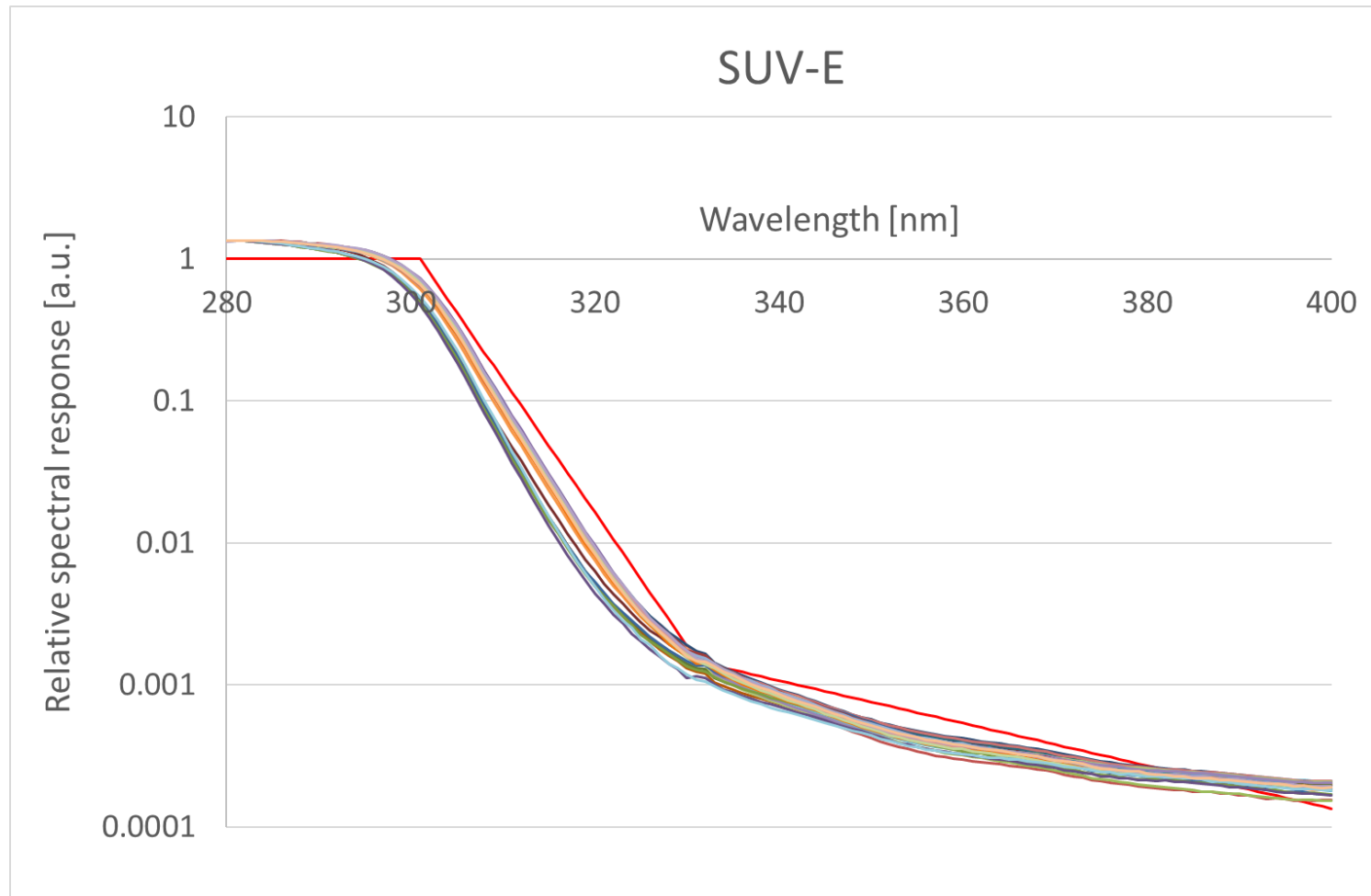Directional response < 2.5% up to 70°

Temperature response < +/- 2%   (-20° to +50°)

Power requirement max. 100 mW

Communication

- RS-485 interface with Modbus® protocol
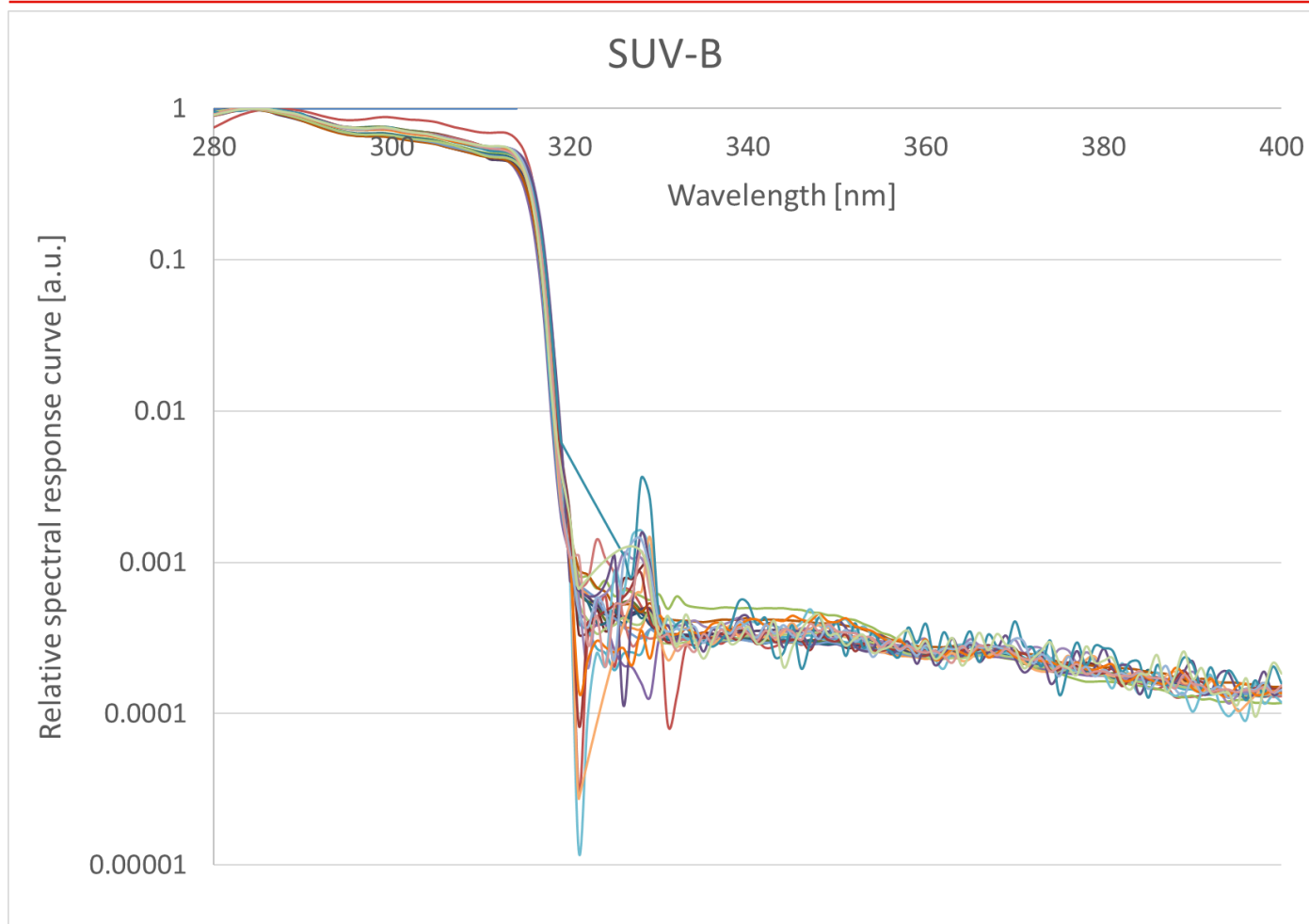- Amplified analogue output 0 – 1 Volt or 4 – 20 mA

[1]Mckenzie et al. 2005

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Lab. response curves of production SUV-E and CIE curve

Lab. response curves of production SUV-B

Due to not 100% match with ideal spectral response there is a sensitivity dependence on Ozone column density and solar zenith angle.
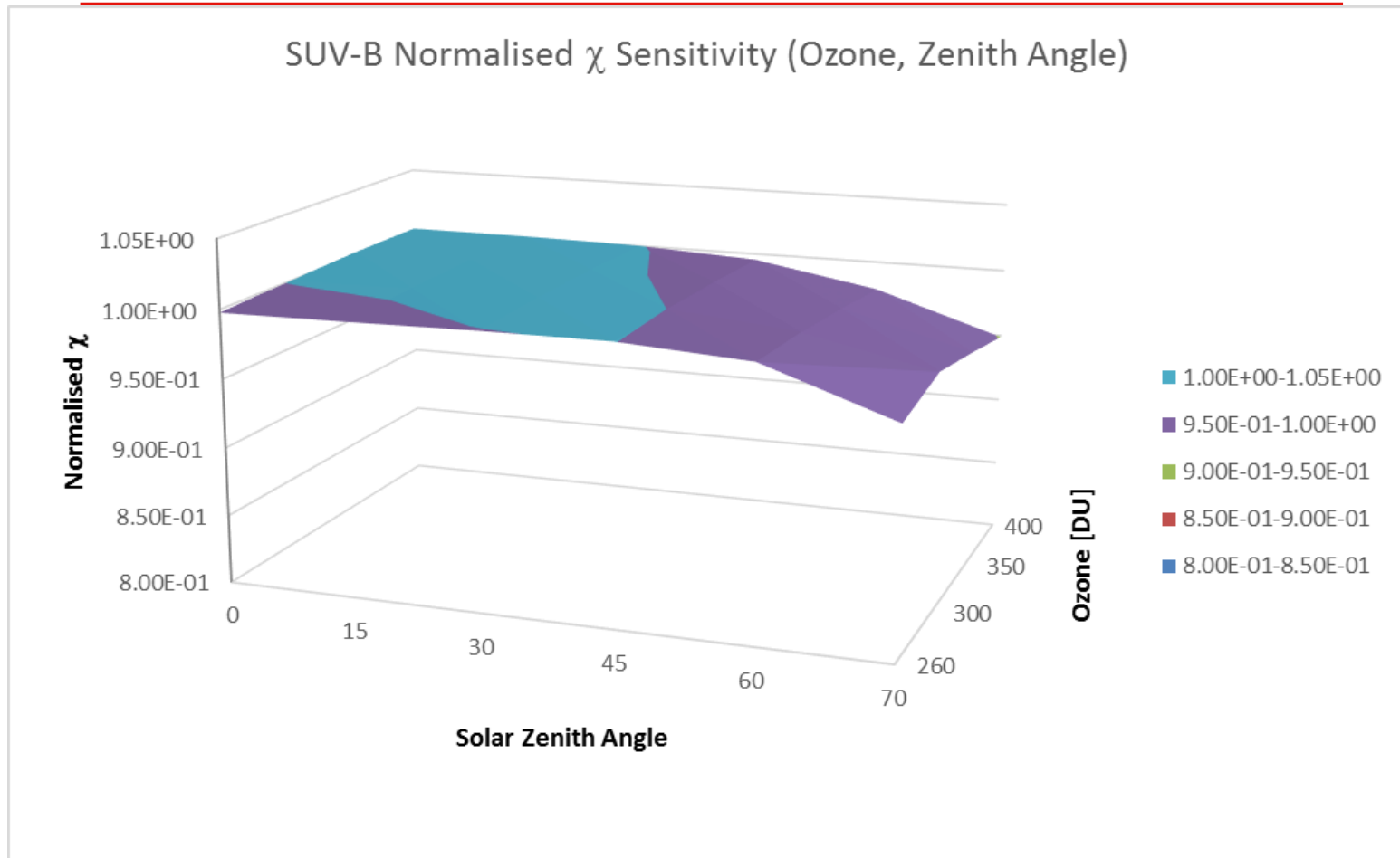
Normalised χ Sensitivity (Ozone, Zenith Angle)
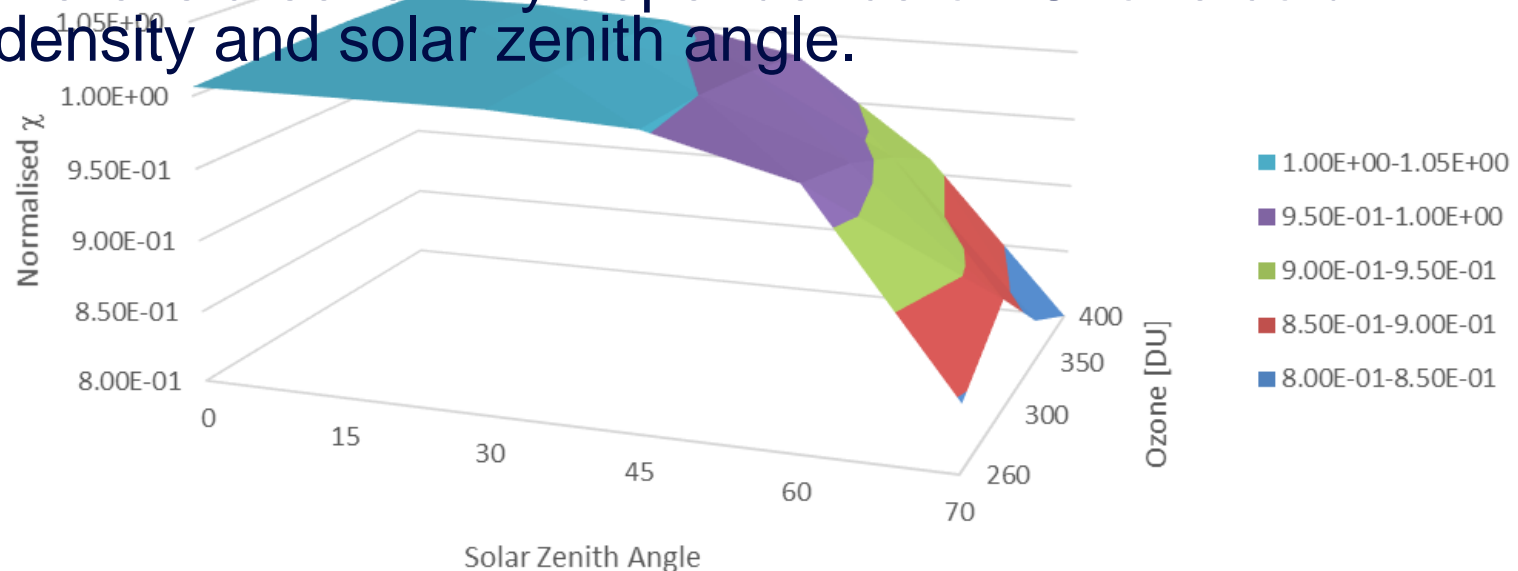
χ Sensitivity as a function of Ozone column density and solar zenith angle. Variation of - 20%.

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SUV-B Normalised χ Sensitivity (Ozone, Zenith Angle)

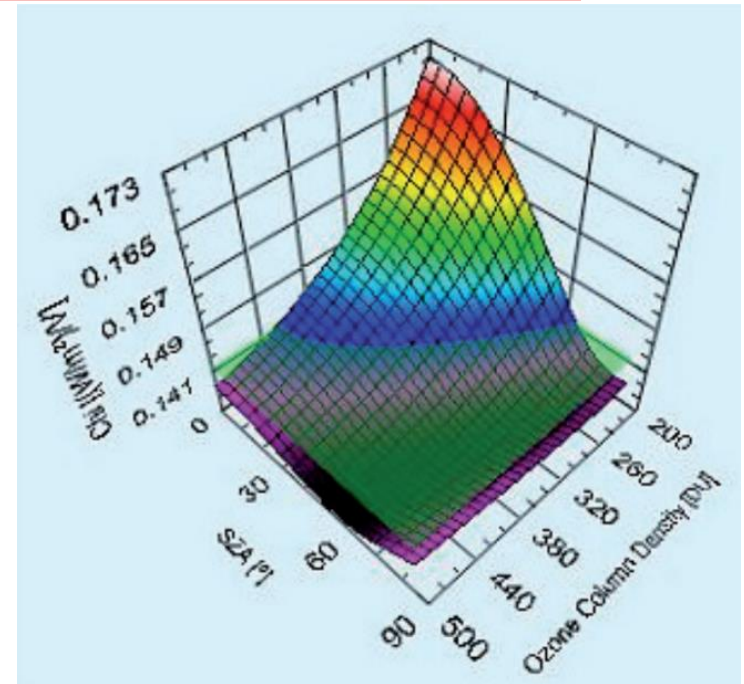Much more constant response for varying zenith angle and ozone. Variation of - 5%.

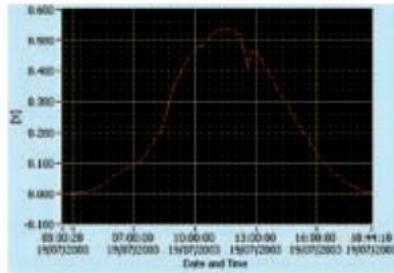χ sensitivity as function of:
- Solar zenith angle
- Ozone column density [DU]

Provided in dcc file
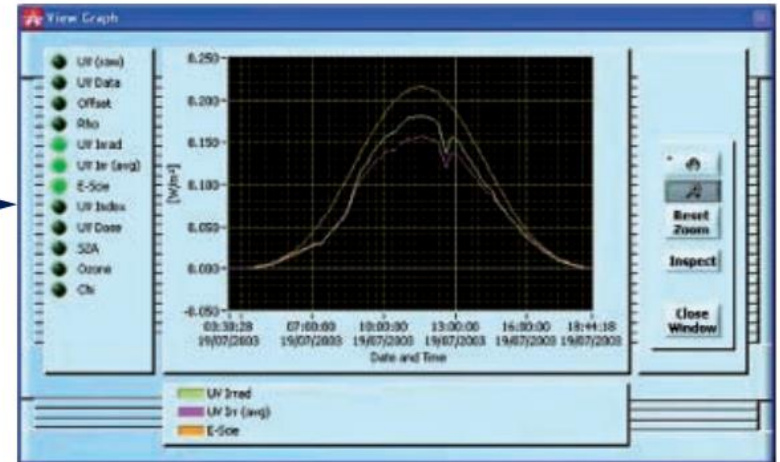
With Uviator software correction for influence of zenith angle and Ozone possible

Calculate UV irradiance by multiplying the radiometer measurement with the correction factor χ

Input: file of measurements over time, location, ozone data
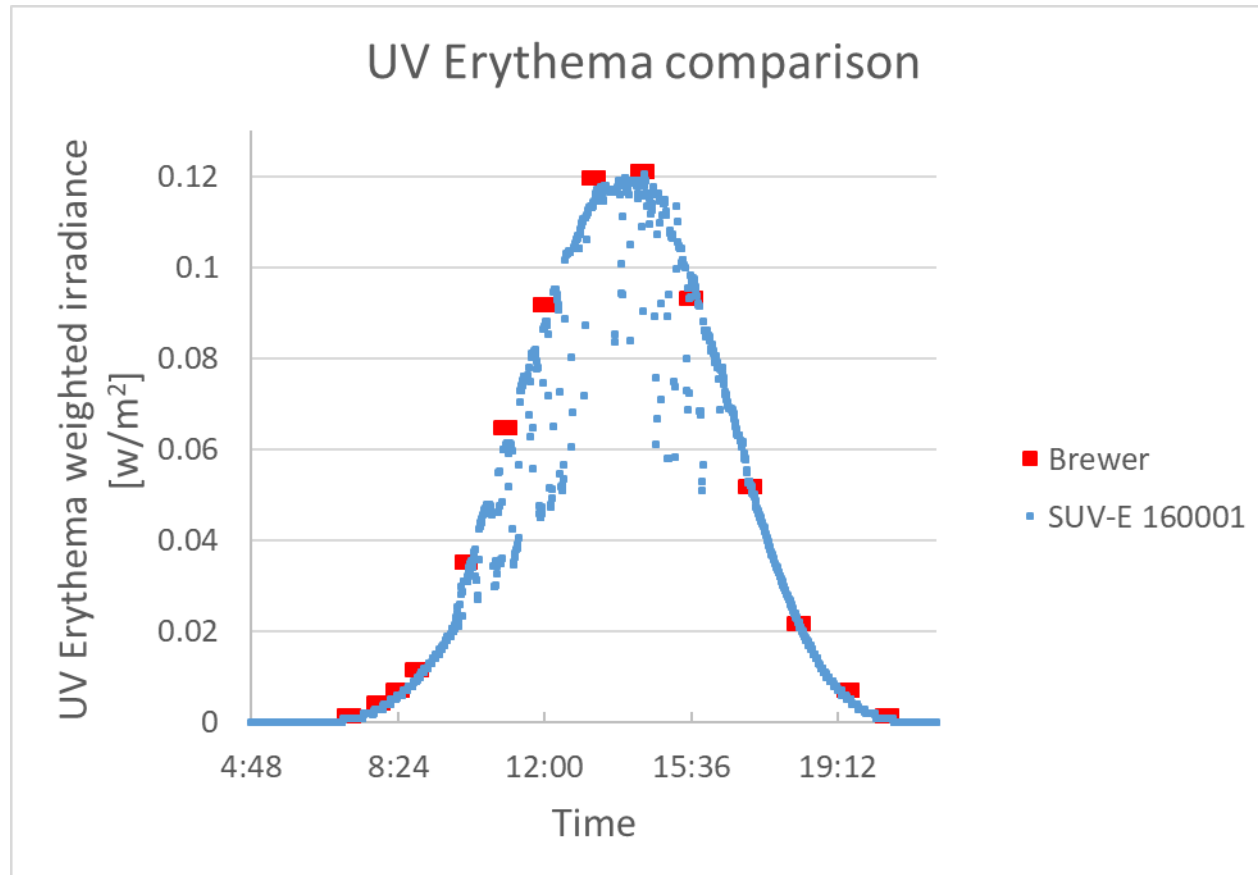
Output: corrected UV irradiance

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SUV E on roof compared to Brewer

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UV Erythema comparison

Good agreement between Brewer and SUV-E in Delft (NL)

Conclusions

- SUV-B improves spectral response compared to old Kipp & Zonen UVS-B

- Uviator software can improve UV measurement data by correcting for instrument response.

- Preliminary outdoor measurements of the SUV-E show a good comparison with the Brewer.

- More outdoor measurements planned

Thank you for your attention!

Questions?

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