photobiologySun Version 0.1.1
Catalogue of Solar Spectra

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May 9, 2014

1 Introduction

We will plot the emission spectra of the different lamps for which data is provided in the pacakge. We plot side-by-side the lamp output as spectral energy irradiance and as spectral photon irradiance. All spectra are normalized to an area of one under the whole curve.

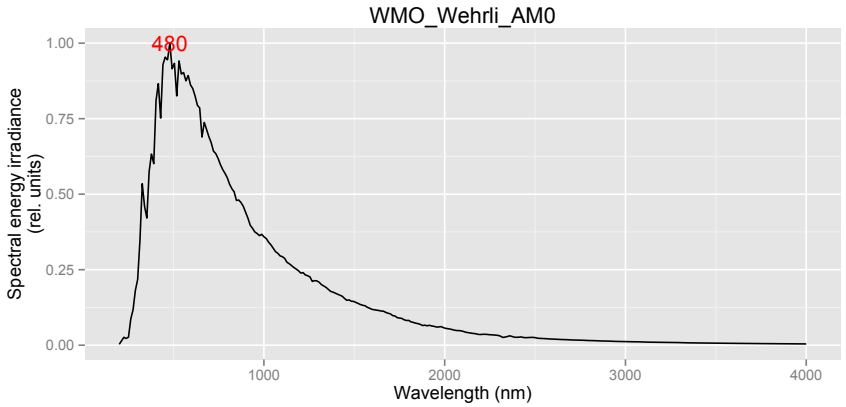
```
library(ggplot2)
library(photobiology)
library(photobiologyLamps)
library(photobiologySun)
library(photobiologygg)

## Loading required package:  proto
## Loading required package:  splus2R
## Loading required package:  plyr
```

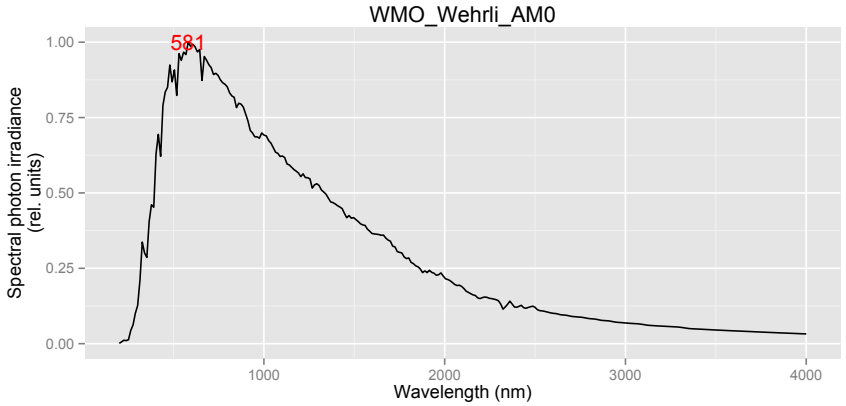
We define a function to do the actual plotting so as to not repeat code, and to make changes easier in the future.

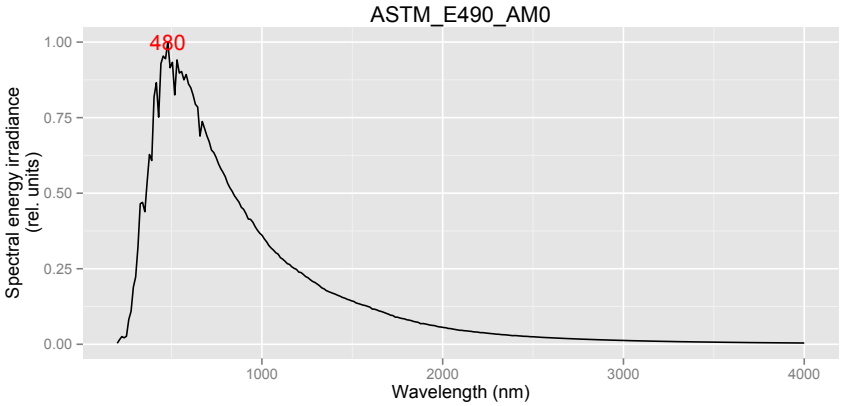
```
source.plotter <- function(source.name, w.low = 250, w.high = 900, scaled = "peak") {
    w.length.out <- seq(from = w.low, to = w.high, length.out = 300)
    spectrum.data <- calc_source_output(w.length.out = w.length.out, source.name = source.name,
        scaled = scaled)
    spectrum.data <- na.omit(spectrum.data)
    fig_energy <- ggplot(aes(x = w.length, y = s.e.irrad), data = spectrum.data) +
        xlim(w.low, w.high) + labs(x = "Wavelength (nm)", y = "Spectral energy irradiance\n(rel. units)",
        title = source.name) + geom_line() + stat_peaks(ignore_threshold = 0.33,
        colour = "red", span = 21)
    fig_photon <- ggplot(aes(x = w.length, y = s.q.irrad), data = spectrum.data) +
        xlim(w.low, w.high) + labs(x = "Wavelength (nm)", y = "Spectral photon irradiance\n(rel. units)",
        title = source.name) + geom_line() + stat_peaks(ignore_threshold = 0.33,
        colour = "red", span = 21)
    print(fig_energy)
    print(fig_photon)
}
```

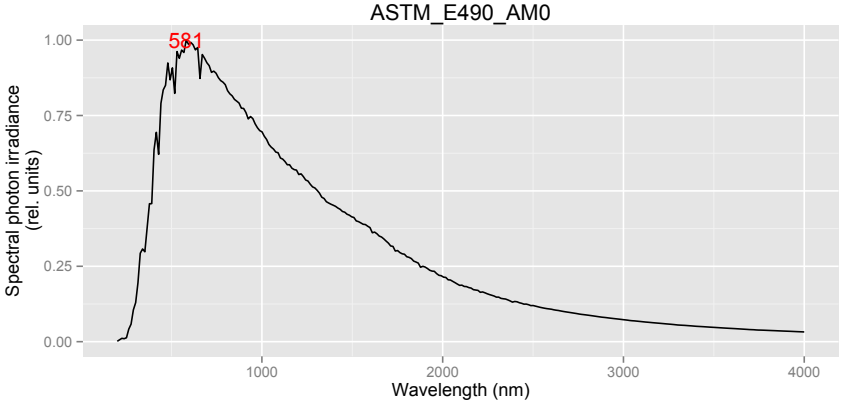
2 Extraterrestrial solar spectra

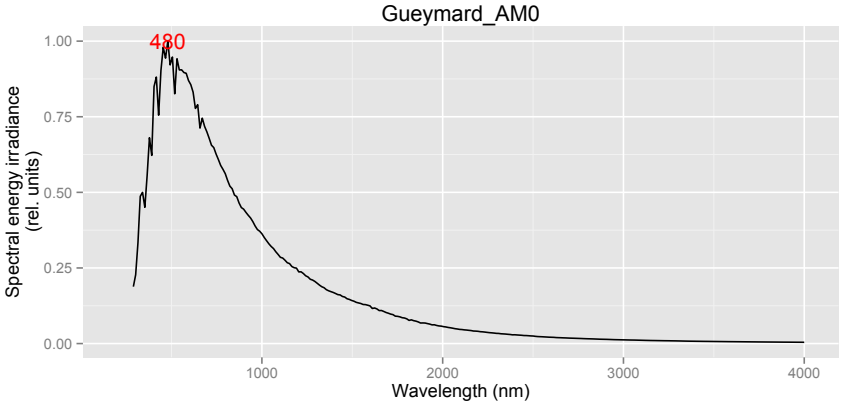
```
spectra <- c("WMO_Wehrli_AM0", "ASTM_E490_AM0", "Gueymard_AM0")
for (spc in spectra) {
    source.plotter(source.name = spc, w.low = 200, w.high = 4000)
}
```

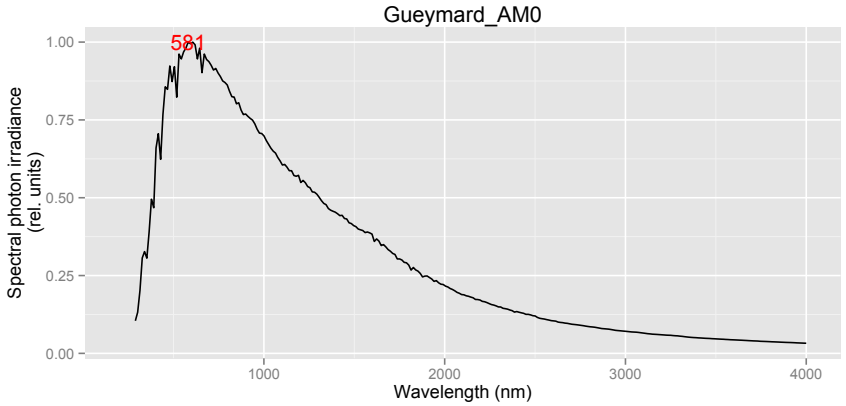





ASTM_E490_AM0
480
Spectral energy irradiance
(rel. units)
1.00
0.75
0.50
0.25
0.00
1000
2000
3000
4000
Wavelength (nm)

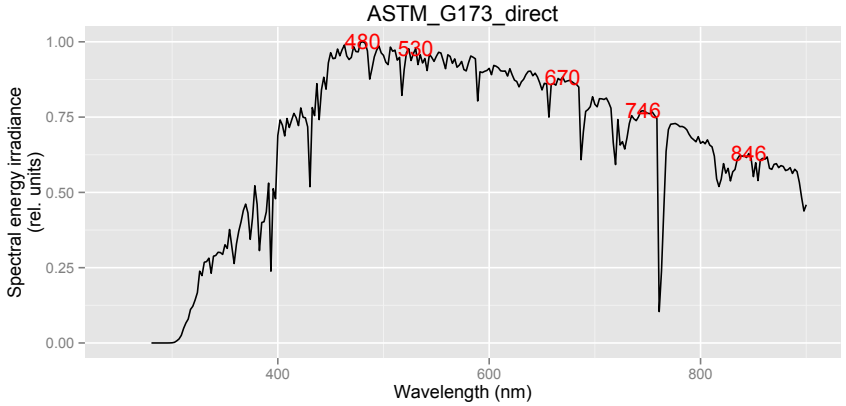

ASTM_E490_AM0
581
Spectral photon irradiance
(rel. units)
1.00
0.75
0.50
0.25
0.00
1000
2000
3000
4000
Wavelength (nm)

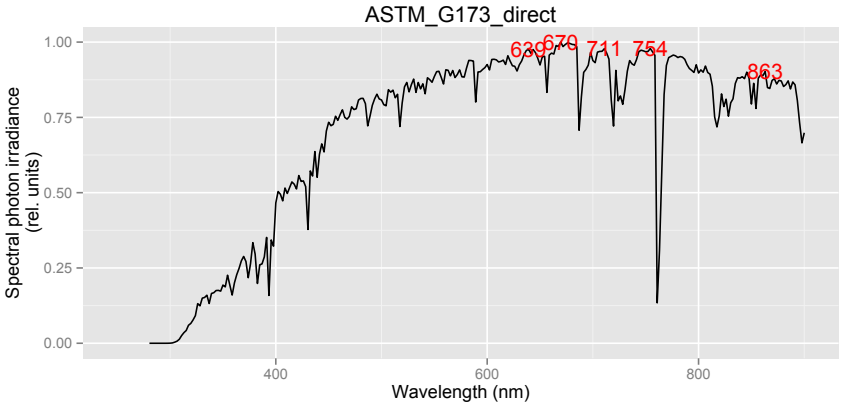

Gueymard_AM0
480
Spectral energy irradiance
(rel. units)
1.00
0.75
0.50
0.25
0.00
1000
2000
3000
4000
Wavelength (nm)

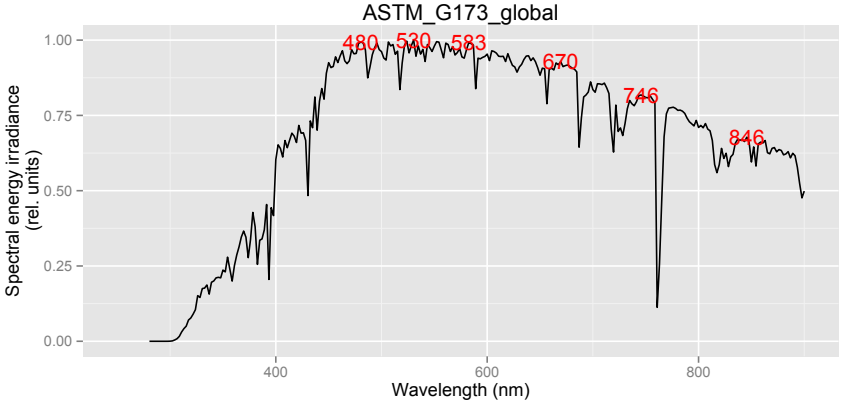


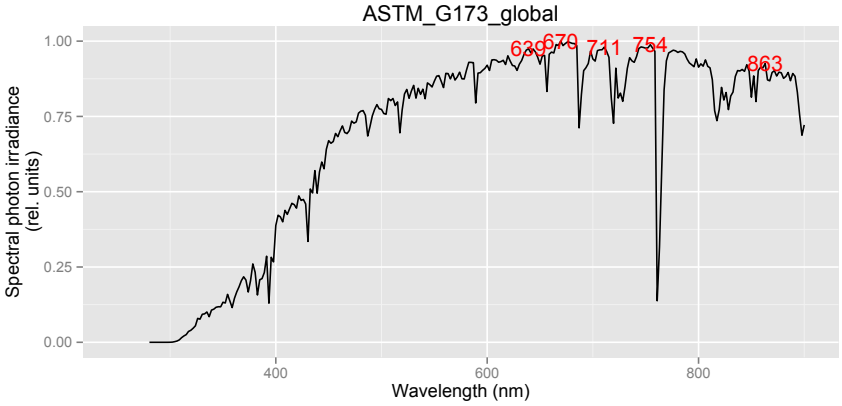
3 Standard terrestrial solar spectra

```
spectra <- c("ASTM_G173_direct", "ASTM_G173_global")
for (spc in spectra) {
    source.plotter(source.name = spc)
}
```









4 Measured dayligh spectra

```
spectra <- c("sun_May_morning")
for (spc in spectra) {
    source.plotter(source.name = spc)
}
```