photobiologySun Version 0.3.1
Catalogue of Solar Spectra

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1 Introduction

The plots show the solar spectral irradiance data included in the package.

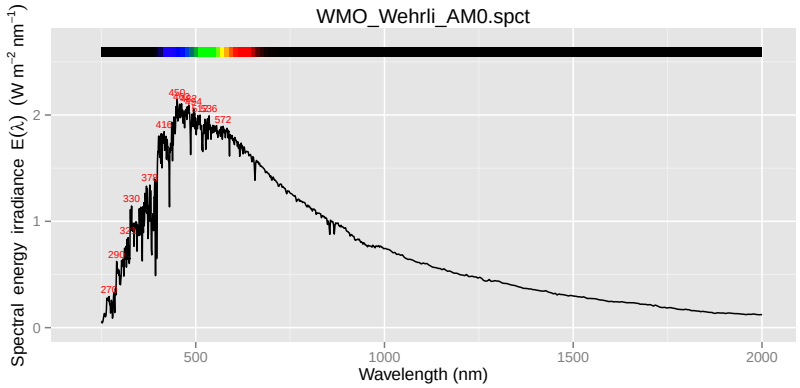
```
library(ggplot2)
library(photobiology)
library(photobiologySun)
library(photobiologygg)
```

```
options(photobiology.plot.annotations =
          c("boxes", "labels", "colour.guide", "peaks", "title"))
```

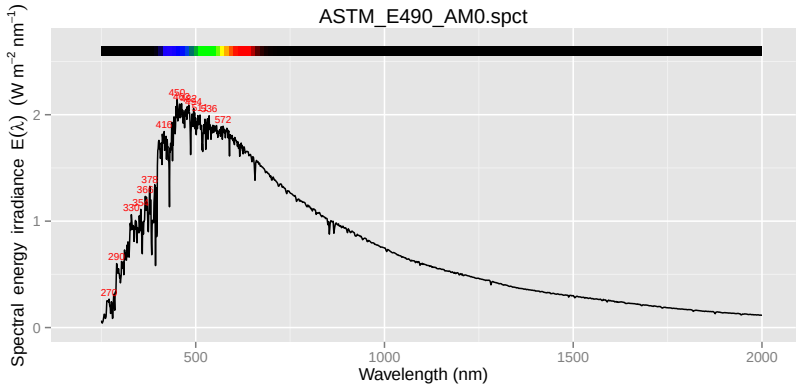
We define a function to do the actual plotting so as to not repeat code, and to make changes easier in the future.

2 Extraterrestrial solar spectra

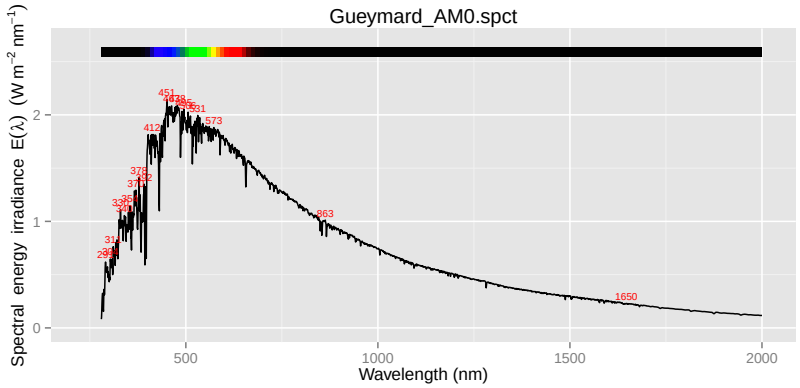
```
plot(WMO_Wehrli_AM0.spct, range=c(250, 2000), w.band = NULL)
```



```
plot(ASTM_E490_AM0.spct, range=c(250, 2000), w.band = NULL)
```

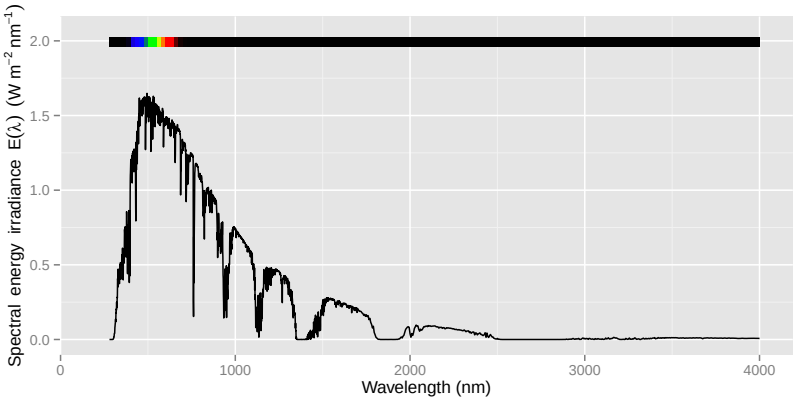



```
plot(Gueymard_AM0.spct, range=c(250, 2000), w.band = NULL)
```

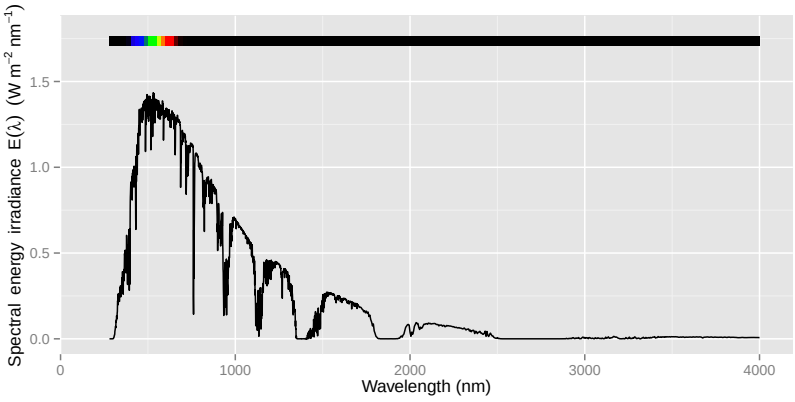


3 Standard terrestrial solar spectra

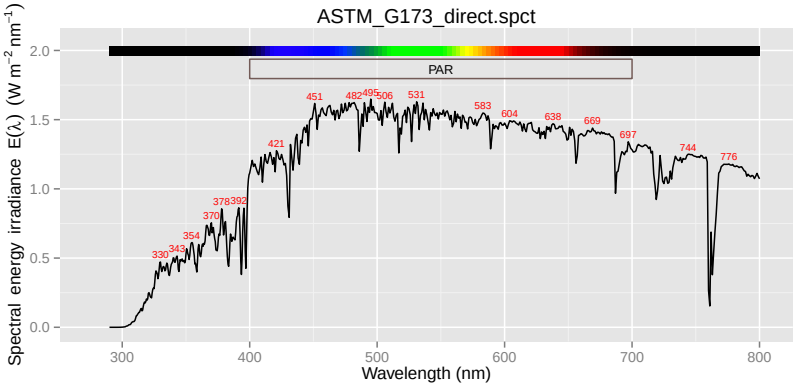
```
plot(ASTM_G173_direct.spct, annotations="colour.guide")
```



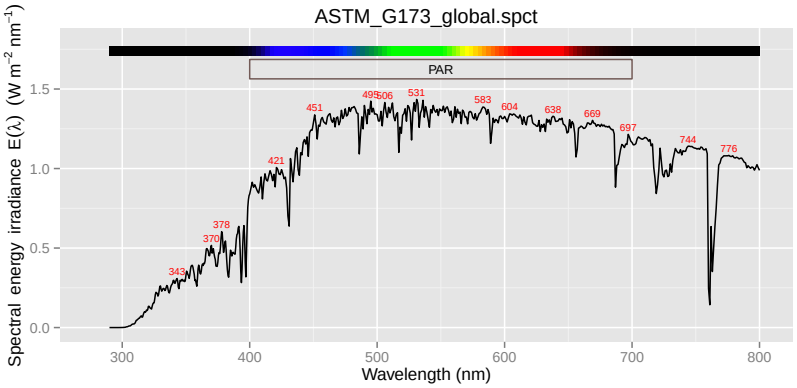

```
plot(ASTM_G173_global.spct, annotations="colour.guide")
```




```
plot(ASTM_G173_direct.spct, range=c(290, 800), w.band=PAR())
```

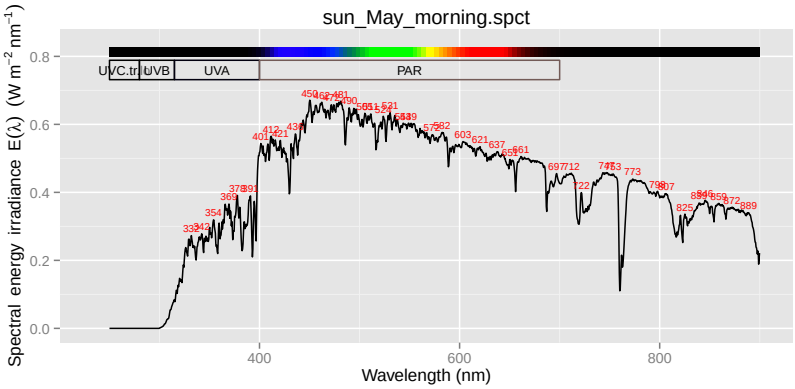


```
plot(ASTM_G173_global.spct, range=c(290, 800), w.band=PAR())
```

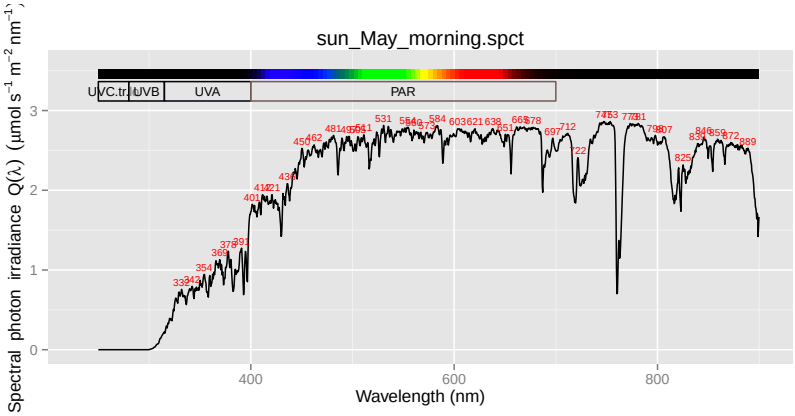


4 Measured daylight spectra

```
plot(sun_May_morning.spct)
```



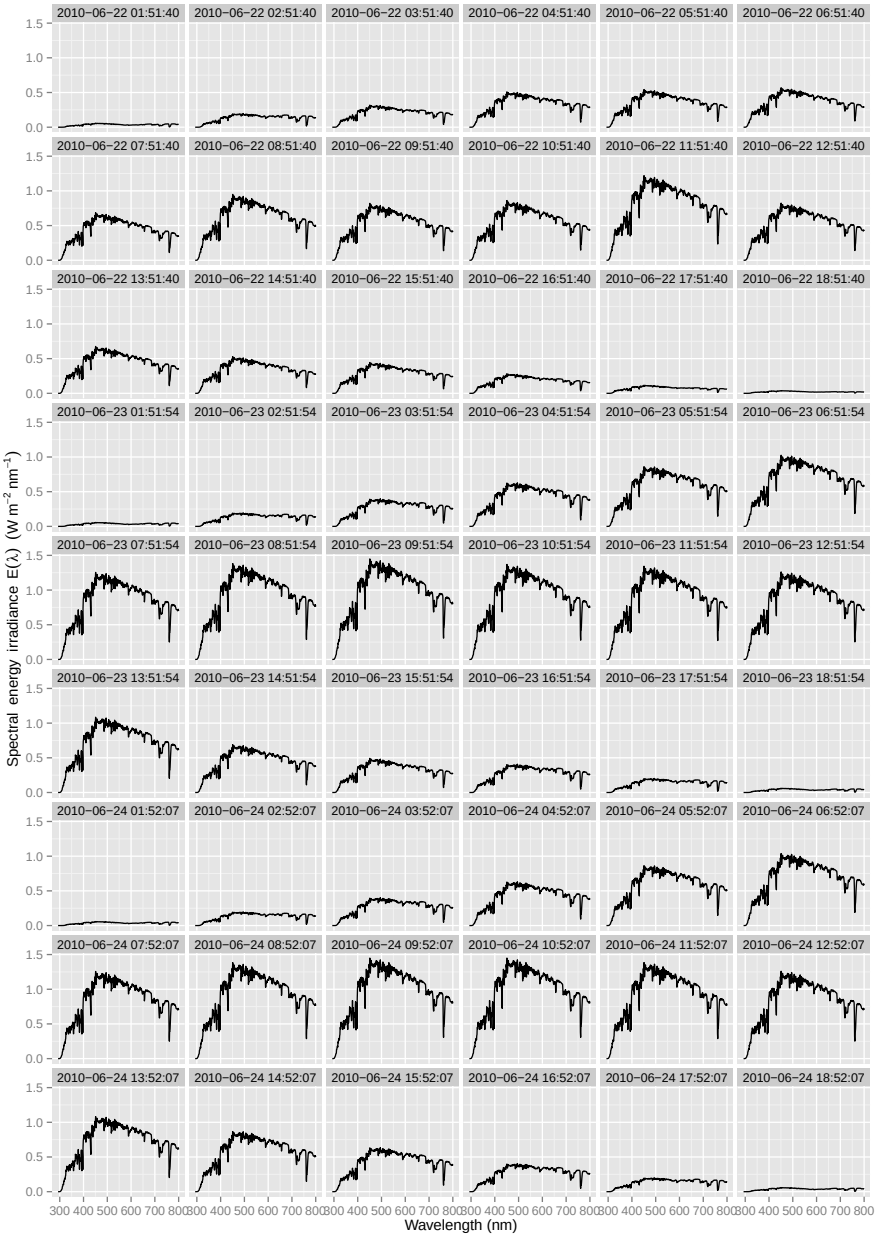

```
plot(sun_May_morning.spct, unit.out = "photon")
```



5 Simulated hourly daylight spectra

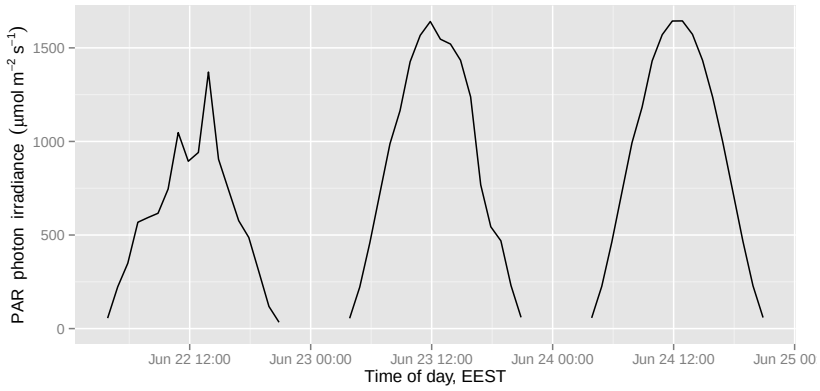
Summer in Helsinki, modelled spectra using a radition transfer model.

```
plot(subset(sun_hourly.spct, !is.na(s.e.irrad)), annotations = NULL) +
  facet_wrap(~UTC, ncol = 6)
```

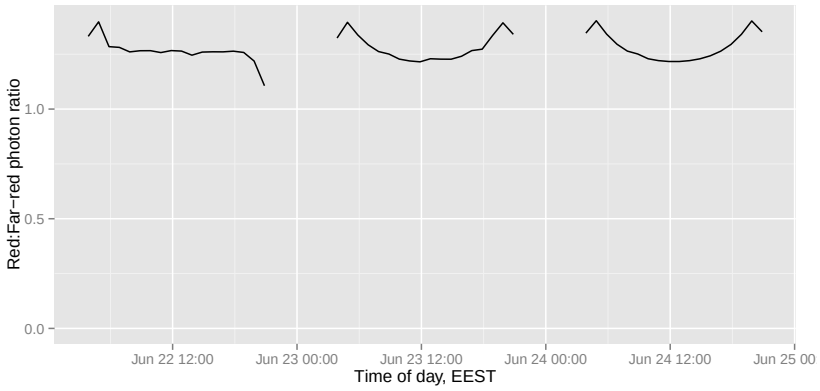


```
ratios.dt <-
  sun_hourly.spct[ , list(RFR  = q_ratio(.SD, Red("Smith10"), Far_red("Smith10")),
                          BG   = q_ratio(.SD, Blue("Sellaro"), Green("Sellaro")),
                          BR   = q_ratio(.SD, Blue("Sellaro"), Red("Sellaro")),
                          UVAsl = q_ratio(.SD, waveband(c(min(UVA()), 350)),
                                          waveband(c(350, max(UVA())))),
                          UVBUVA = q_ratio(.SD, UVB(), UVA()),
                          UVAPAR = q_ratio(.SD, UVA(), PAR()),
                          UVBPAR = q_ratio(.SD, UVB(), PAR()),
                          PPFD = q_irrad(.SD, PAR()) * 1e6 ),
                  by = UTC]
```

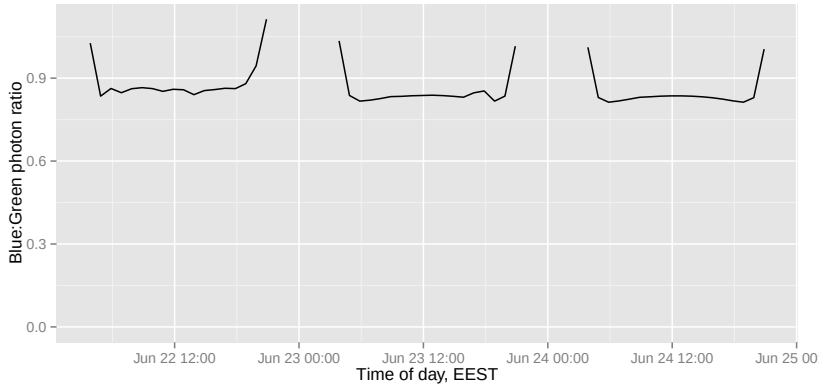
```
ggplot(data = ratios.dt, aes(x = UTC + hours(2), y = PPFD)) +
  geom_line() + ylim(0, NA) +
  labs(x = "Time of day, EEST",
       y = expression(PAR~~photon~~irradiance~~(mu*mol~m^{-2}~s^{-1})) )
```



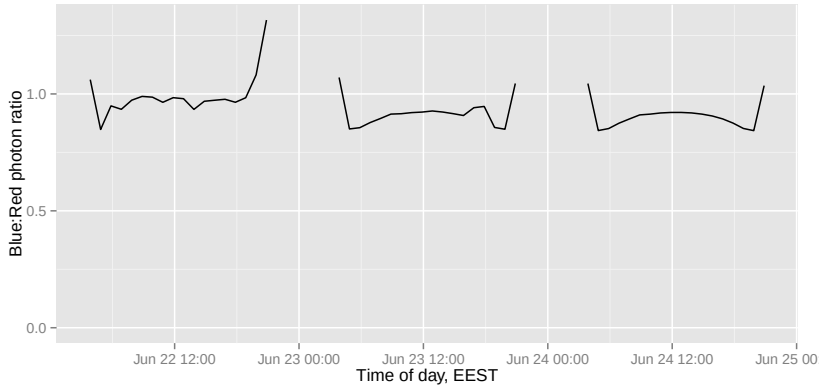

```
ggplot(data = ratios.dt, aes(x = UTC  + hours(2), y = RFR)) +
  geom_line() + ylim(0, NA) +
  labs(x = "Time of day, EEST", y = "Red:Far-red photon ratio")
```



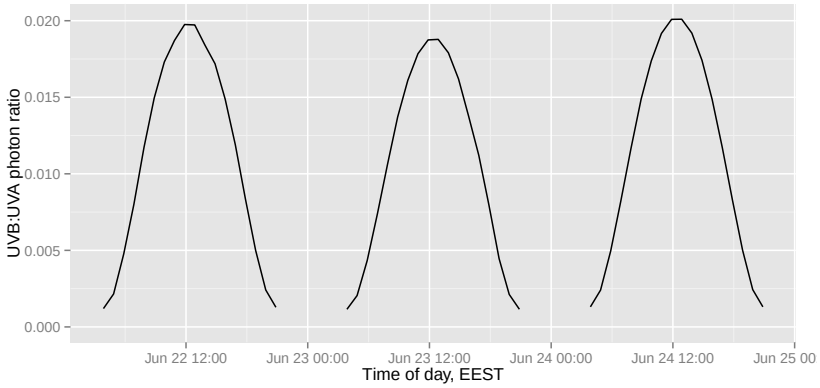
```
ggplot(data = ratios.dt, aes(x = UTC + hours(2), y = BG)) +
  geom_line() + ylim(0, NA) +
  labs(x = "Time of day, EEST", y = "Blue:Green photon ratio")
```



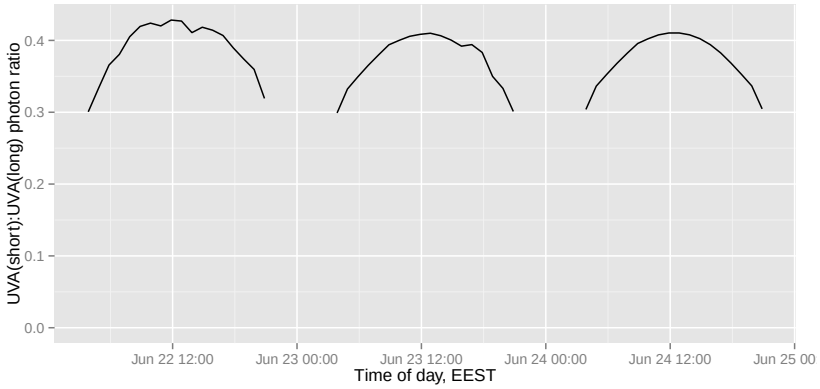

```
ggplot(data = ratios.dt, aes(x = UTC + hours(2), y = BR)) +
  geom_line() + ylim(0, NA) +
  labs(x = "Time of day, EEST", y = "Blue:Red photon ratio")
```



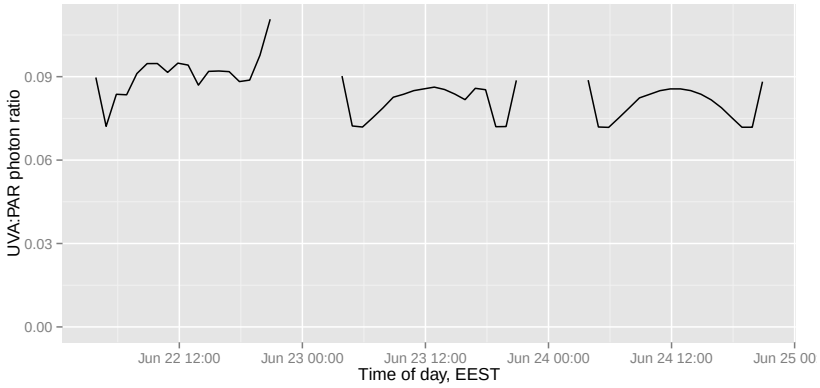
```
ggplot(data = ratios.dt, aes(x = UTC + hours(2), y = UVBUVA)) +
  geom_line() + ylim(0, NA) +
  labs(x = "Time of day, EEST", y = "UVB:UVA photon ratio")
```




```
ggplot(data = ratios.dt, aes(x = UTC + hours(2), y = UVAsl)) +
  geom_line() + ylim(0, NA) +
  labs(x = "Time of day, EEST", y = "UVA(short):UVA(long) photon ratio")
```



```
ggplot(data = ratios.dt, aes(x = UTC + hours(2), y = UVAPAR)) +
  geom_line() + ylim(0, NA) +
  labs(x = "Time of day, EEST", y = "UVA:PAR photon ratio")
```




```
ggplot(data = ratios.dt, aes(x = UTC + hours(2), y = UVBPAR)) +
  geom_line() + ylim(0, NA) +
  labs(x = "Time of day, EEST", y = "UVB:PAR photon ratio")
```