1 Data Processing

1.1 Create path temperature sensor csv files

```
filepath106 = "/home/CAMPUS/mwl04747/github/Climate_Change_Narratives/Data/FA19/Onset_Data/2

filepath107 = "/home/CAMPUS/mwl04747/github/Climate_Change_Narratives/Data/FA19/Onset_Data/2

filepath109 = "/home/CAMPUS/mwl04747/github/Climate_Change_Narratives/Data/FA19/Onset_Data/2

filepath110 = "/home/CAMPUS/mwl04747/github/Climate_Change_Narratives/Data/FA19/Onset_Data/2

filepath543 = "/home/CAMPUS/mwl04747/github/Climate_Change_Narratives/Data/FA19/Onset_Data/1

filepath544 = "/home/CAMPUS/mwl04747/github/Climate_Change_Narratives/Data/FA19/Onset_Data/1
```

1.2 Read csv files into R and clean files

The headers are a mess, so I had to skip the first line before reading the CSV file. After that, I renamed the first few columns and then assigned the location from the header, manually. Total pain!

```
onset106 = read.csv(filepath106, skip = 1); #str(onset106)
names(onset106) = c("Obs", "DateTime", "Temp")
onset106$Location = "Walker Beach"; onset106$Exposure = "Shade";
onset106 <- onset106[,c(1,8, 9, 2,3)]; #head(onset106)

onset107 = read.csv(filepath107, skip = 1); #str(onset107)
names(onset107) = c("Obs", "DateTime", "Temp")
onset107$Location = "Tranquada Lot"; onset107$Exposure = "Sun";
onset107 <- onset107[,c(1,8, 9, 2,3)]; #head(onset107)

onset109 = read.csv(filepath109, skip = 1); #str(onset109)
names(onset109) = c("Obs", "DateTime", "Temp")
onset109$Location = "Kravis"; onset109$Exposure="Sun";
onset109 <- onset109[,c(1,5,6, 2,3)]; #head(onset109)

onset110 = read.csv(filepath110, skip = 1); #str(onset110)
names(onset110) = c("Obs", "DateTime", "Temp")
onset110$Location = "SCC Parking Lot"; onset110$Exposure = "Shade";
onset110 <- onset110[,c(1,8, 9, 2,3)]; #head(onset110)

onset543 = read.csv(filepath543, skip = 1); #str(onset543)
names(onset543) = c("Obs", "DateTime", "Temp")
```

```
onset543$Location = "Sontag 1"; onset543$Exposure = "Sun";
onset543 <- onset543[,c(1,8,9,2,3)]; #head(onset543)

onset544 = read.csv(filepath544, skip = 1); #str(onset544)
names(onset544) = c("Obs", "DateTime", "Temp")
onset544$Location = "Sontag 2"; onset544$Exposure="Shade";
onset544 <- onset544[,c(1,9,10, 2,3)]; #head(onset544)


onset = rbind(onset106, onset107, onset109, onset110, onset543, onset544)
```

1.3 Fix Date-Time format

I shouldn't be surprised, but the date/time format is not read correctly in R. So, after a bit of experimenting, I am using a package call `lubridate` that makes is a tiny bit easier.

```
onset$Location=as.factor(onset$Location)
#str.date = as.character(onset£DateTime)
#as.Date(str.date, format="%m%d%y", "h:m:s")
library("lubridate")

##
## Attaching package:  'lubridate'
## The following object is masked from 'package:base':
##
##    date

#mdy_hms(str.date)
onset$DateTime=DateTime = mdy_hms(onset$DateTime)
```

1.4 Remove Data after Sensors were collected

Although the sensors didn't start until we put them in the field, they did not stop until I downloaded the data. So, I manually removed the data based on a guess of when the temps did something odd for each site.

```
# Remove Data after Retrival

# Walker Beach
onset2 = subset(onset, subset=Location ==
      levels(onset$Location)[6] &
      DateTime < as.POSIXct("2019-11-30 09:45:00", tz="UTC"))
onset2 = subset(onset, subset=Location ==
```

```
      levels(onset$Location)[6] &
      DateTime < as.POSIXct("2019-12-04 12:30:00", tz="UTC"))

onset2 = rbind(onset2, subset(onset, subset=Location ==
      levels(onset$Location)[5] &
      DateTime < as.POSIXct("2019-12-09 10:30:00", tz="UTC")))

# Sontag 2
onset2 = rbind(onset2, subset(onset, subset=Location ==
      levels(onset$Location)[4] &
      DateTime < as.POSIXct("2019-12-06 12:30:00", tz="UTC")))

# Sontag 1
onset2 = rbind(onset2, subset(onset, subset=Location ==
      levels(onset$Location)[3] &
      DateTime < as.POSIXct("2019-12-06 12:30:00", tz="UTC")))

# SCC Parking Lot
onset2 = rbind(onset2, subset(onset, subset=Location ==
      levels(onset$Location)[2] &
      DateTime < as.POSIXct("2019-12-07 14:30:00", tz="UTC")))

# Kravis Sun
onset2 = rbind(onset2, subset(onset, subset=Location ==
      levels(onset$Location)[1] &
      DateTime < as.POSIXct("2019-12-06 14:00:00", tz="UTC")))
```

2 Results

2.1 Interogating the Results

First, we'll put everything in one graph (Figure 1).

2.2 Paired Plots – Sun versus Shade

First, we'll put everything in one graph (Figure 2). Here we can see the spikes associated with the sunshine, which is not representative of "weather" records.

3 TMAX-TMIN and TAVE

```
##         Date Location     TAVE    TMAX   TMIN
## 1 2019-11-19   Kravis 64.90554  95.207 53.449
```

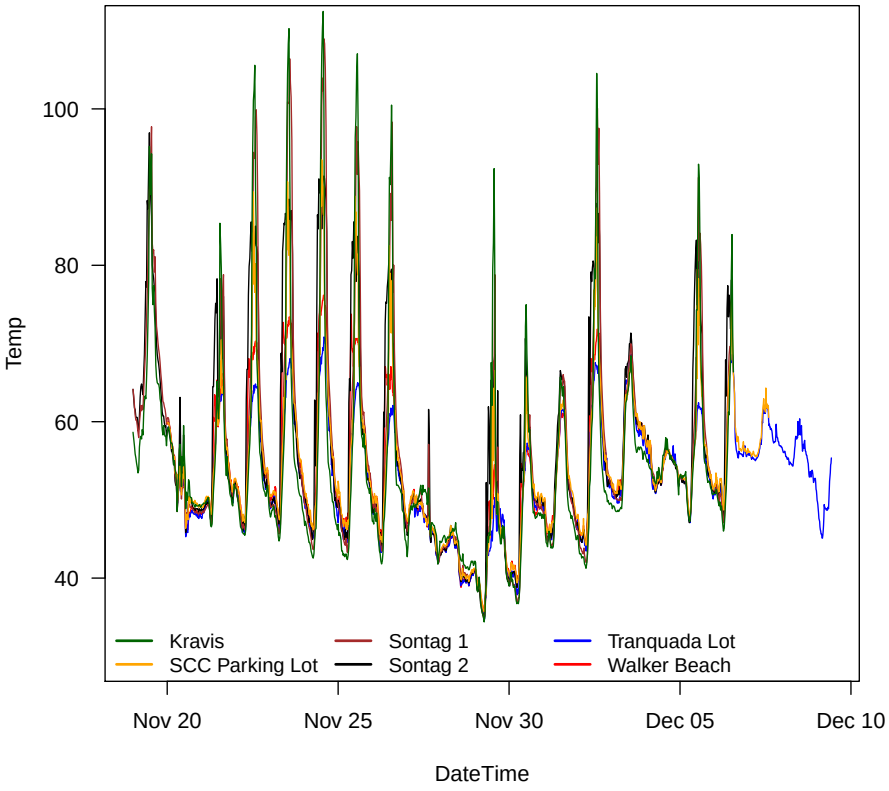

Figure 1: All time series in one graphic. Not easy to see what's going on.

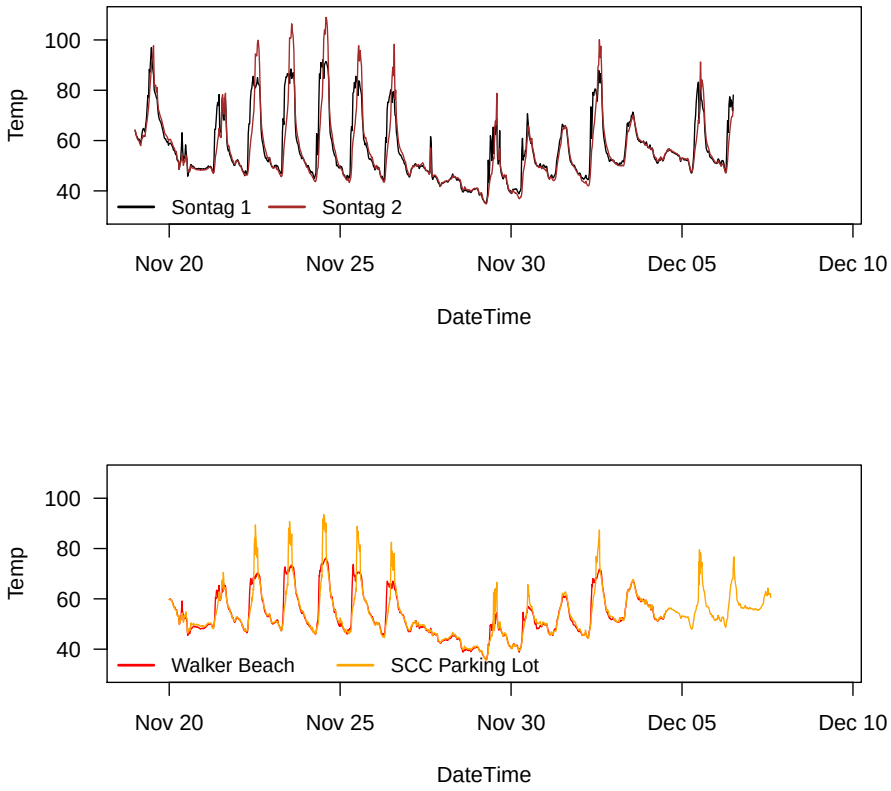

Figure 2: Just just two values seems to allow us with some capacity to distinquish the differences with more confidence.

```
## 2 2019-11-20   Kravis 52.93400  59.508 48.517
## 3 2019-11-21   Kravis 55.29337  85.374 46.548
## 4 2019-11-22   Kravis 58.33877 105.577 45.466
## 5 2019-11-23   Kravis 58.37640 110.264 44.742
## 6 2019-11-24   Kravis 57.38912 112.467 42.548
##         Date        Location     TAVE   TMAX   TMIN
## 1 2019-11-20 SCC Parking Lot 52.21220 59.851 46.369
## 2 2019-11-21 SCC Parking Lot 54.93791 70.480 48.160
## 3 2019-11-22 SCC Parking Lot 58.05701 89.384 47.088
## 4 2019-11-23 SCC Parking Lot 59.43398 90.680 47.446
## 5 2019-11-24 SCC Parking Lot 59.32753 93.493 46.188
## 6 2019-11-25 SCC Parking Lot 57.50675 88.833 46.188
```