

Li-600 comparison

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Background

In this document, I do some simple descriptive analyses of data collecting using the new [Li-600 porometer] (<https://www.licor.com/env/products/LI-600/>). I was lucky to be allowed to test the porometer. Li-COR (aka Lambda Instruments Corporation, Lincoln, NE) let me borrow an instrument for one week (from 10/16 to 10/23 2020). With the help of Catherine Bravo, from the Ken Feeley Lab (aka Jungle Biology), we measured stomatal conductance and Chlorophyll fluorescence on 40 plant species (3 leaves per plant) at Fairchild Topical Botanical Garden (FTBG) in Miami, FL from 3:00-5:00 PM on Saturday 10/17/2020. We compare measurements from the Li-6800 to the Meter (was Decacon Devices) [SC-1 porometer] (<https://www.metergroup.com/environment/products/sc-1-leaf-porometer/>). We measured 10 species (30 leaves) with both instruments. Here, we look at those data.

```
# Read in the data

### I call it poroTest, and it has the taxonomic information
### for each tree species we measured, the Li-COR 600 data
### (left columns), and the Decagon Devices/METER SC-1
### porometer data (right columns, only for 10 species)

library(readr)
poroTest <- read_csv("C:/Users/hogie/Desktop/OCTOBER 2020_Li600 Testing/LI-600_ComparisonData.csv")
# View(poroTest)

### factorize Family
poroTest$Family <- as.factor(poroTest$Family)
# head(poroTest)
```

Table of species sampled at FTBG

- Note: 3 leaves for each species on the same individual were measured. The first 10 species were used for comparison of the Li-600 to the SC-1 porometer.

```
library(dplyr)
library(knitr)
kable(poroTest %>% distinct(Genus, Species, Family))
```

Genus	Species	Family
Bursera	simarouba	Bursreaceae
Ficus	petiolaris	Moraceae
Rahpidophyllum	hystrix	Aracaceae

Genus	Species	Family
Coccoloba	diversifolia	Polganaceae
Conocarpus	erectus silver	Combretaceae
Cloerodendrum	quadrilogularea	Lamiaceae
Dracena	drago	Agavaceae
Monstera	deliciosa	Araceae
Kavalama	urens	Malvaceae
Quercus	virginiana	Fagaceae
Chamaedorea	sp.	Aracaceae
Psychotria	sp.	Rubiaceae
Agathis	macriphylla	Araucariaceae
Philodendron	sp.	Araceae
Theobroma	cacao	Malvaceae
Canarium	odontophyllum	Bursreaceae
Ilex	opaca	Aquifoliaceae
Plumeria	sp.	Apocynaceae
Caloptyris	gigantea	Asclepidaceae
Hamelia	patens	Rubiaceae
Randia	aculeata	Rubiaceae
Senna	alata	Fabaceae
Buxus	vahlII	Buxaceae
Jatropha	pauciflora	Euphorbiaceae
Schaefferia	frutescens	Celestraceae
Druranta	erecta	Verbenaceae
Musa	sp.	Musaceae
Azadirachta	indica	Meliaceae
Dillenia	indica	Dilleniaceae
Piper	betle	Piperaceae
Portlandia	platantha	Rubiaceae
Aechmea	sp.	Bromeliaceae
Megaskeposma	erythochalamys	Acanthaceae
Neomillspaughia	emarginata	Polygalaceae
Brosimum	alicastrum	Moraceae
Ceiba	petandra	Malvaceae
Datura	sp.	Solanaceae
Neea	nigricans	Nyctaginaceae
Amphitecna	latifolia	Bignoniaceae
Tabernamontana	divaricata	Apocynaceae

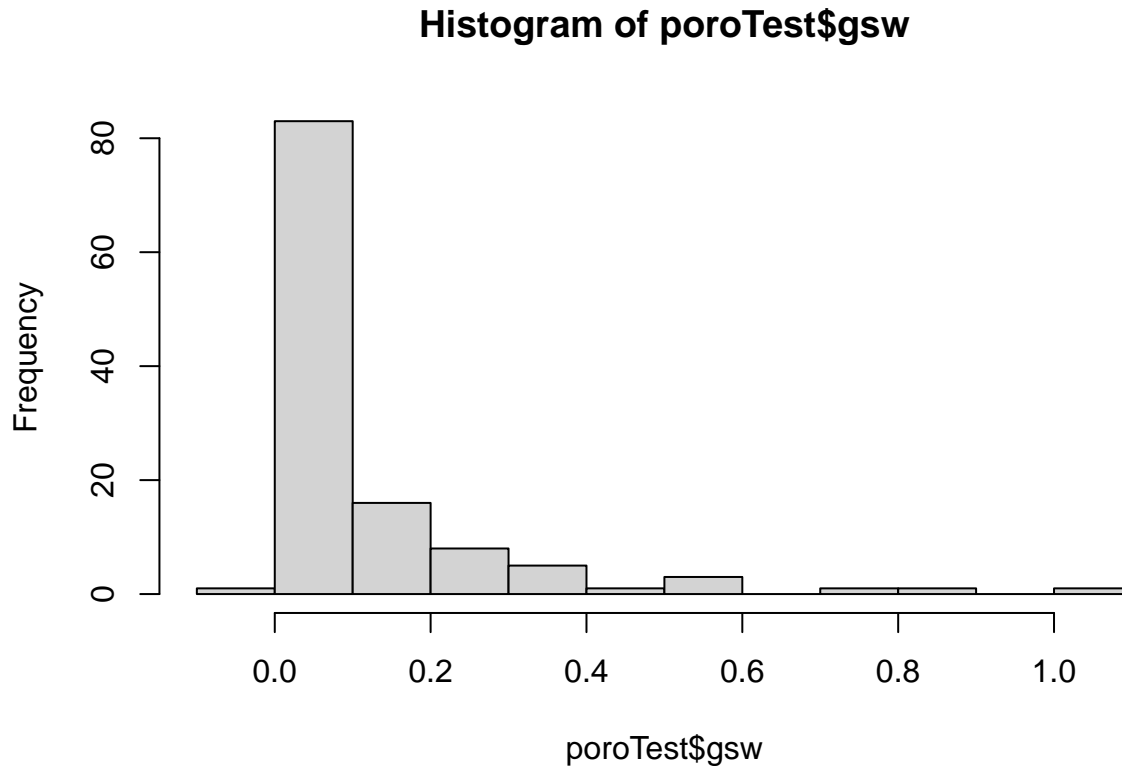
```

# library(kableExtra) kable(poroTest %>% distinct(Genus,
# Species, Family)) %>% kable_classic(full_width = F) %>%
# column_spec(1, width = '10em', italic = TRUE) %>%
# column_spec(2, width = '10em', italic = TRUE) %>%
# row_spec(c(1:10), bold = TRUE) %>% save_kable(file =
# 'PoroTest_SpeciesTable.html')

```

Question 1: What are the range of gsw values measured with the Li-600

```
### histogram  
hist(poroTest$gsw)
```



```
### range  
range(poroTest$gsw)
```

```
## [1] -0.004152  1.007095
```

```
### mean and std.error  
mean(poroTest$gsw)
```

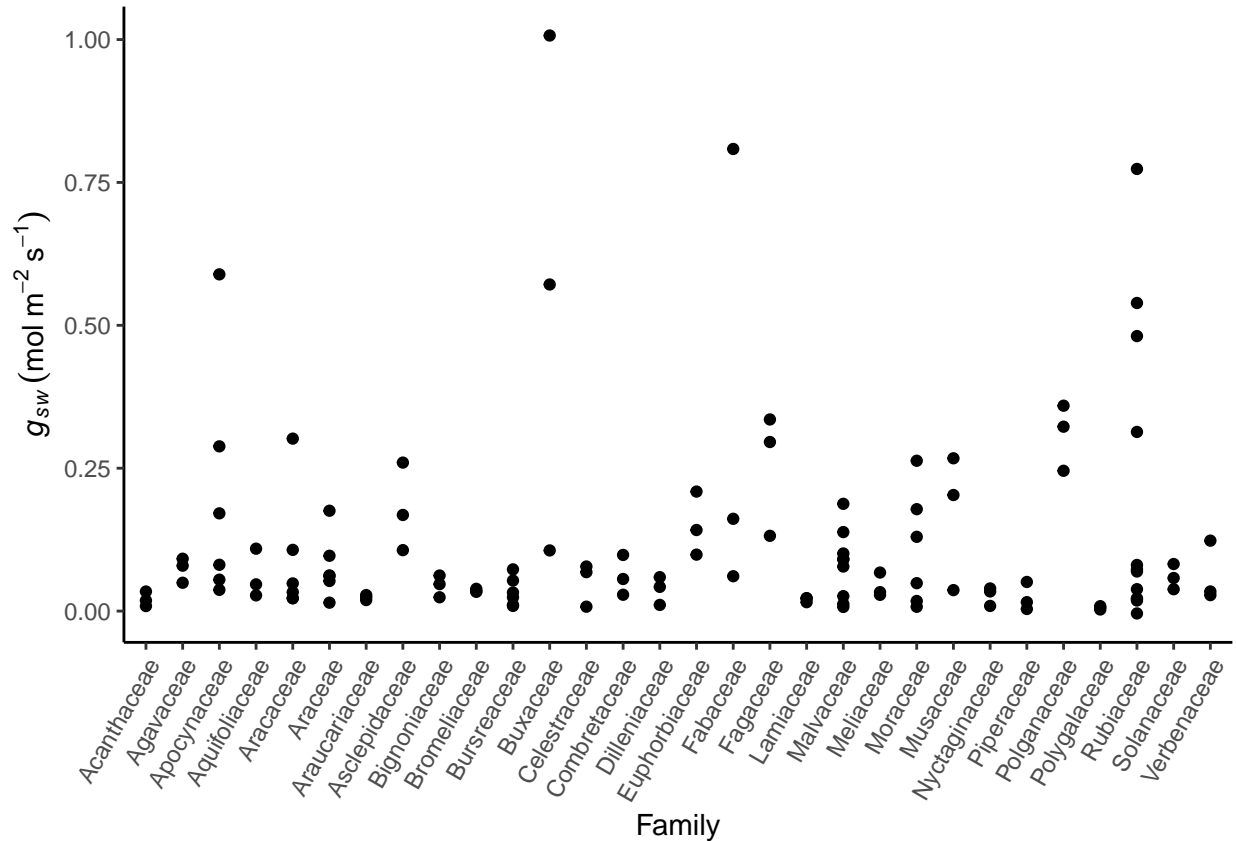
```
## [1] 0.1173089
```

```
plotrix::std.error(poroTest$gsw)
```

```
## [1] 0.01541475
```

```
library(ggplot2)
```

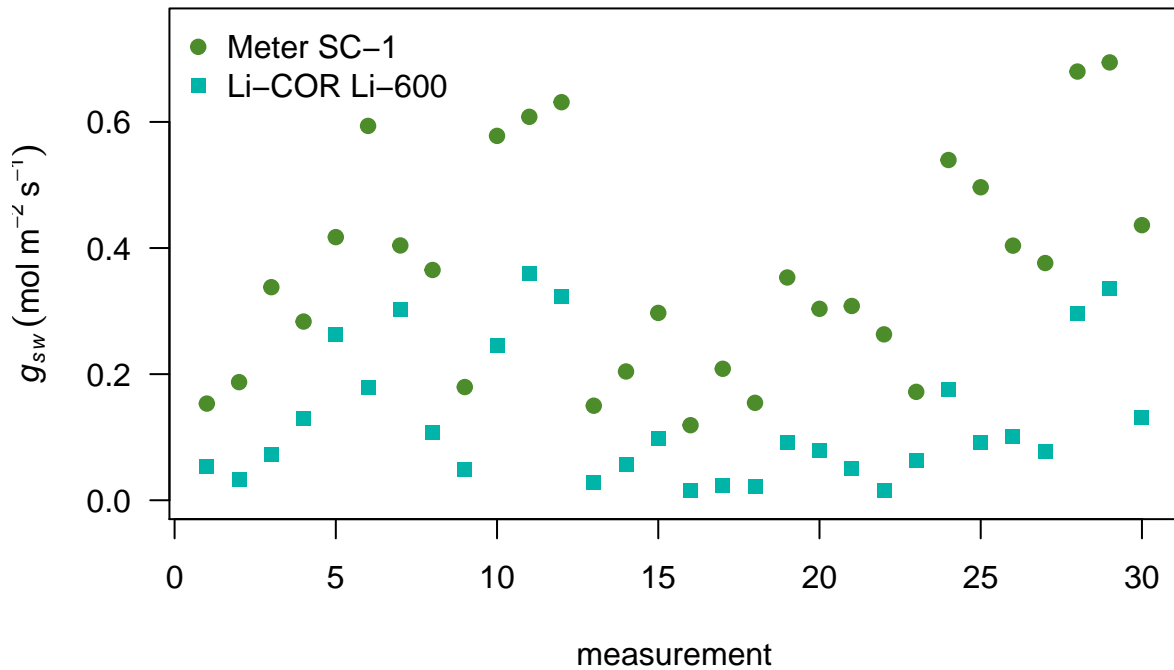
```
# tiff(filename = 'Li600measurements.tiff', width = 18,  
# height = 12, units = 'cm', res = 600, compression = 'lzw')  
ggplot(aes(Family, gsw), data = poroTest) + geom_point() + theme_classic() +  
  theme(axis.text.x = element_text(angle = 60, hjust = 1)) +  
  ylab(expression(italic(g[sw]) ~ (mol ~ m^-2 ~ s^-1)))
```



```
# dev.off()
```

Question 2: How do the measurements from the Li-600 compare to the SC-1

```
## plot Li-600 vs. SC-1 data tiff(filename =
## 'Li600vsSC1.tiff', width = 18, height =12, units = 'cm',
## res=600, compression = 'lzw')
plot(poroTest[poroTest$Tree < 11, ]$gsw, las = 1, xlab = "measurement",
      ylim = c(0, 0.75), ylab = expression(italic(g[sw]) ~ (mol ~
      m^-2 ~ s^-1)), pch = 15, col = "#00b4a8")
points(poroTest[poroTest$Tree < 11, ]$SC1_Conductance/1000, col = "#4c8c2b",
       pch = 19)
legend("topleft", legend = c("Meter SC-1", "Li-COR Li-600"),
      col = c("#4c8c2b", "#00b4a8"), pch = c(19, 15), bty = "n")
```

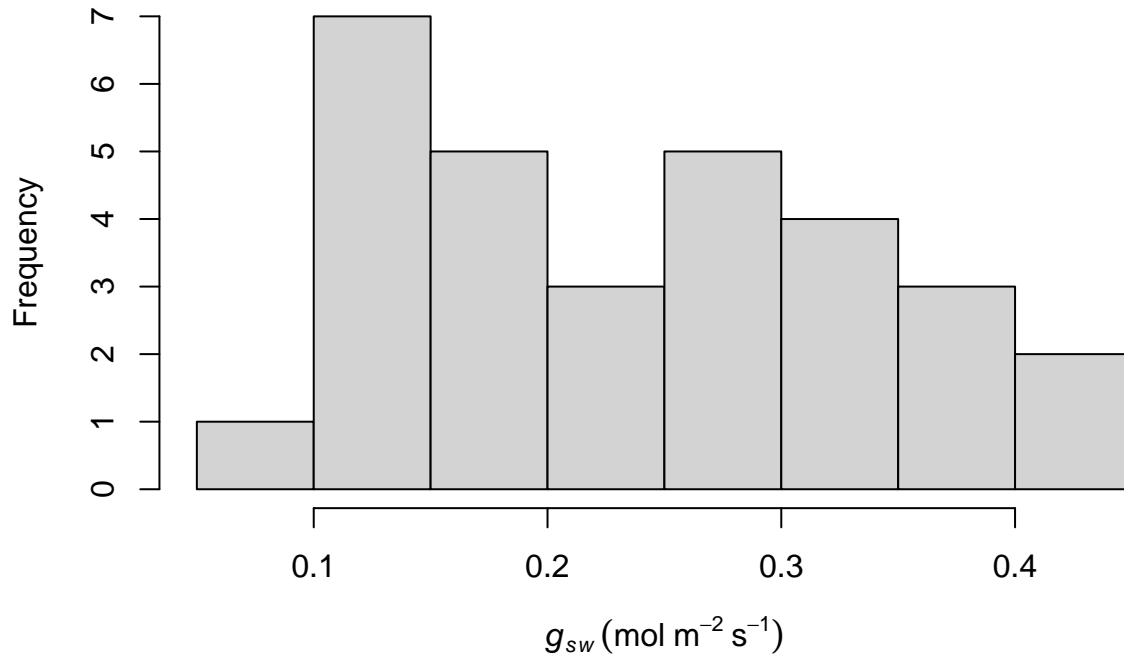


```
# dev.off()
```

```
## plot differences between the two instruments
```

```
hist((poroTest[poroTest$Tree < 11, ]$SC1_Conductance/1000) -
      poroTest[poroTest$Tree < 11, ]$gsw, main = "Difference between SC-1 and Li-600 n=30",
      xlab = expression(italic(g[sw]) ~ (mol ~ m^-2 ~ s^-1)))
```

Difference between SC-1 and Li-600 n=30



```
## average difference  
mean((poroTest[poroTest$Tree < 11, ]$SC1_Conductance/1000) -  
      poroTest[poroTest$Tree < 11, ]$gsw)
```

```
## [1] 0.2344721
```

