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.

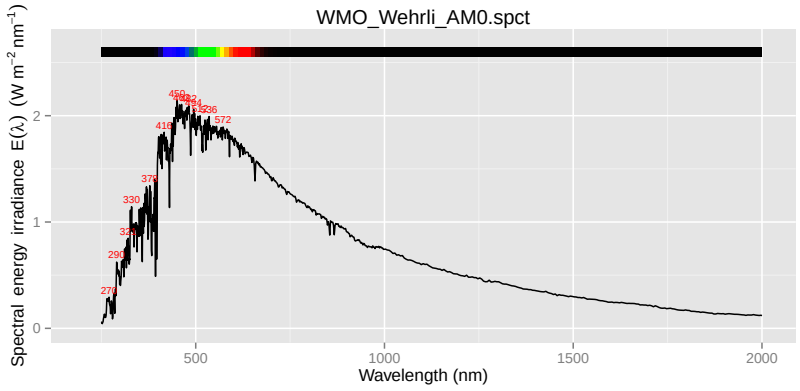
```
library(ggplot2)
library(photobiology)
library(photobiologySun)
library(photobiologyPlants)
library(photobiologygg)
```

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

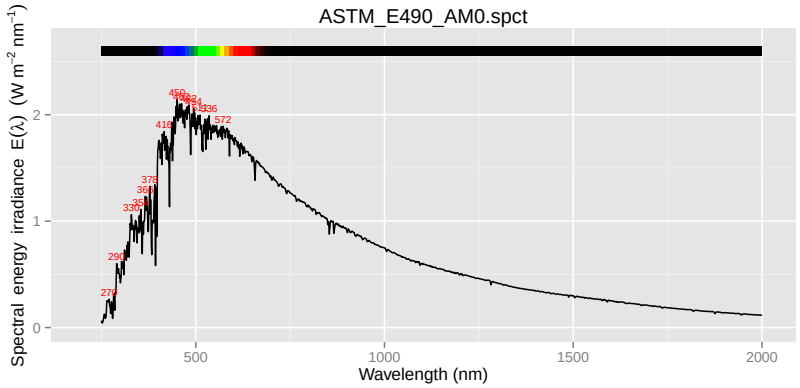
We define a function to do the actual plotting so as to not repeat code, and to make changes easier in the future.

2 Extraterrestrial solar spectra

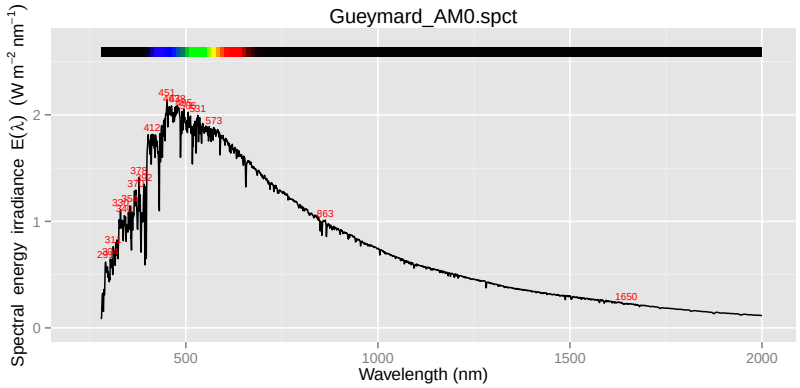
```
plot(WMO_Wehrli_AM0.spct, range=c(250, 2000), w.band = NULL)
```



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

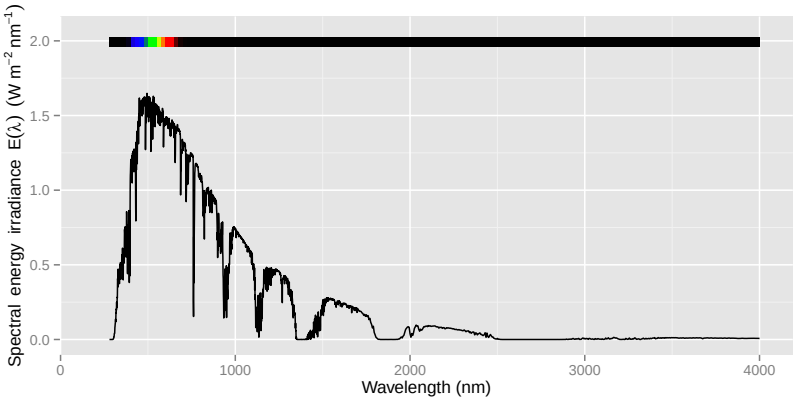



```
plot(Gueymard_AM0.spct, range=c(250, 2000), w.band = NULL)
```

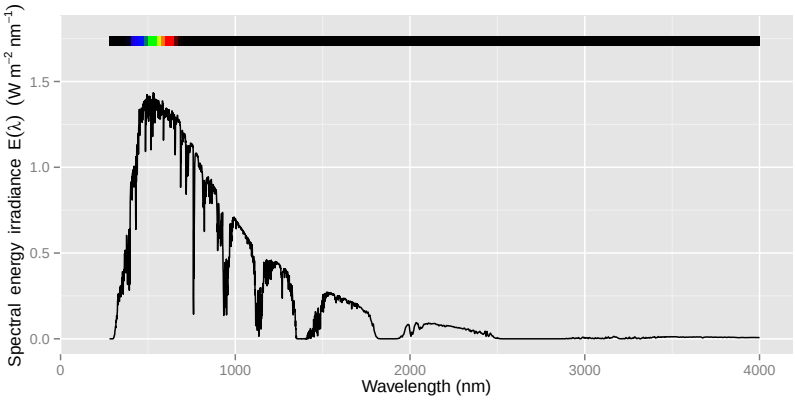


3 Standard terrestrial solar spectra

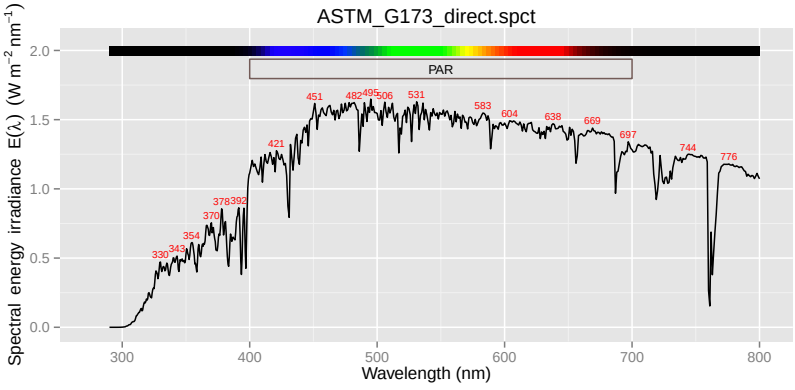
```
plot(ASTM_G173_direct.spct, annotations="colour.guide")
```



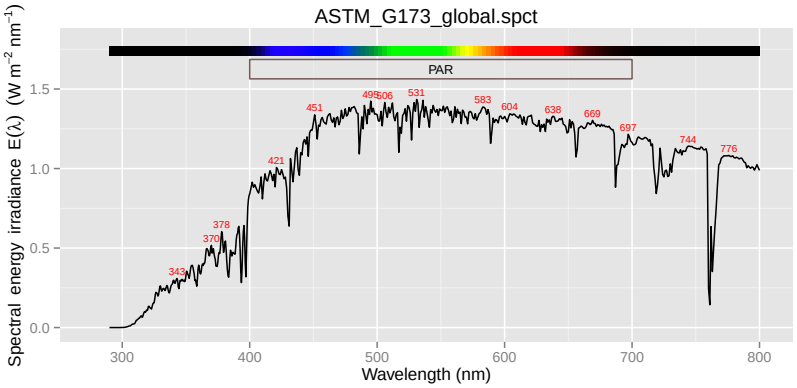

```
plot(ASTM_G173_global.spct, annotations="colour.guide")
```




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

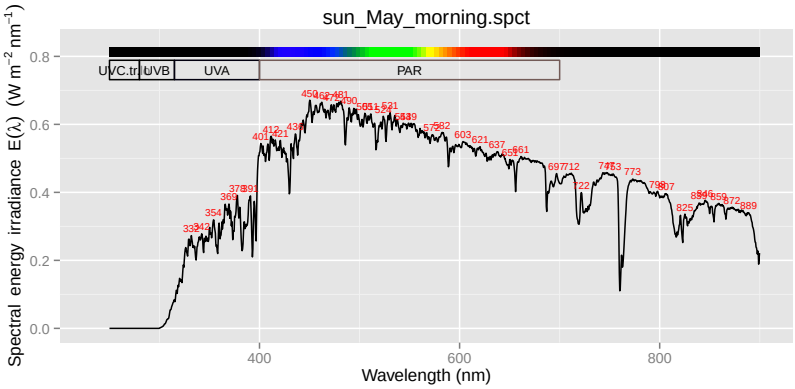


```
plot(ASTM_G173_global.spct, range=c(290, 800), w.band=PAR())
```

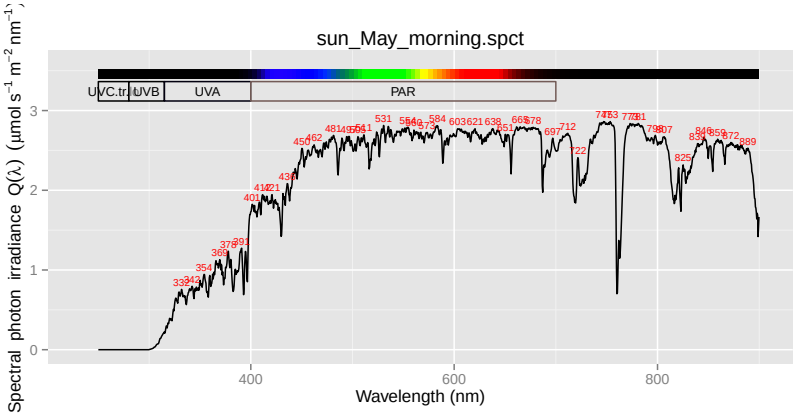


4 Measured daylight spectra

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



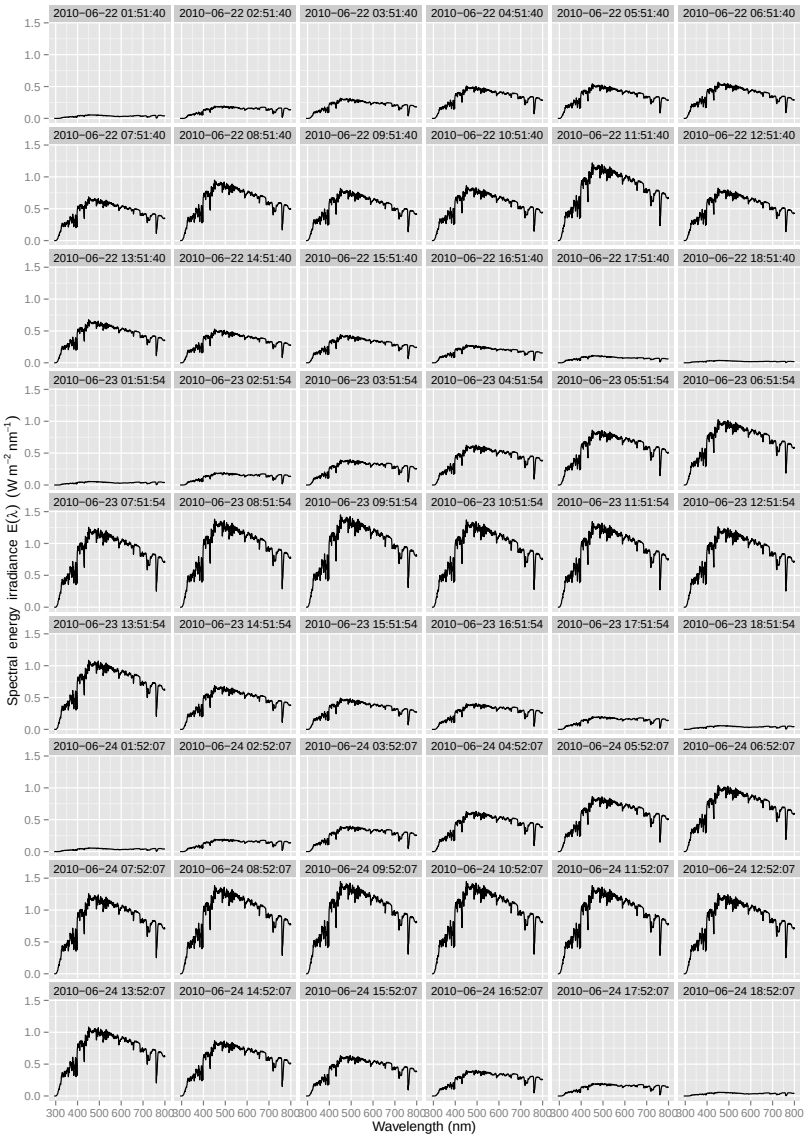

```
plot(sun_May_morning.spct, unit.out = "photon")
```



5 Simulated hourly daylight spectra

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

```
plot(sun_hourly.spct, annotations = NULL) + facet_wrap(~UTC, ncol = 6)
```

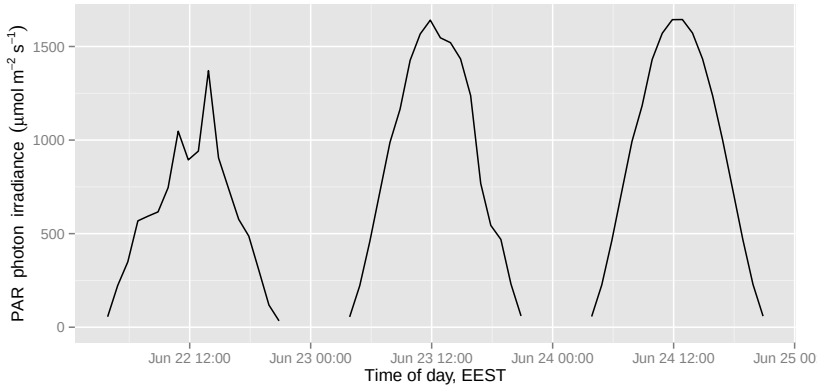


```
night22b.spct <- data.table(w.length = 293:800,
                            s.e.irrad = NA,
                            UTC = ymd_h("2010-06-22 19"))
night23a.spct <- data.table(w.length = 293:800,
                            s.e.irrad = NA,
                            UTC = ymd_h("2010-06-23 1"))
night23b.spct <- data.table(w.length = 293:800,
                            s.e.irrad = NA,
                            UTC = ymd_h("2010-06-23 19"))
night24a.spct <- data.table(w.length = 293:800,
                            s.e.irrad = NA,
                            UTC = ymd_h("2010-06-24 1"))
setSourceSpct(night22b.spct)
setSourceSpct(night23a.spct)
setSourceSpct(night23b.spct)
setSourceSpct(night24a.spct)
```

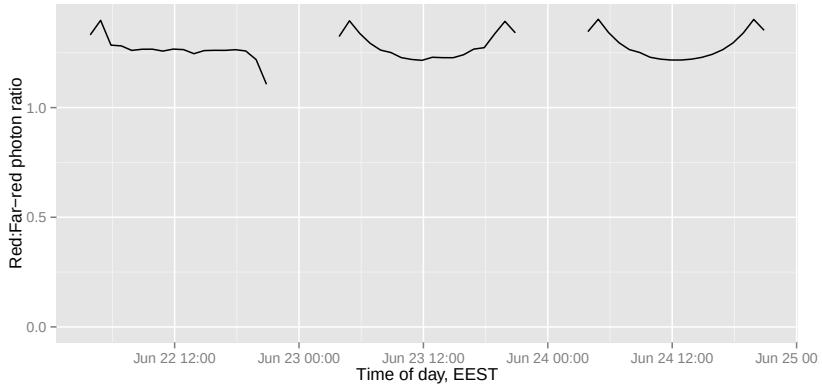
```
day_night_hourly.spct <- rbindspct(list(copy(sun_hourly.spct),
                                        night22b.spct,
                                        night23a.spct,
                                        night23b.spct,
                                        night24a.spct))
```

```
ratios.dt <-
  day_night_hourly.spct[ , list(RFR  = R_FR(.SD),
                                BG   = B_G(.SD),
                                BR   = q_ratio(.SD, Blue("Sellaro"), Red("Sellaro")),
                                UVAPAR = q_ratio(.SD, UVA(), PAR()),
                                UVBPAR = q_ratio(.SD, UVB(), PAR()),
                                PPFD = q_irrad(.SD, PAR()) * 1e6),
                            by = UTC]
```

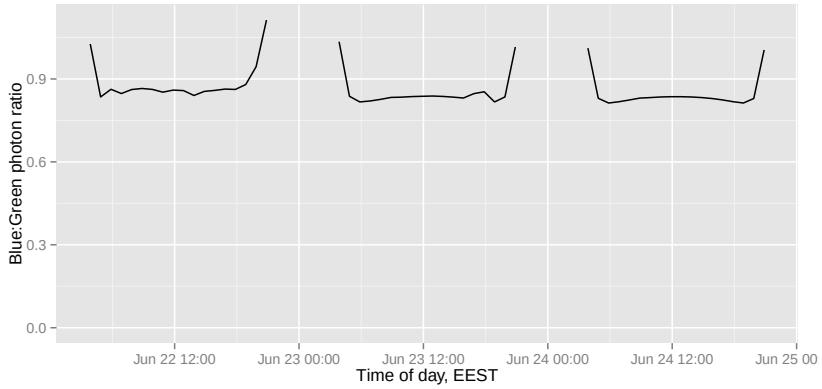
```
ggplot(data = ratios.dt, aes(x = UTC + hours(2), y = PPFD)) +
  geom_line() + ylim(0, NA) +
  labs(x = "Time of day, EEST",
       y = expression(PAR~~photon~~irradiance~~(mu*mol~m^{-2}~s^{-1})) )
```



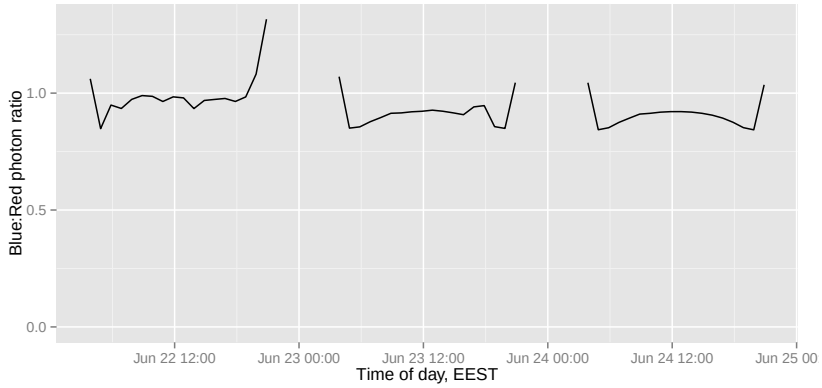
```
ggplot(data = ratios.dt, aes(x = UTC  + hours(2), y = RFR)) +
  geom_line() + ylim(0, NA) +
  labs(x = "Time of day, EEST", y = "Red:Far-red photon ratio")
```



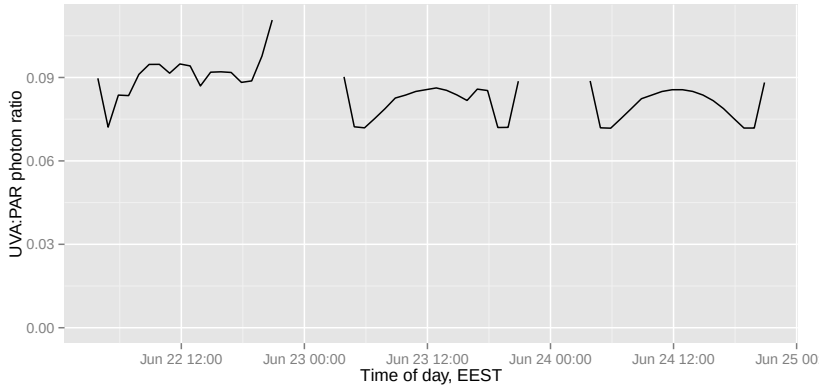

```
ggplot(data = ratios.dt, aes(x = UTC + hours(2), y = BG)) +
  geom_line() + ylim(0, NA) +
  labs(x = "Time of day, EEST", y = "Blue:Green photon ratio")
```



```
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 = 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")
```