photobiologySensors Version 0.1.4
Catalogue of Sensors

Pedro J. Aphalo

January 5, 2014

1 Introduction

We will plot the spectral response of the different sensors for which data is provided in the pacakge. We plot side-by-side the response to energy (i.e. the electrical output that would be expected at each wavelengths with a source emitting equal spectral energy irradiance at all wavelengths) and the response to photons (i.e. as above but with a source emitting equal spectral photon irradiance at all wavelengths). All responses are normalized to an area of one under the whole curve.

```
library(ggplot2)
library(photobiologygg)

## Loading required package:  photobiology
## Loading required package:  proto
## Loading required package:  splus2R

library(photobiology)
library(photobiologySensors)
```

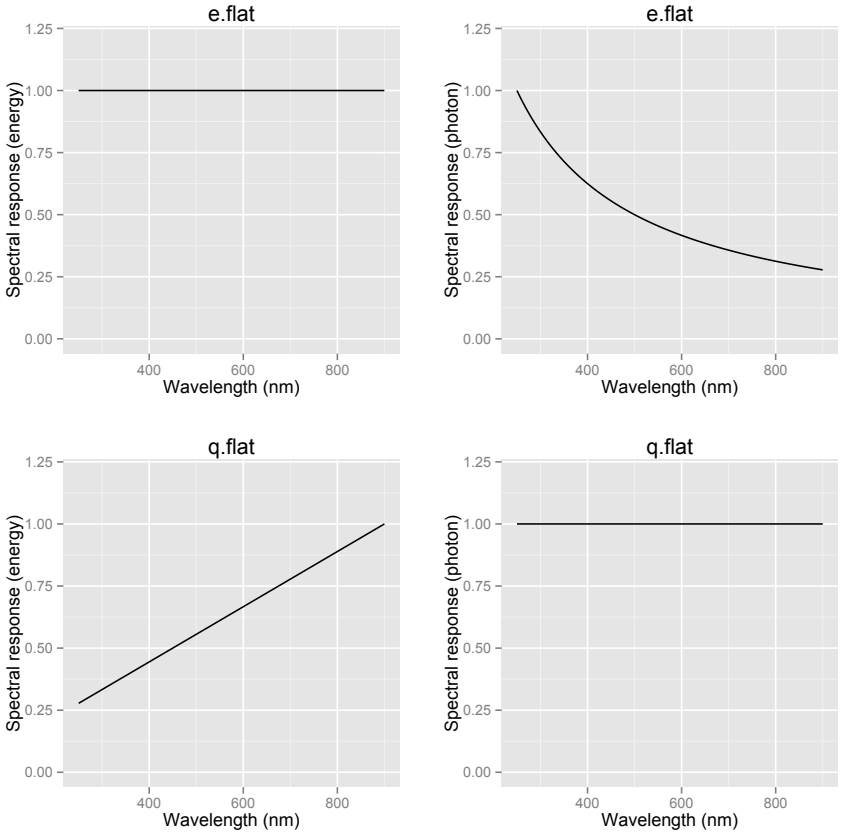
We define a function to do the actual plotting so as to not repeat code, and to make changes easier in the future.

```
sensor.plotter <- function(sensor.name, w.low = 250, w.high = 900, scaled = "peak") {
    w.length.out <- seq(from = w.low, to = w.high, length.out = 300)
    e.spectrum.data <- calc_sensor_multipliers(w.length.out = w.length.out,
        sensor.name = sensor.name, unit.out = "energy", scaled = scaled)
    q.spectrum.data <- calc_sensor_multipliers(w.length.out = w.length.out,
        sensor.name = sensor.name, unit.out = "photon", scaled = scaled)
    e.spectrum.data <- na.omit(e.spectrum.data)
    q.spectrum.data <- na.omit(q.spectrum.data)
    fig_energy <- ggplot(aes(x = w.length, y = response), data = e.spectrum.data) +
        xlim(w.low, w.high) + ylim(0, 1.2) + labs(x = "Wavelength (nm)", y = "Spectral response (energy)",
        title = sensor.name) + geom_line() + stat_peaks(hjust = -0.5, angle = 90)
    fig_photon <- ggplot(aes(x = w.length, y = response), data = q.spectrum.data) +
        xlim(w.low, w.high) + ylim(0, 1.2) + labs(x = "Wavelength (nm)", y = "Spectral response (photon)",
        title = sensor.name) + geom_line() + stat_peaks(hjust = -0.5, angle = 90)
    print(fig_energy)
```

```
    print(fig_photon)
}
```

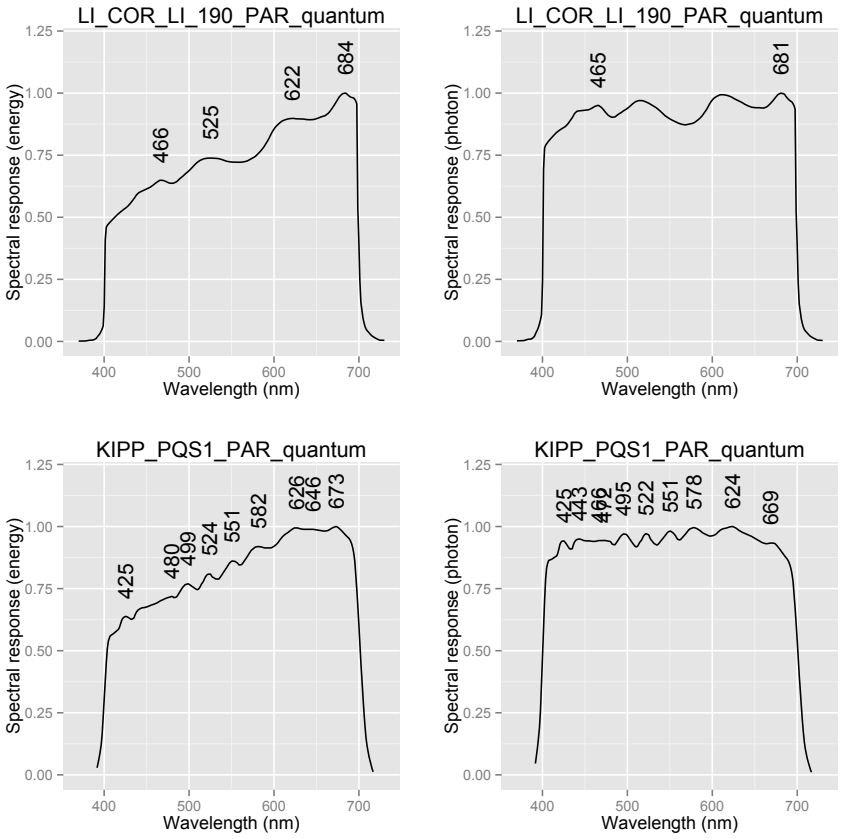
2 Flat responses

```
sensor.plotter("e.flat")
sensor.plotter("q.flat")
```



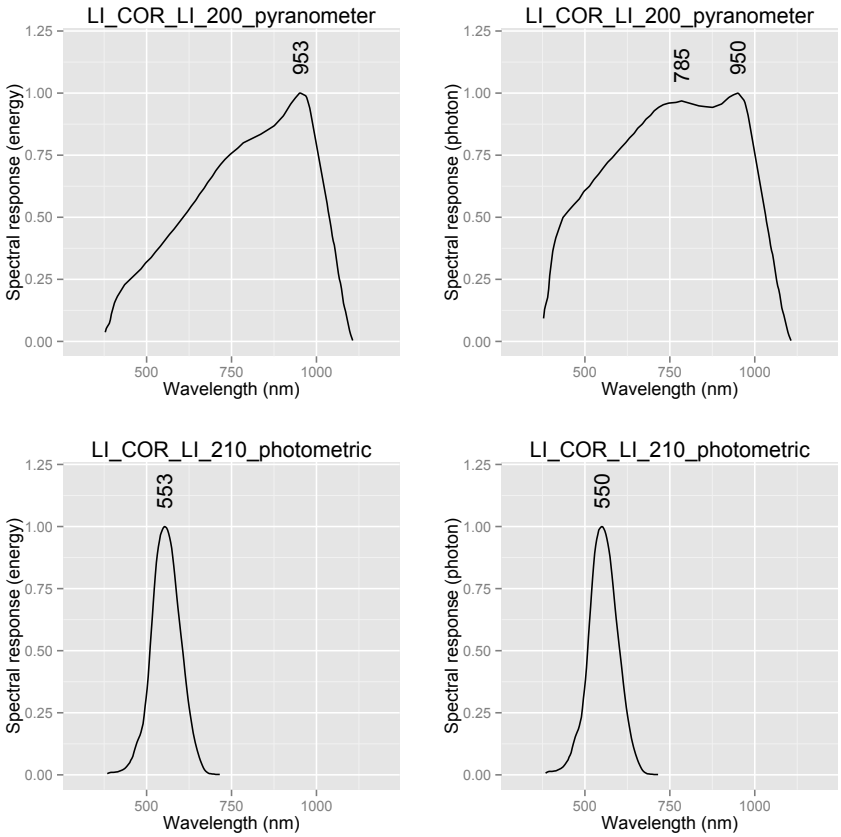
3 Quantum PAR sensors

```
par.sensors <- c("LI_COR_LI_190_PAR_quantum", "KIPP_PQS1_PAR_quantum")
for (sensor in par.sensors) {
    sensor.plotter(sensor.name = sensor, w.low = 370, w.high = 730)
}
```



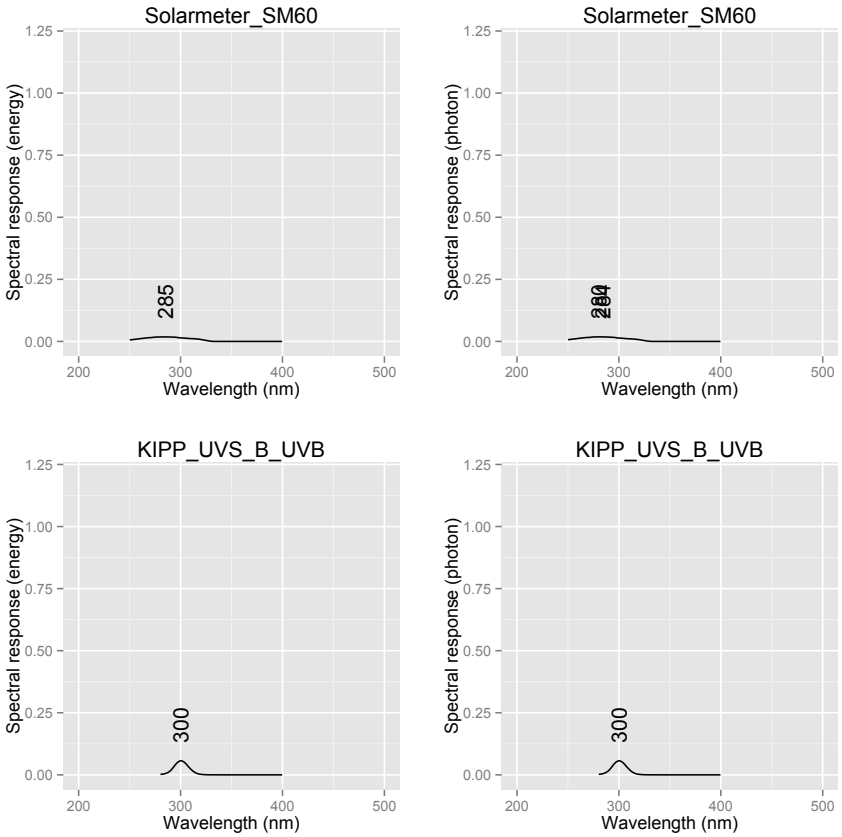
4 Other sensors

```
other.sensors <- c("LI_COR_LI_200_pyranometer", "LI_COR_LI_210_photometric")
for (sensor in other.sensors) {
    sensor.plotter(sensor.name = sensor, w.low = 300, w.high = 1200)
}
```



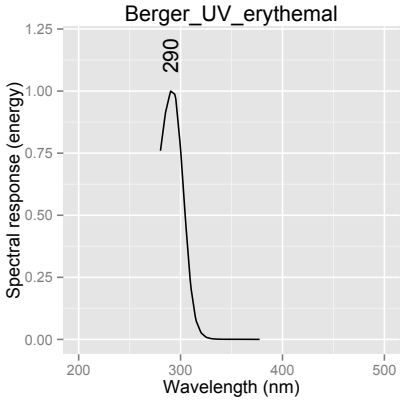
5 UVB sensors

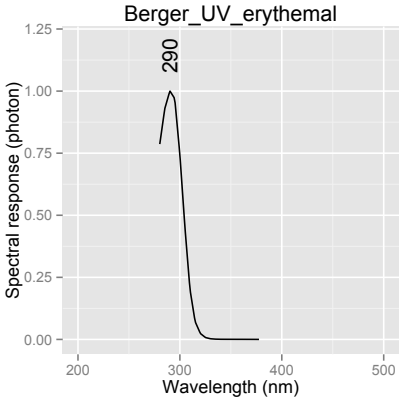
```
uvb.sensors <- c("Solarmeter_SM60", "KIPP_UVS_B_UVB")
for (sensor in uvb.sensors) {
    sensor.plotter(sensor, w.low = 200, w.high = 500, scaled = "area")
}
```

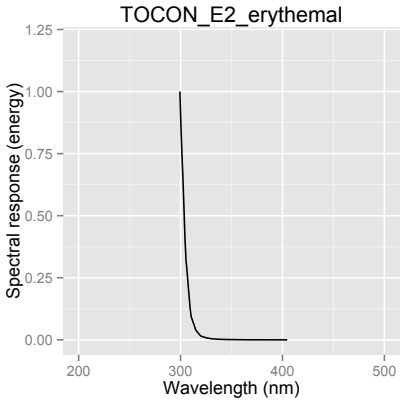


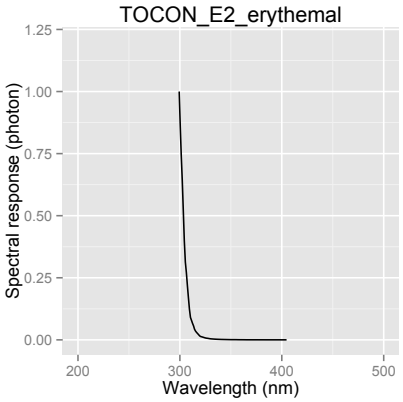
6 Erythemal UV sensors

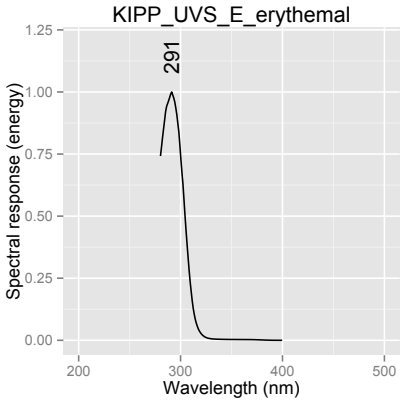
```
uv_ery.sensors <- c("Berger_UV_erythemal", "TOCON_E2_erythemal", "KIPP_UVS_E_erythemal",
    "Solar_Light_501_typical", "Solar_Light_501_high_UVA", "Solar_Light_501_low_UVA",
    "Vital_BW_20")
for (sensor in uv_ery.sensors) {
    sensor.plotter(sensor, w.low = 200, w.high = 500)
}
```

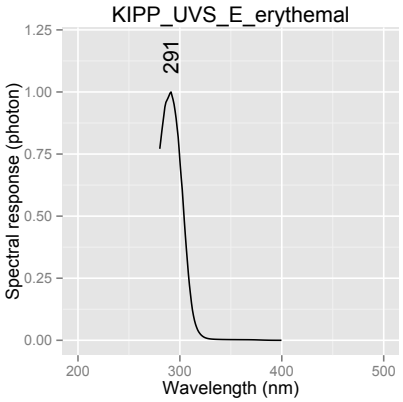

Berger_UV_erythemal
290
Spectral response (energy)
Wavelength (nm)
1.25
1.00
0.75
0.50
0.25
0.00
200
300
400
500

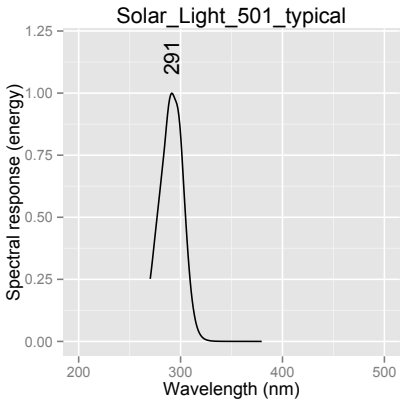

Berger_UV_erythemal
290
Spectral response (photon)
Wavelength (nm)
1.25
1.00
0.75
0.50
0.25
0.00
200
300
400
500

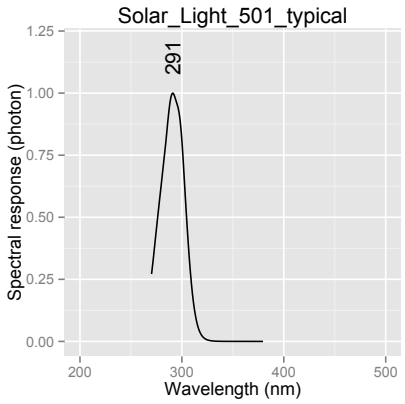

TOCON_E2_erythemal
Spectral response (energy)
Wavelength (nm)
1.25
1.00
0.75
0.50
0.25
0.00
200
300
400
500

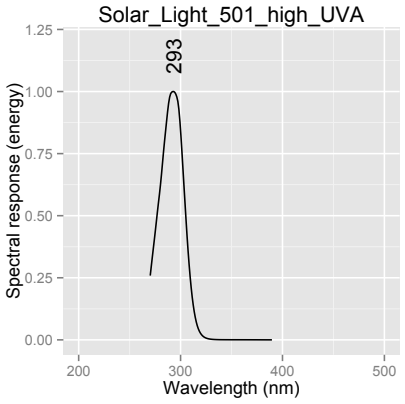

TOCON_E2_erythemal
Spectral response (photon)
Wavelength (nm)
1.25
1.00
0.75
0.50
0.25
0.00
200
300
400
500

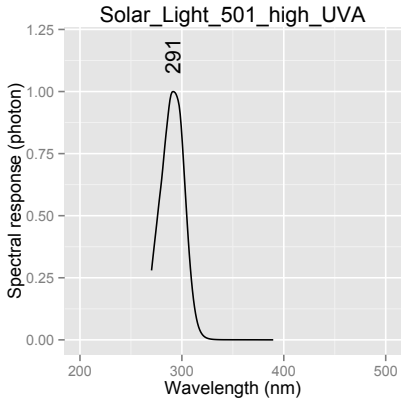

KIPP_UVS_E_erythemal
291
Spectral response (energy)
Wavelength (nm)
1.25
1.00
0.75
0.50
0.25
0.00
200
300
400
500

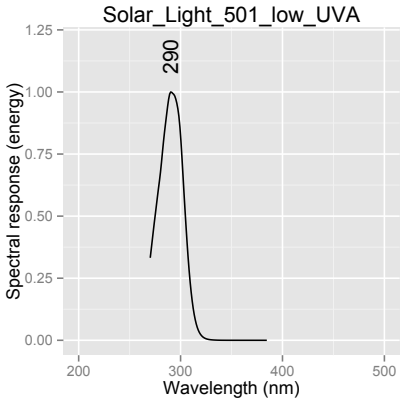

KIPP_UVS_E_erythemal
291
Spectral response (photon)
Wavelength (nm)
1.25
1.00
0.75
0.50
0.25
0.00
200
300
400
500

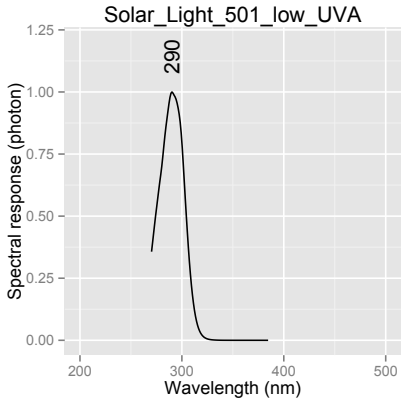

Solar_Light_501_typical
291
Spectral response (energy)
Wavelength (nm)

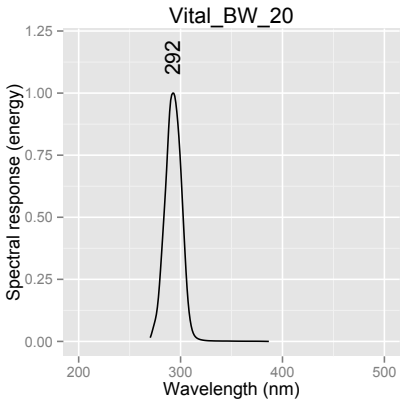

Solar_Light_501_typical
291
Spectral response (photon)
Wavelength (nm)

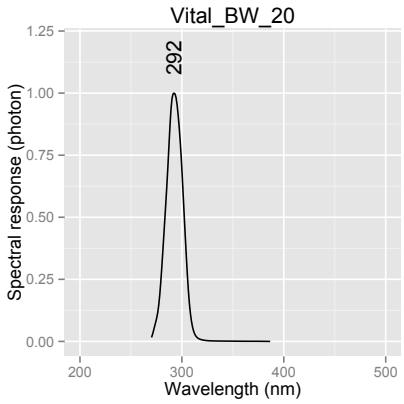

Solar_Light_501_high_UVA
293
Spectral response (energy)
Wavelength (nm)


Solar_Light_501_high_UVA
291
Spectral response (photon)
Wavelength (nm)


Solar_Light_501_low_UVA
290
Spectral response (energy)
Wavelength (nm)

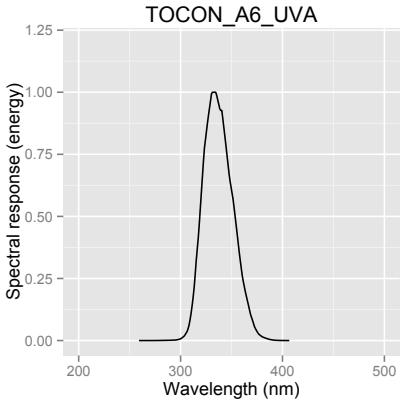

Solar_Light_501_low_UVA
290
Spectral response (photon)
Wavelength (nm)

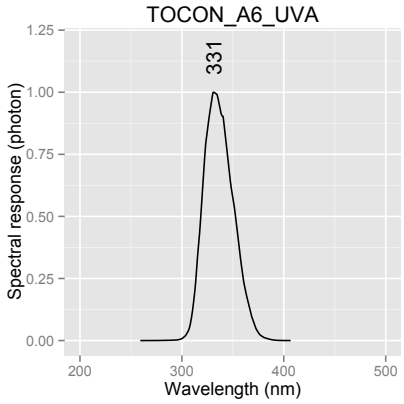


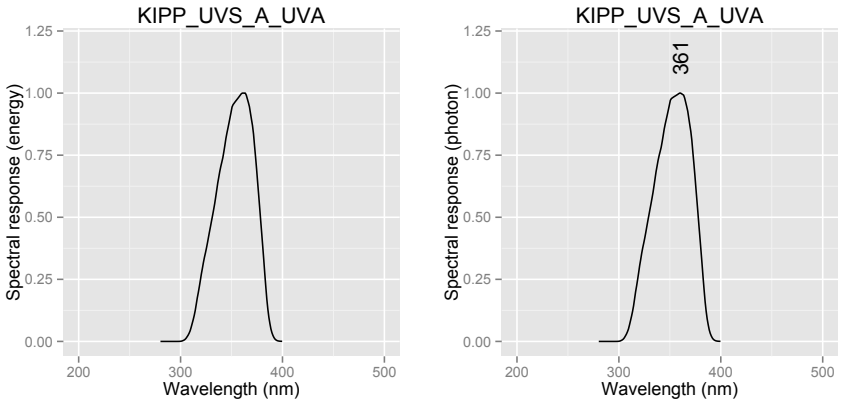


7 UVA sensors

```
uva.sensors <- c("TOCON_A6_UVA", "KIPP_UVS_A_UVA")
for (sensor in uva.sensors) {
    sensor.plotter(sensor, w.low = 200, w.high = 500)
}
```

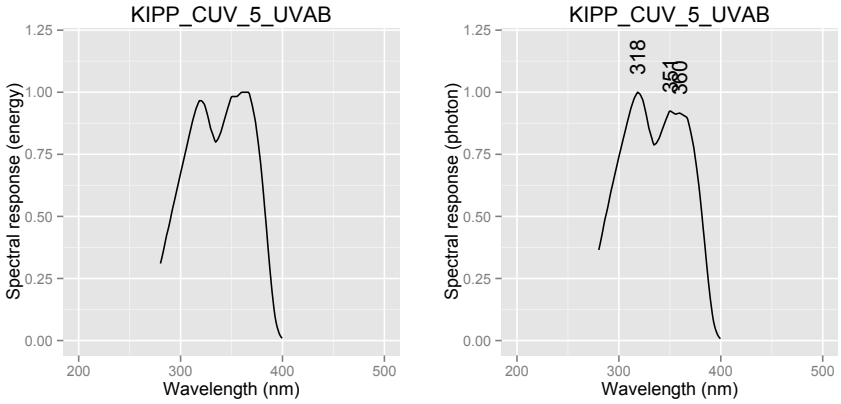






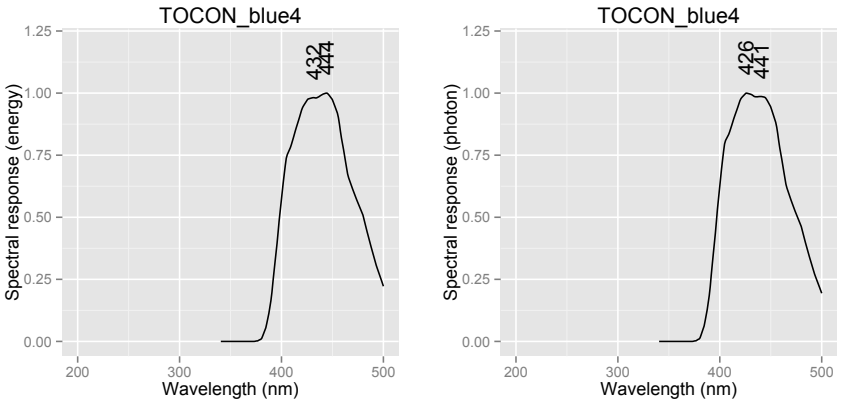
8 UVA + UVB sensors

```
uvab.sensors <- c("KIPP_CUV_5_UVAB")
for (sensor in uvab.sensors) {
    sensor.plotter(sensor, w.low = 200, w.high = 500)
}
```



9 Blue sensors

```
b.sensors <- c("TOCON_blue4")
for (sensor in b.sensors) {
    sensor.plotter(sensor, w.low = 200, w.high = 500)
}
```


TOCON_blue4
Spectral response (energy)
Wavelength (nm)
432
444
TOCON_blue4
Spectral response (photon)
Wavelength (nm)
426
441