photobiologySensors Version 0.2.0
Catalogue of Sensors

Pedro J. Aphalo

January 23, 2015

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.

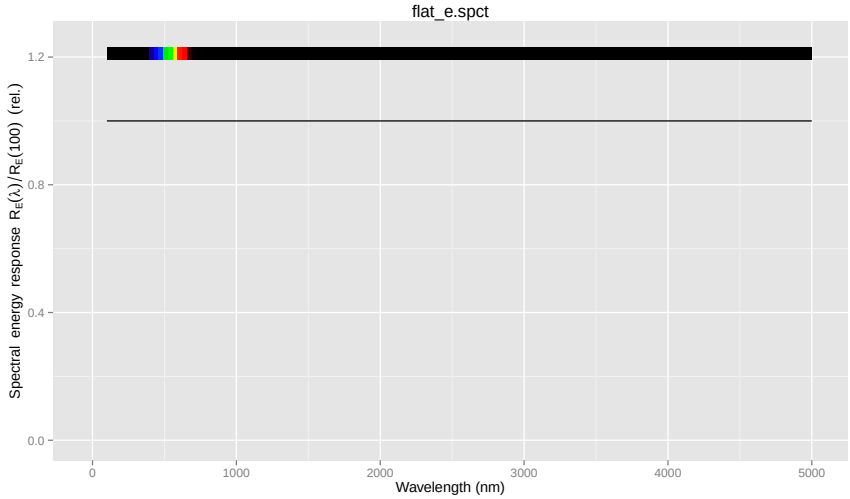
```
library(photobiologygg)
library(photobiology)
library(photobiologySensors)
```

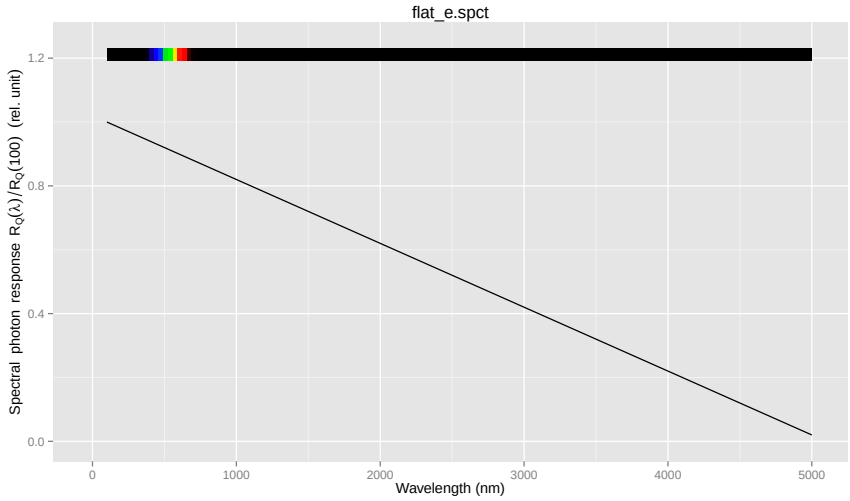
We define a function to do the actual plotting so as to not repeat code, and to make changes easier in the future.

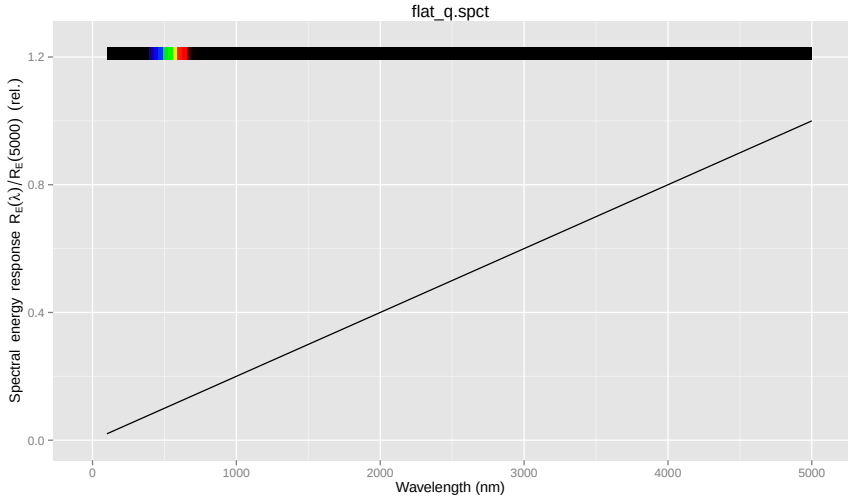
```
plotter <-
  function(spct,
           annotations = c("boxes", "labels", "summaries", "colour.guide"),
           label.qty = "contribution",
           wb.trim=TRUE){
    print(plot(spct,
               unit.out="energy",
               annotations = annotations,
               label.qty = label.qty,
               wb.trim = wb.trim) +
            labs(title=deparse(substitute(spct))))
    print(plot(spct,
               unit.out="photon",
               annotations = annotations,
               label.qty = label.qty,
               wb.trim = wb.trim) +
            labs(title=deparse(substitute(spct))))
  }
```

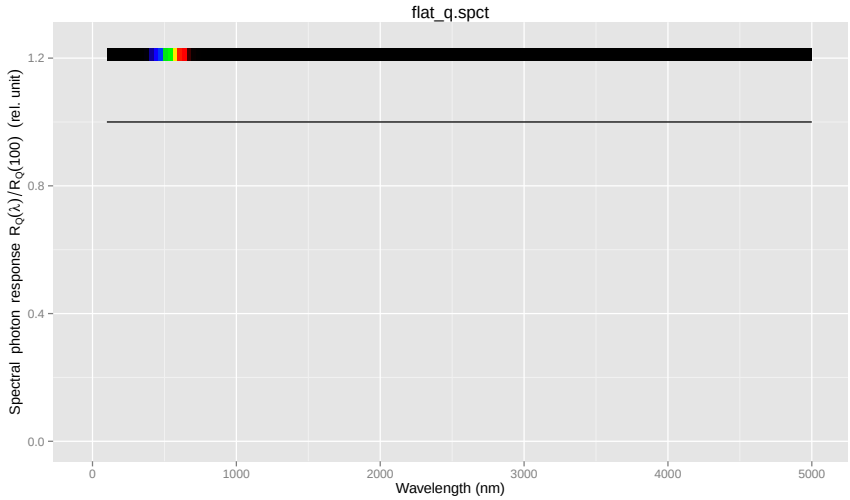
2 Flat responses

```
plotter(flat_e.spct, annotations = "colour.guide")
plotter(flat_q.spct, annotations = "colour.guide")

## Warning in `[.data.table`(x, , `:=`(s.q.irrad, NULL)): Adding new column 's.q.irrad'
then assigning NULL (deleting it).
```



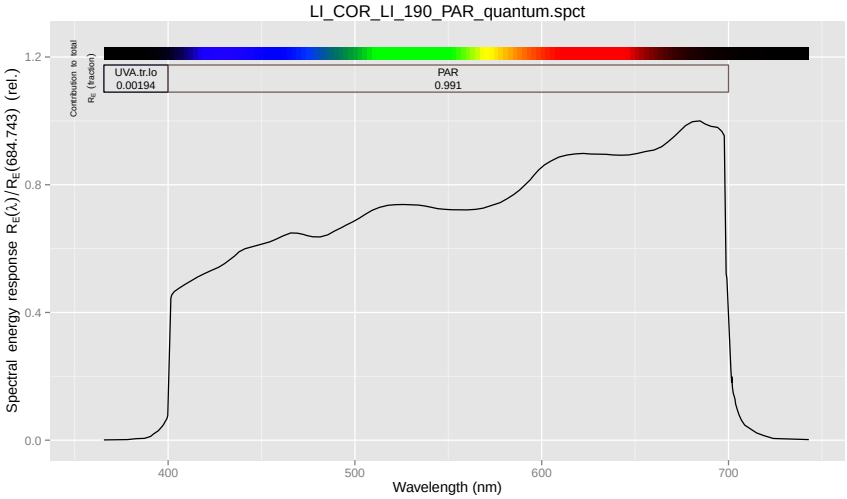


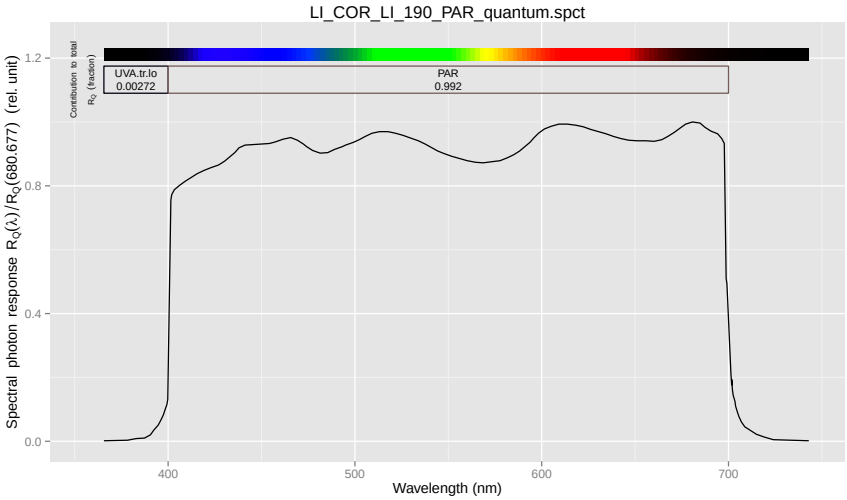


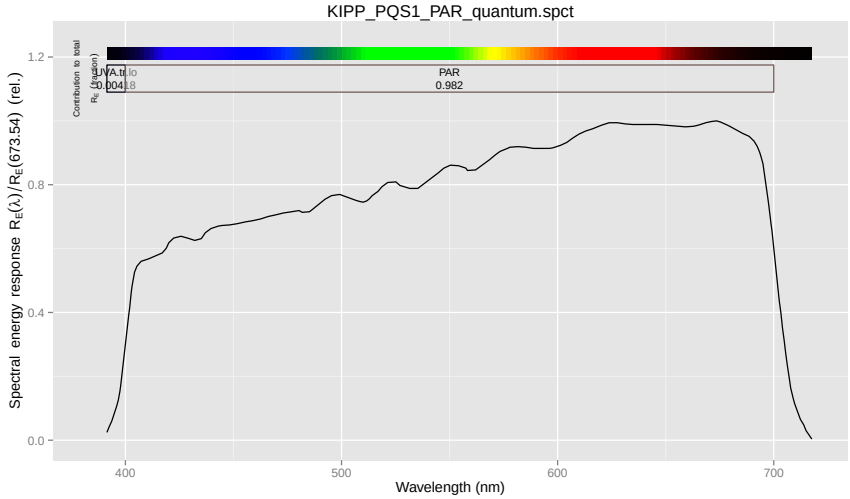


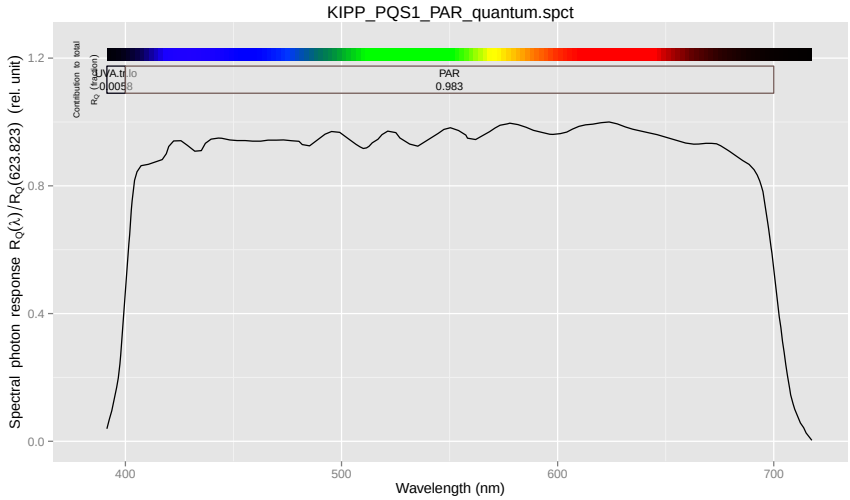
3 Quantum PAR sensors

```
plotter(LI_COR_LI_190_PAR_quantum.spct)

## Warning in `[.data.table`(x, , `:=`(s.q.irrad, NULL)): Adding new column 's.q.irrad'
then assigning NULL (deleting it).

plotter(KIPP_PQS1_PAR_quantum.spct)
```


LI_COR_LI_190_PAR_quantum.spct
Contribution to total
R_E (fraction)
UVA.tr.lo
0.00194
PAR
0.991
Spectral energy response $R_E(\lambda)/R_E(684.743)$ (rel.)
1.2
0.8
0.4
0.0
400
500
600
700
Wavelength (nm)

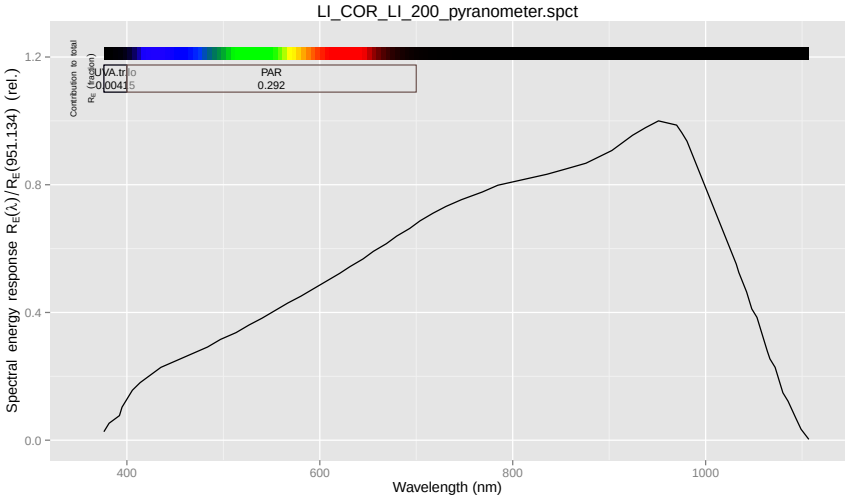

LI_COR_LI_190_PAR_quantum.spct
Contribution to total
R_Q (fraction)
UVA.tr.lo
0.00272
PAR
0.992
Spectral photon response $R_Q(\lambda)/R_Q(680.677)$ (rel. unit)
1.2
0.8
0.4
0.0
400
500
600
700
Wavelength (nm)

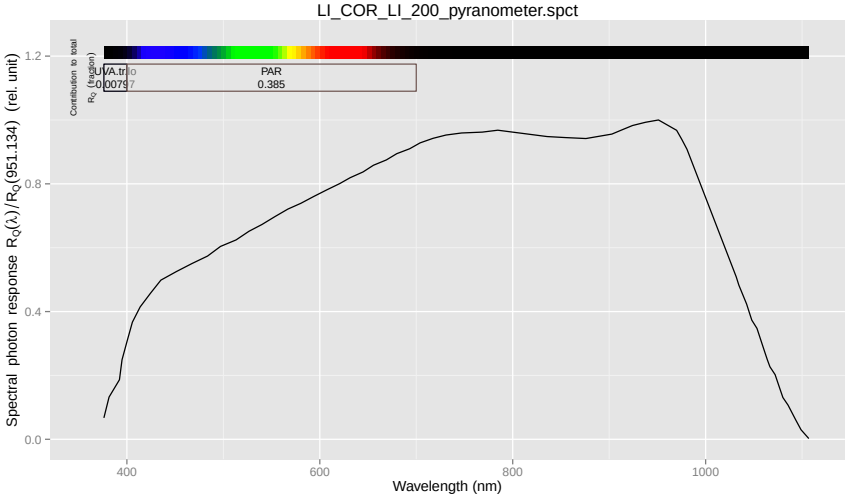


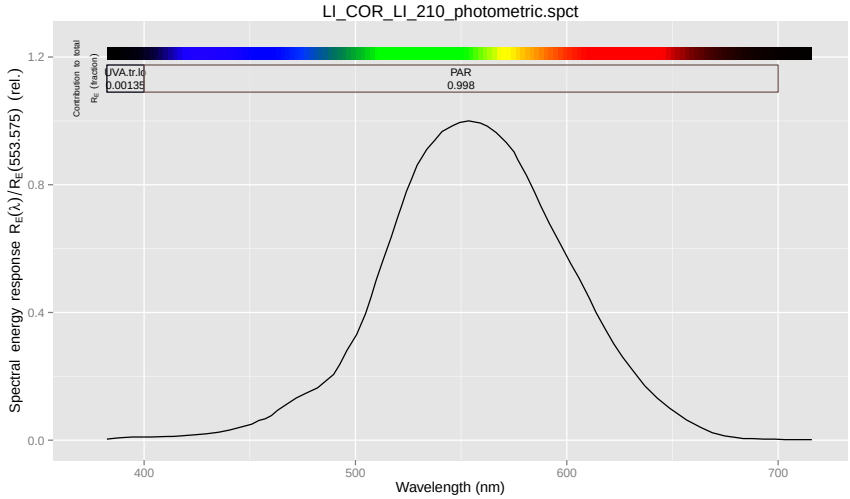


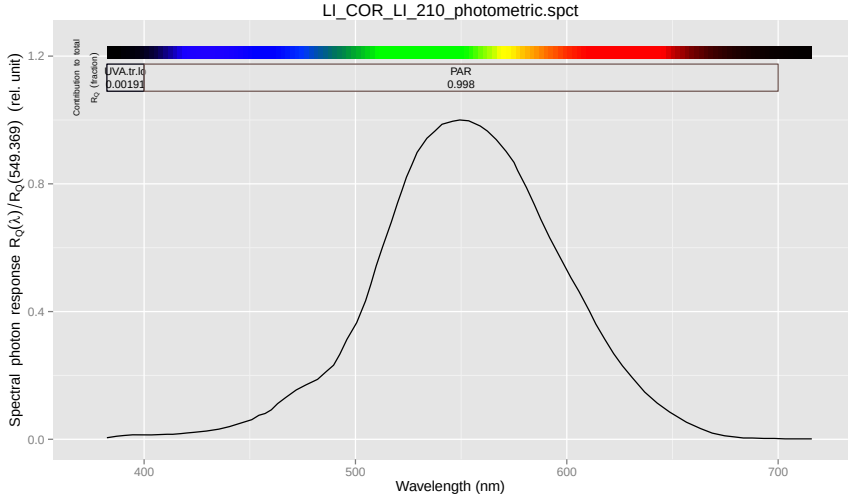
4 Other sensors

```
plotter(LI_COR_LI_200_pyranometer.spct)
plotter(LI_COR_LI_210_photometric.spct)
```


LI_COR_LI_200_pyranometer.spct
Spectral energy response $R_E(\lambda)/R_E(951.134)$ (rel.)
Wavelength (nm)
Contribution to total R_E (region)
UVA.trio 0.00415
PAR 0.292
1.2
0.8
0.4
0.0
400
600
800
1000

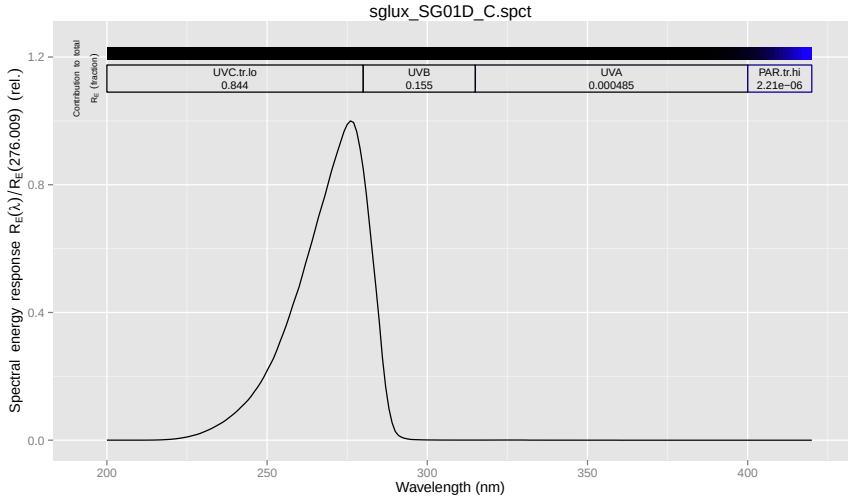

LI_COR_LI_200_pyranometer.spct
Spectral photon response $R_Q(\lambda)/R_Q(951.134)$ (rel. unit)
Wavelength (nm)
Contribution to total R_Q (region)
UVA.trio 0.00797
PAR 0.385
1.2
0.8
0.4
0.0
400
600
800
1000

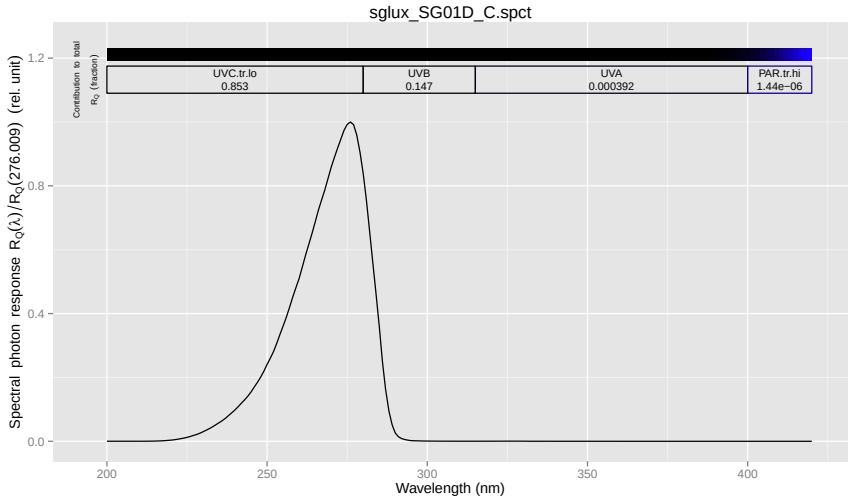




5 UVC sensors

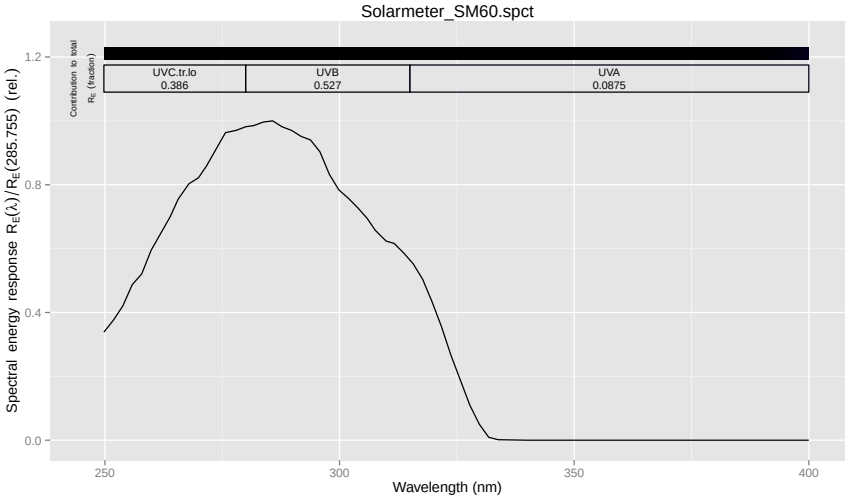
```
plotter(sglux_SG01D_C.spct)
```

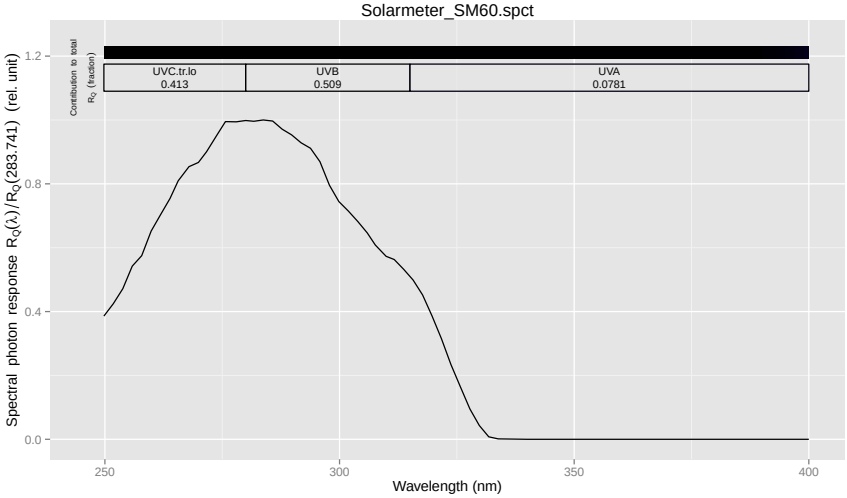


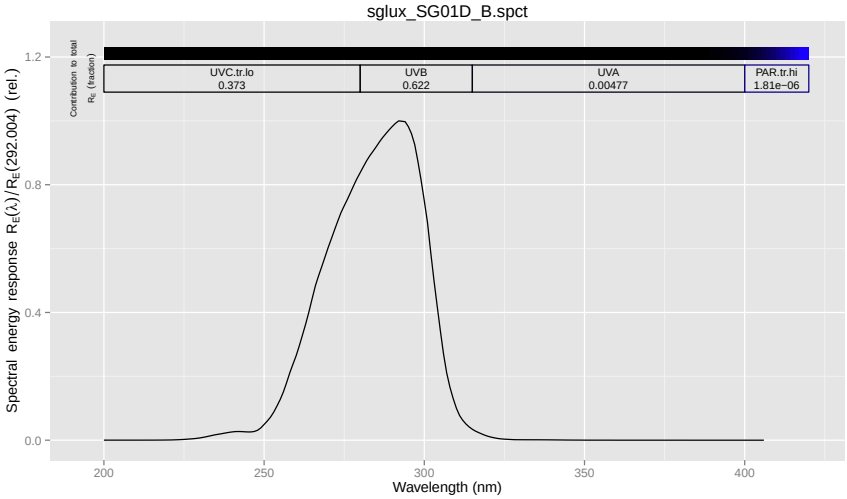


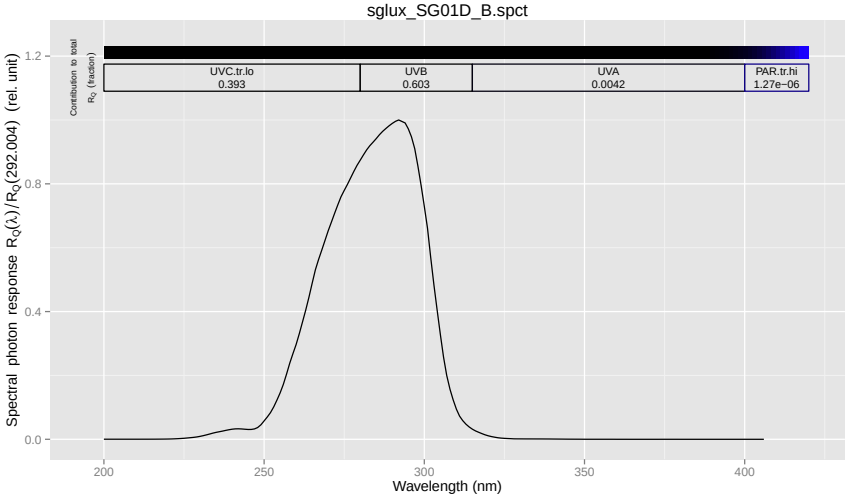
6 UVB sensors

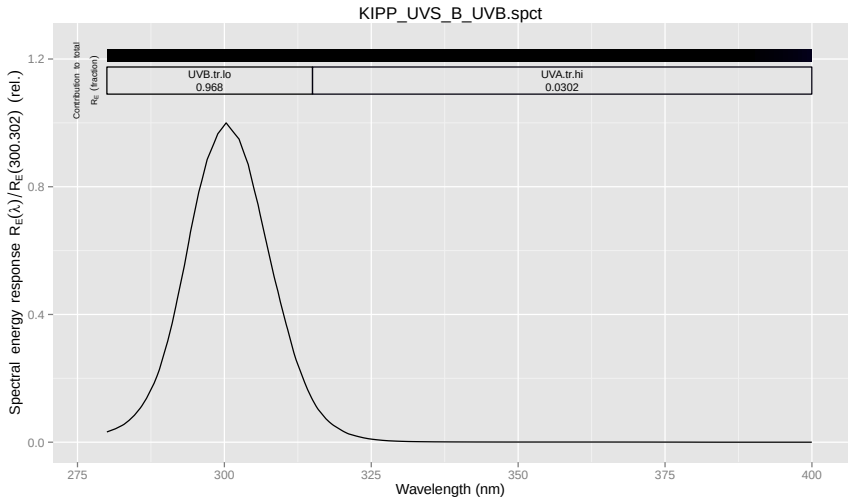
```
plotter(Solarmeter_SM60.spct)
plotter(sglux_SG01D_B.spct)

## Warning:  Removed 15 rows containing missing values (geom_path).
## Warning:  Removed 15 rows containing missing values (geom_path).

plotter(KIPP_UVS_B_UVB.spct)
```

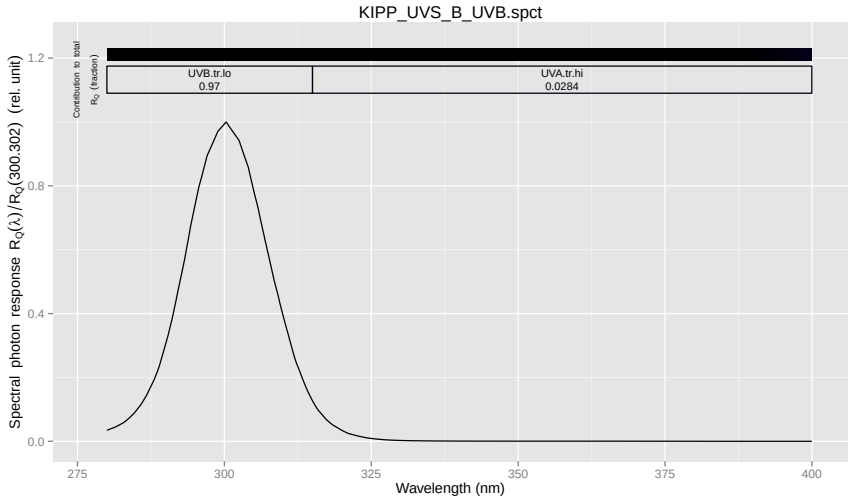

Solarmeter_SM60.spct
Contribution to total
R_E (fraction)
UVC.tr.lo
0.386
UVB
0.527
UVA
0.0875
Spectral energy response $R_E(\lambda)/R_E(285.755)$ (rel.)
1.2
0.8
0.4
0.0
250
300
350
400
Wavelength (nm)


Solarmeter_SM60.spct
Contribution to total
R_Q (fraction)
UVC.tr.lo
0.413
UVB
0.509
UVA
0.0781
Spectral photon response $R_Q(\lambda)/R_Q(283.741)$ (rel. unit)
1.2
0.8
0.4
0.0
250
300
350
400
Wavelength (nm)


sglux_SG01D_B.spct
Contribution to total
R_E (fraction)
UVC.tr.lo
0.373
UVB
0.622
UVA
0.00477
PAR.tr.hi
1.81e−06
Spectral energy response $R_E(\lambda)/R_E(292.004)$ (rel.)
1.2
0.8
0.4
0.0
200
250
300
350
400
Wavelength (nm)

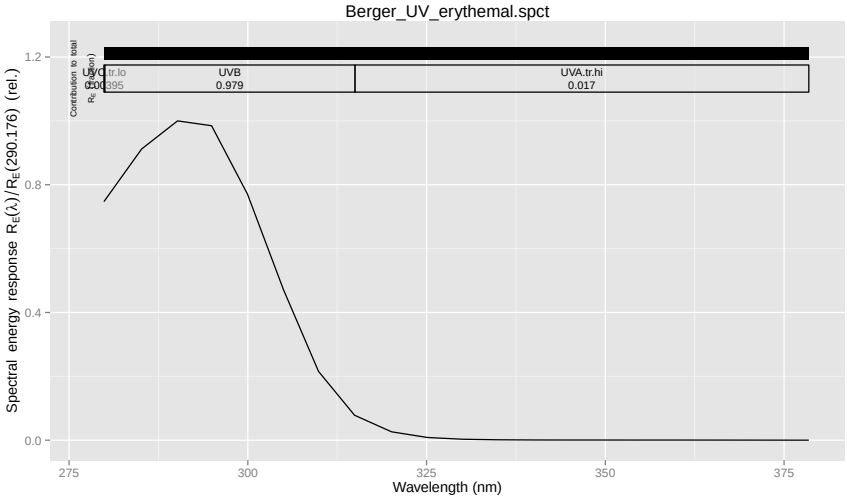

sglux_SG01D_B.spct
Contribution to total
R_Q (fraction)
UVC.tr.lo
0.393
UVB
0.603
UVA
0.0042
PAR.tr.hi
1.27e−06
Spectral photon response $R_Q(\lambda)/R_Q(292.004)$ (rel. unit)
1.2
0.8
0.4
0.0
200
250
300
350
400
Wavelength (nm)

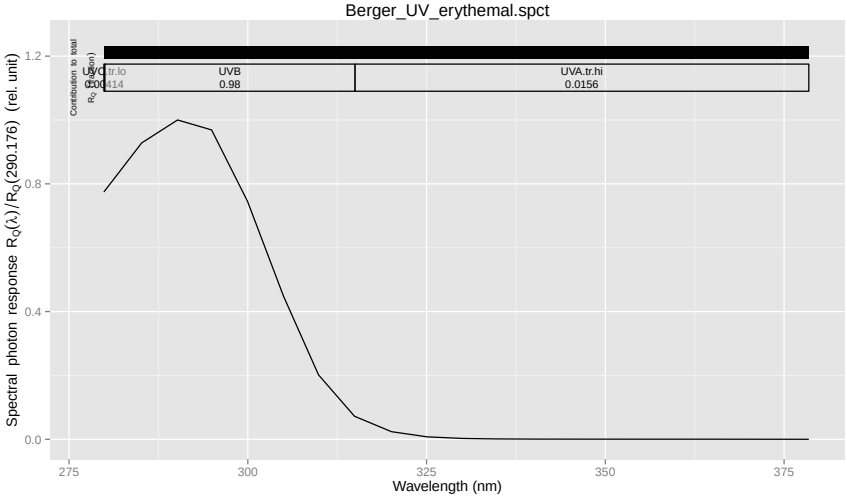


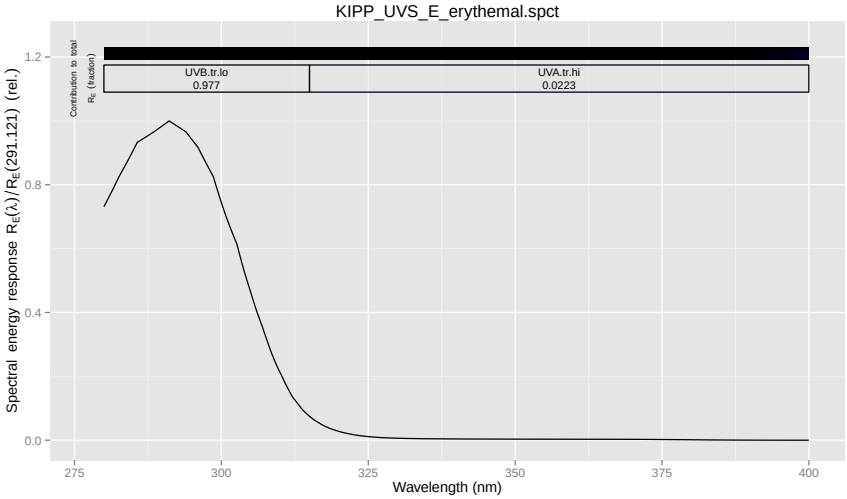


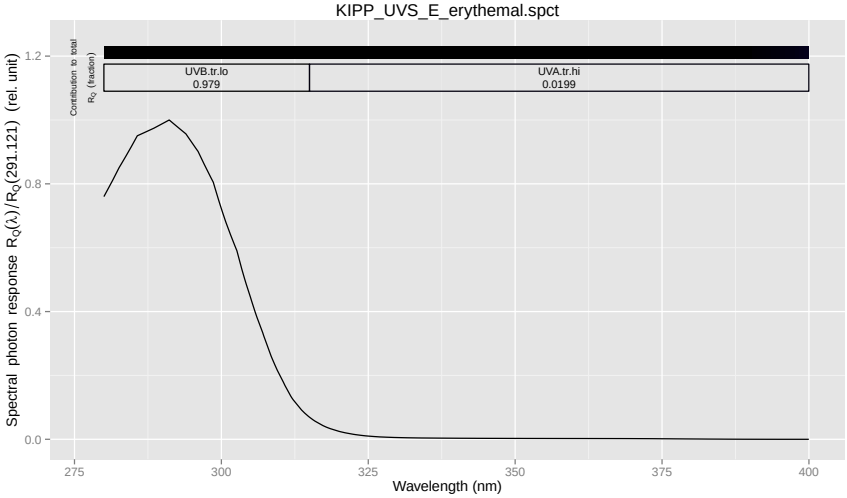
7 Erythemal UV sensors

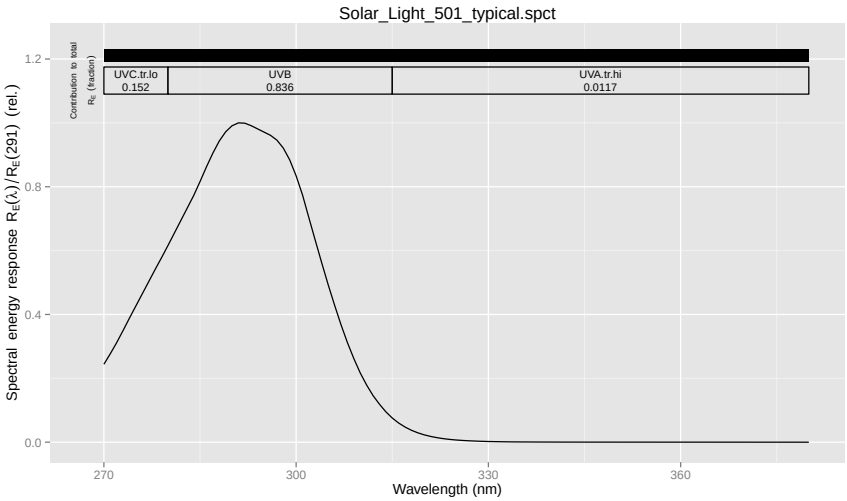
```
plotter(Berger_UV_erythemal.spct)
plotter(KIPP_UVS_E_erythemal.spct)
plotter(Solar_Light_501_typical.spct)
plotter(Solar_Light_501_high_UVA.spct)
plotter(Solar_Light_501_low_UVA.spct)
plotter(Vital_BW_20.spct)
plotter(Thies_E1c.spct)
```

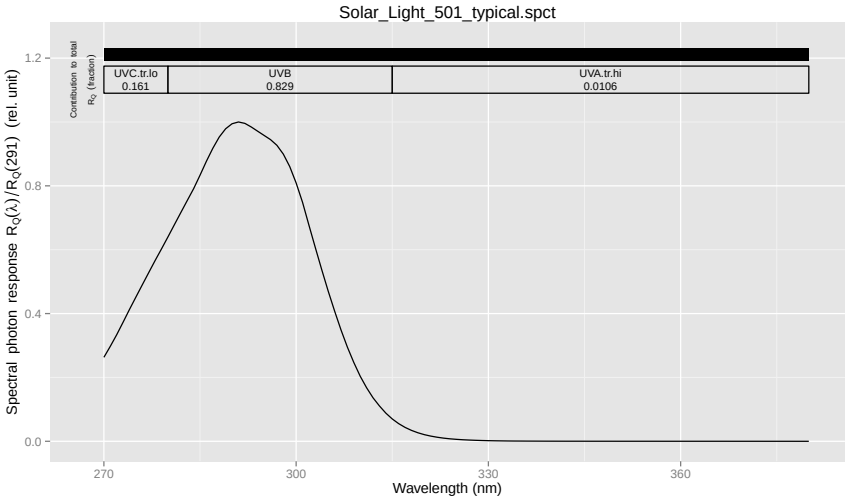

Berger_UV_erythemal.spct
Contribution to total
UV.tr.lo
0.0395
UVB
0.979
UVA.tr.hi
0.017
Spectral energy response $R_E(\lambda)/R_E(290.176)$ (rel.)
1.2
0.8
0.4
0.0
275
300
325
350
375
Wavelength (nm)

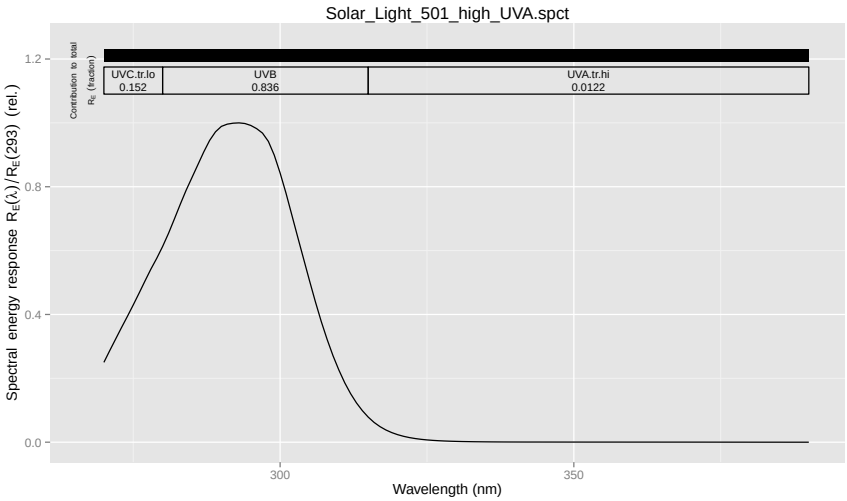

Berger_UV_erythemal.spct
Contribution to total
UV.tr.lo
0.0414
UVB
0.98
UVA.tr.hi
0.0156
Spectral photon response $R_Q(\lambda)/R_Q(290.176)$ (rel. unit)
1.2
0.8
0.4
0.0
275
300
325
350
375
Wavelength (nm)

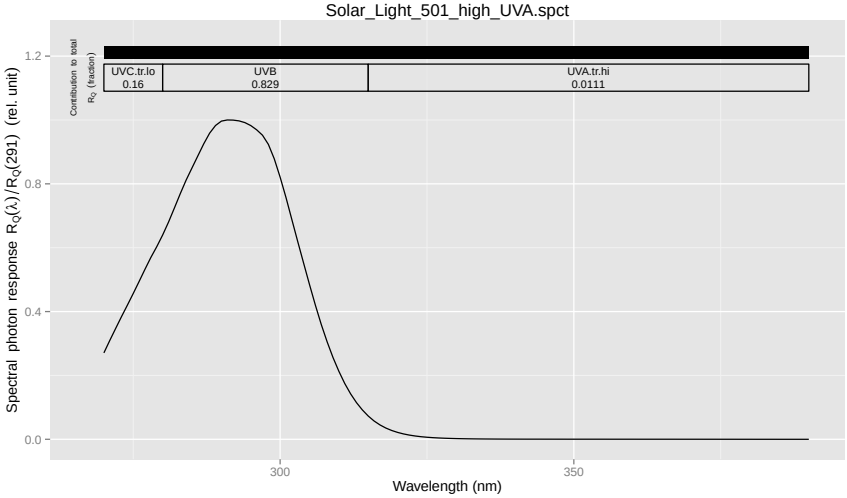

KIPP_UVS_E_erythemal.spct
Contribution to total
R_E (fraction)
UVB.tr.lo
0.977
UVA.tr.hi
0.0223
Spectral energy response $R_E(\lambda)/R_E(291.121)$ (rel.)
1.2
0.8
0.4
0.0
275
300
325
350
375
400
Wavelength (nm)

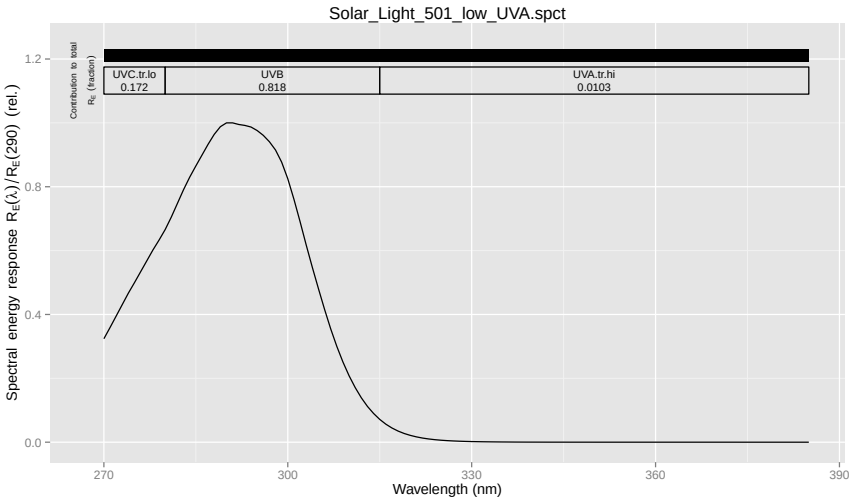

KIPP_UVS_E_erythemal.spct
Contribution to total
R_Q (fraction)
UVB.tr.lo
0.979
UVA.tr.hi
0.0199
Spectral photon response $R_Q(\lambda)/R_Q(291.121)$ (rel. unit)
1.2
0.8
0.4
0.0
275
300
325
350
375
400
Wavelength (nm)

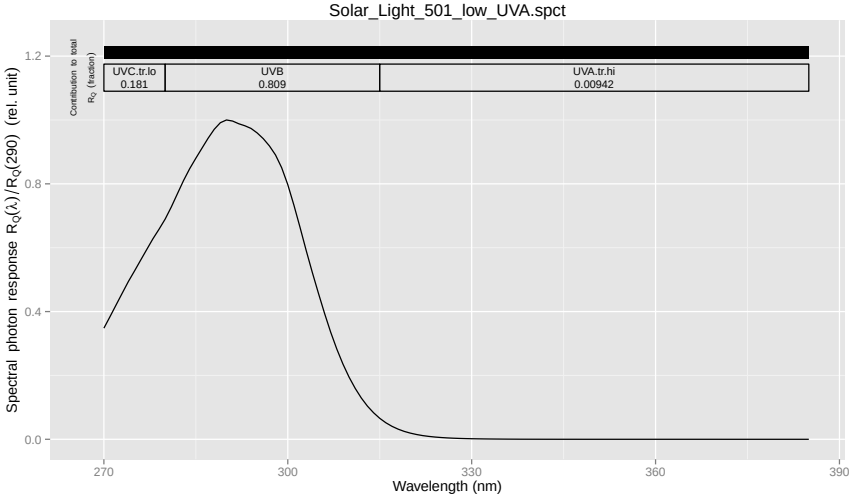

Solar_Light_501_typical.spct
Contribution to total
R_E (fraction)
UVC.tr.lo
0.152
UVB
0.836
UVA.tr.hi
0.0117
Spectral energy response $R_E(\lambda)/R_E(291)$ (rel.)
1.2
0.8
0.4
0.0
270
300
330
360
Wavelength (nm)

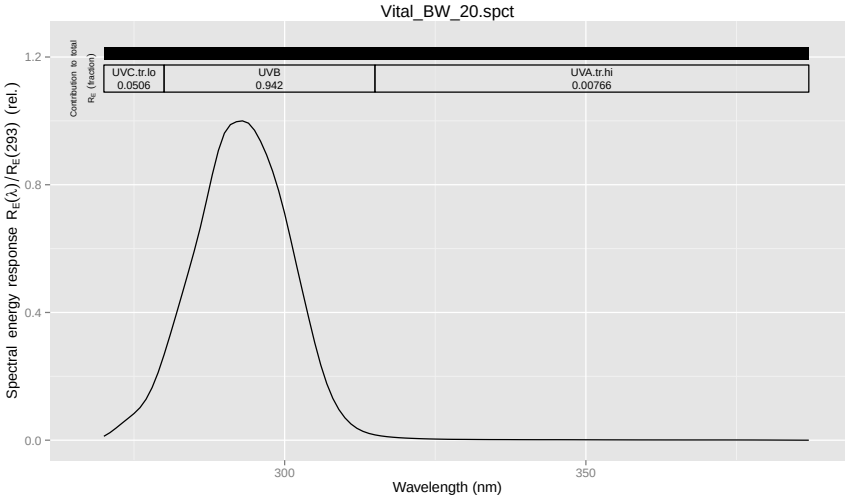

Solar_Light_501_typical.spct
Contribution to total
R_Q (fraction)
UVC.tr.lo
0.161
UVB
0.829
UVA.tr.hi
0.0106
Spectral photon response $R_Q(\lambda)/R_Q(291)$ (rel. unit)
1.2
0.8
0.4
0.0
270
300
330
360
Wavelength (nm)

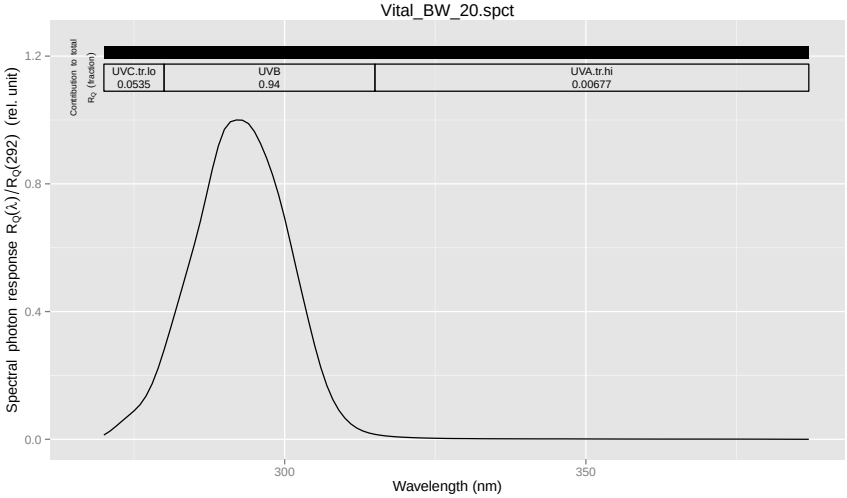

Solar_Light_501_high_UVA.spct
Contribution to total
R_E (fraction)
UVC.tr.lo
0.152
UVB
0.836
UVA.tr.hi
0.0122
Spectral energy response $R_E(\lambda)/R_E(293)$ (rel.)
1.2
0.8
0.4
0.0
300
350
Wavelength (nm)

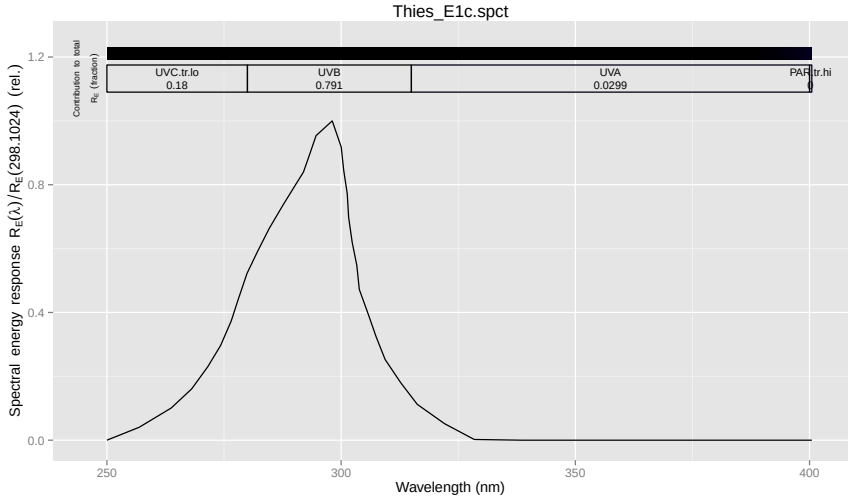

Solar_Light_501_high_UVA.spct
Contribution to total
R_Q (fraction)
UVC.tr.lo
0.16
UVB
0.829
UVA.tr.hi
0.0111
Spectral photon response $R_Q(\lambda)/R_Q(291)$ (rel. unit)
1.2
0.8
0.4
0.0
300
350
Wavelength (nm)

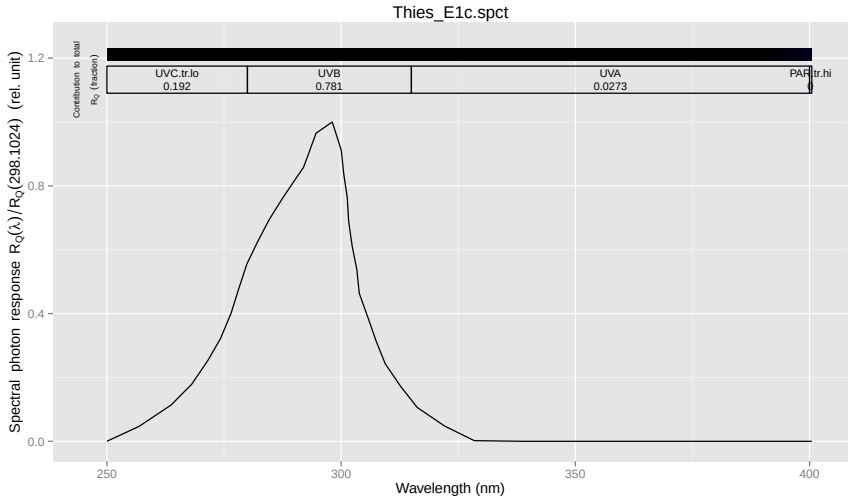

Solar_Light_501_low_UVA.spct
Contribution to total R_E (fraction)
UVC.tr.lo 0.172
UVB 0.818
UVA.tr.hi 0.0103
Spectral energy response $R_E(\lambda)/R_E(290)$ (rel.)
1.2
0.8
0.4
0.0
270
300
330
360
390
Wavelength (nm)


Solar_Light_501_low_UVA.spct
Contribution to total R_Q (fraction)
UVC.tr.lo 0.181
UVB 0.809
UVA.tr.hi 0.00942
Spectral photon response $R_Q(\lambda)/R_Q(290)$ (rel. unit)
1.2
0.8
0.4
0.0
270
300
330
360
390
Wavelength (nm)


Vital_BW_20.spct
Contribution to total
R_E (fraction)
UVC.tr.lo
0.0506
UVB
0.942
UVA.tr.hi
0.00766
Spectral energy response $R_E(\lambda)/R_E(293)$ (rel.)
1.2
0.8
0.4
0.0
300
350
Wavelength (nm)

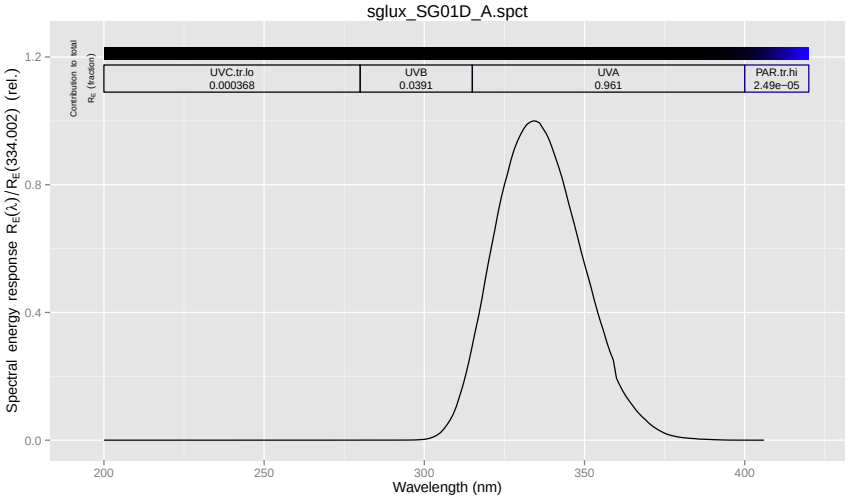

Vital_BW_20.spct
Contribution to total
R_Q (fraction)
UVC.tr.lo
0.0535
UVB
0.94
UVA.tr.hi
0.00677
Spectral photon response $R_Q(\lambda)/R_Q(292)$ (rel. unit)
1.2
0.8
0.4
0.0
300
350
Wavelength (nm)

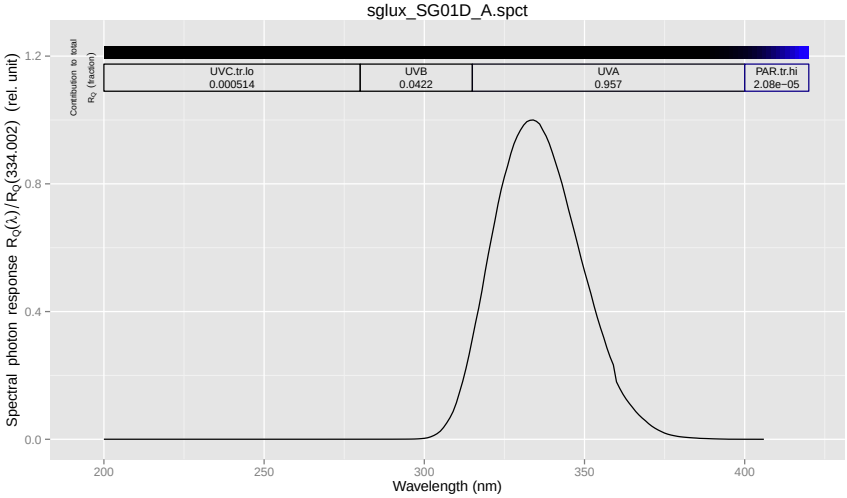


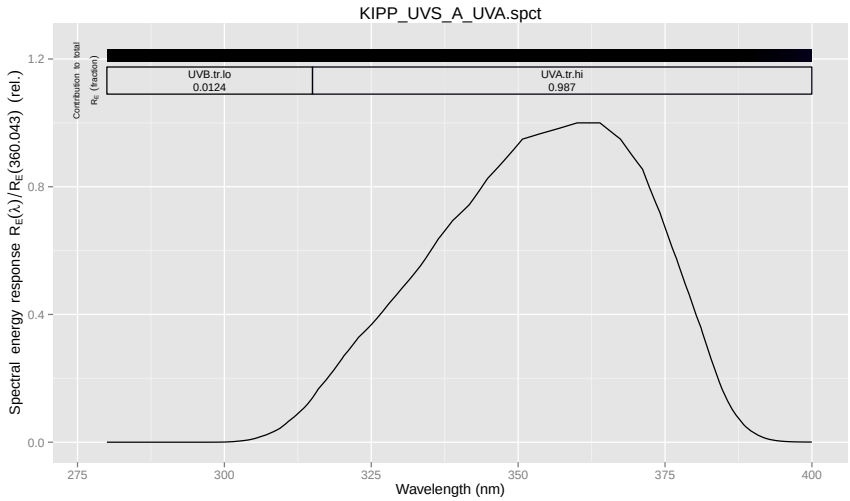


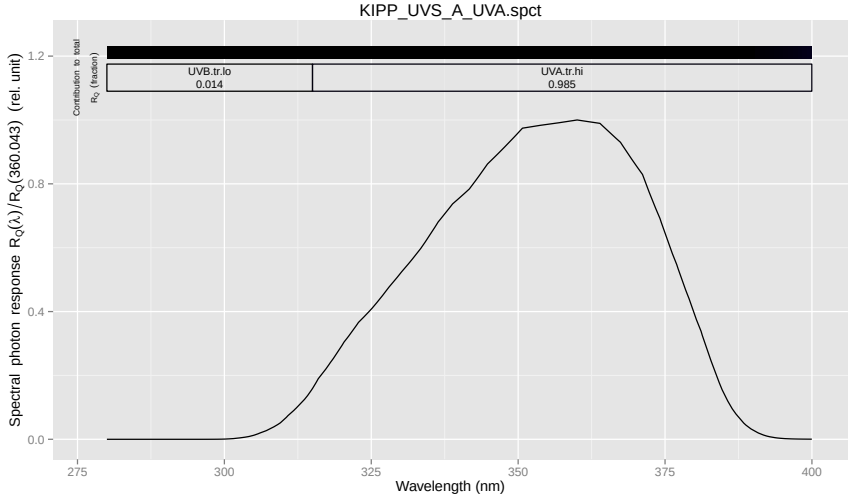
8 UVA sensors

```
plotter(sglux_SG01D_A.spct)

## Warning:  Removed 3 rows containing missing values (geom_path).
## Warning:  Removed 3 rows containing missing values (geom_path).

plotter(KIPP_UVS_A_UVA.spct)
```


sglux_SG01D_A.spct
Contribution to total
R_E (fraction)
UVC.tr.lo
0.000368
UVB
0.0391
UVA
0.961
PAR.tr.hi
2.49e−05
Spectral energy response $R_E(\lambda)/R_E(334.002)$ (rel.)
1.2
0.8
0.4
0.0
200
250
300
350
400
Wavelength (nm)

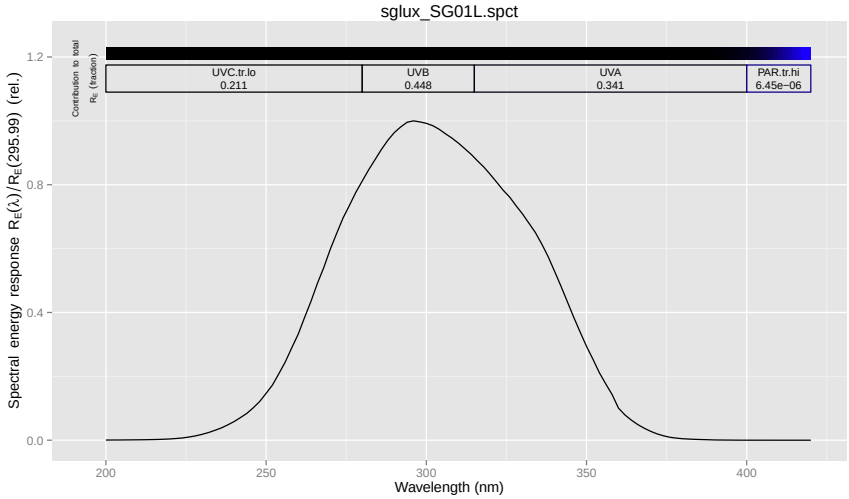

sglux_SG01D_A.spct
Contribution to total
R_Q (fraction)
UVC.tr.lo
0.000514
UVB
0.0422
UVA
0.957
PAR.tr.hi
2.08e−05
Spectral photon response $R_Q(\lambda)/R_Q(334.002)$ (rel. unit)
1.2
0.8
0.4
0.0
200
250
300
350
400
Wavelength (nm)

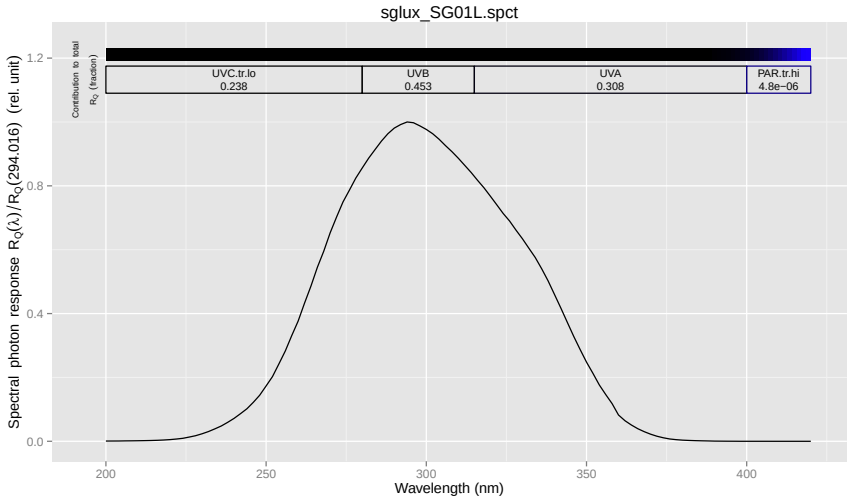


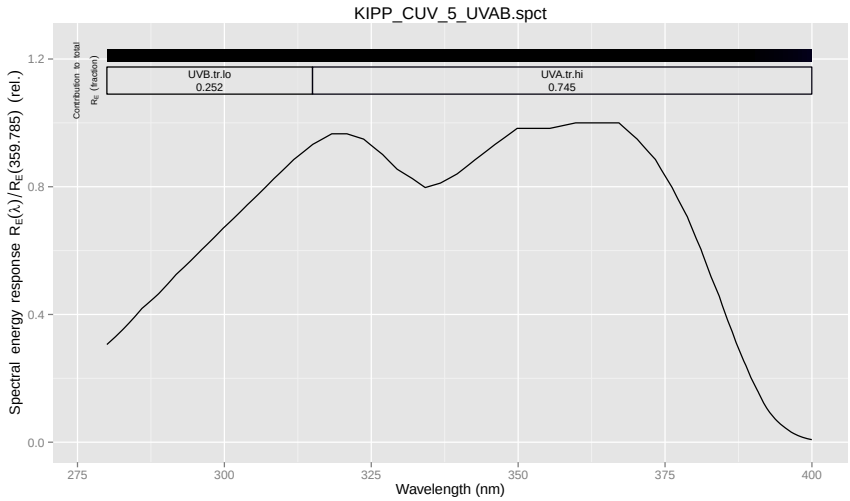


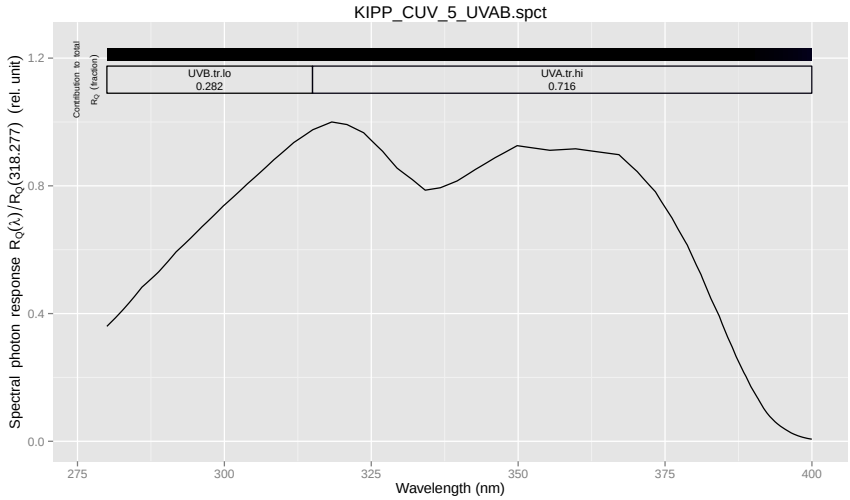
9 Broadband UV sensors

```
plotter(sglux_SG01L.spct)
plotter(KIPP_CUV_5_UVAB.spct)
```


sglux_SG01L.spct
Contribution to total
R_E (fraction)
UVC.tr.lo
0.211
UVB
0.448
UVA
0.341
PAR.tr.hi
6.45e−06
Spectral energy response $R_E(\lambda)/R_E(295.99)$ (rel.)
1.2
0.8
0.4
0.0
200
250
300
350
400
Wavelength (nm)

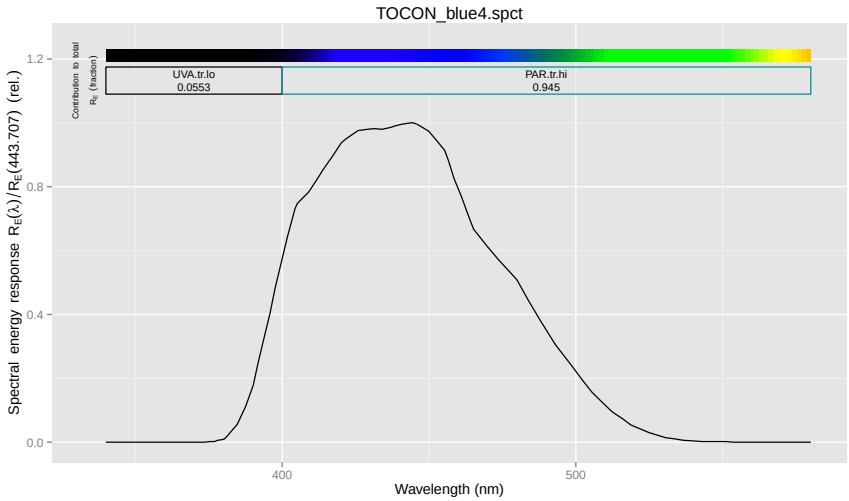

sglux_SG01L.spct
Contribution to total
R_Q (fraction)
UVC.tr.lo
0.238
UVB
0.453
UVA
0.308
PAR.tr.hi
4.8e−06
Spectral photon response $R_Q(\lambda)/R_Q(294.016)$ (rel. unit)
1.2
0.8
0.4
0.0
200
250
300
350
400
Wavelength (nm)

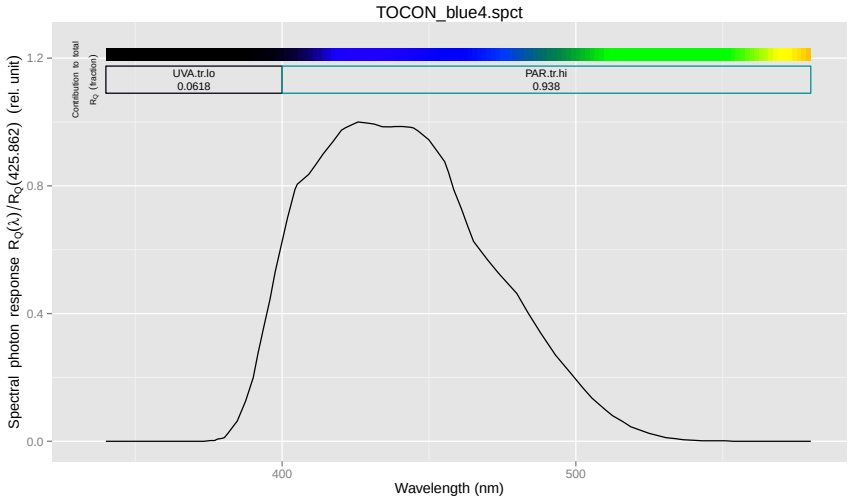




10 Blue sensors

```
plotter(TOCON_blue4.spct)
```


TOCON_blue4.spct
Contribution to total
R_E (fraction)
UVA.tr.lo
0.0553
PAR.tr.hi
0.945
Spectral energy response $R_E(\lambda)/R_E(443.707)$ (rel.)
1.2
0.8
0.4
0.0
400
500
Wavelength (nm)


TOCON_blue4.spct
Contribution to total
R_Q (fraction)
UVA.tr.lo
0.0618
PAR.tr.hi
0.938
Spectral photon response $R_Q(\lambda)/R_Q(425.862)$ (rel. unit)
1.2
0.8
0.4
0.0
400
500
Wavelength (nm)