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)

## 'data.frame': 1881 obs. of  7 variables:
##  $ X.                                                              : int  1 2
##  $ Date.Time..GMT.08.00                                            : Factor w
##  $ Temp...F..LGR.S.N..20724106..SEN.S.N..20724106..LBL..Gandalf..Walker.Beach..: num  59.
##  $ Coupler.Attached..LGR.S.N..20724106..SEN.S.N..20724106.         : Factor w
##  $ Host.Connected..LGR.S.N..20724106..SEN.S.N..20724106.           : Factor w
##  $ Stopped..LGR.S.N..20724106..SEN.S.N..20724106.                  : Factor w
##  $ End.Of.File..LGR.S.N..20724106..SEN.S.N..20724106.              : Factor w

names(onset106) = c("Obs", "DateTime", "Temp")
onset106$Location = "Walker Beach"; onset106$Exposure = "Shade"; onset106 <- onset106[,c(1,8

##   Obs     Location Exposure            DateTime   Temp
## 1   1 Walker Beach    Shade 11/20/19 12:00:00 AM 59.680
## 2   2 Walker Beach    Shade 11/20/19 12:15:00 AM 59.851
## 3   3 Walker Beach    Shade 11/20/19 12:30:00 AM 59.851
## 4   4 Walker Beach    Shade 11/20/19 12:45:00 AM 60.024
## 5   5 Walker Beach    Shade 11/20/19 01:00:00 AM 59.851
## 6   6 Walker Beach    Shade 11/20/19 01:15:00 AM 59.680

onset107 = read.csv(filepath107, skip = 1); str(onset107)
```

```
## 'data.frame':	1881 obs. of  7 variables:
##  $ X.                                                             : int  1
##  $ Date.Time..GMT.08.00                                           : Factor
##  $ Temp...F..LGR.S.N..20724107..SEN.S.N..20724107..LBL..Gertrude..Tranquada.Lot..: num  5
##  $ Coupler.Attached..LGR.S.N..20724107..SEN.S.N..20724107.        : Factor
##  $ Host.Connected..LGR.S.N..20724107..SEN.S.N..20724107.          : Factor
##  $ Stopped..LGR.S.N..20724107..SEN.S.N..20724107.                 : Factor
##  $ End.Of.File..LGR.S.N..20724107..SEN.S.N..20724107.             : Factor
```

```r
names(onset107) = c("Obs", "DateTime", "Temp")
onset107$Location = "Tranquada Lot"; onset107$Exposure = "Sun"; onset107 <- onset107[,c(1,8,
```

```
##   Obs       Location Exposure               DateTime   Temp
## 1   1 Tranquada Lot      Sun 11/20/19 12:00:00 AM 58.647
## 2   2 Tranquada Lot      Sun 11/20/19 12:15:00 AM 58.993
## 3   3 Tranquada Lot      Sun 11/20/19 12:30:00 AM 59.164
## 4   4 Tranquada Lot      Sun 11/20/19 12:45:00 AM 59.337
## 5   5 Tranquada Lot      Sun 11/20/19 01:00:00 AM 59.164
## 6   6 Tranquada Lot      Sun 11/20/19 01:15:00 AM 59.164
```

```r
onset109 = read.csv(filepath109, skip = 1); str(onset109)
```

```
## 'data.frame':	848 obs. of  4 variables:
##  $ X.                                                             : int  1 2 3 4 5 6 7 8
##  $ Date.Time..GMT.08.00                                           : Factor w/ 848 levels
##  $ Temp...F..LGR.S.N..20724109..SEN.S.N..20724109..LBL..KravisSun.: num  58.6 57.8 56.9 5
##  $ End.Of.File..LGR.S.N..20724109..SEN.S.N..20724109.             : Factor w/ 2 levels "'
```

```r
names(onset109) = c("Obs", "DateTime", "Temp")
onset109$Location = "Kravis"; onset109$Exposure="Sun"; onset109 <- onset109[,c(1,5,6, 2,3)];
```

```
##   Obs Location Exposure               DateTime   Temp
## 1   1   Kravis      Sun 11/19/19 12:00:00 AM 58.647
## 2   2   Kravis      Sun 11/19/19 12:30:00 AM 57.785
## 3   3   Kravis      Sun 11/19/19 01:00:00 AM 56.923
## 4   4   Kravis      Sun 11/19/19 01:30:00 AM 55.884
## 5   5   Kravis      Sun 11/19/19 02:00:00 AM 55.364
## 6   6   Kravis      Sun 11/19/19 02:30:00 AM 54.669
```

```r
onset110 = read.csv(filepath110, skip = 1); str(onset110)
```

```
## 'data.frame':	1864 obs. of  7 variables:
##  $ X.                                                             : int  1 2
##  $ Date.Time..GMT.08.00                                           : Factor v
##  $ Temp...F..LGR.S.N..20724110..SEN.S.N..20724110..LBL..Gwen..SCC.Parking.Lot..: num  59.
##  $ Host.Connected..LGR.S.N..20724110..SEN.S.N..20724110.          : Factor v
##  $ Coupler.Attached..LGR.S.N..20724110..SEN.S.N..20724110.        : Factor v
##  $ Stopped..LGR.S.N..20724110..SEN.S.N..20724110.                 : Factor v
##  $ End.Of.File..LGR.S.N..20724110..SEN.S.N..20724110.             : Factor v
```

```r
names(onset110) = c("Obs", "DateTime", "Temp")
onset110$Location = "SCC Parking Lot"; onset110$Exposure = "Shade"; onset110 <- onset110[,c(
```

```
##   Obs         Location Exposure            DateTime   Temp
## 1   1 SCC Parking Lot    Shade 11/20/19 12:00:00 AM 59.851
## 2   2 SCC Parking Lot    Shade 11/20/19 12:15:00 AM 59.851
## 3   3 SCC Parking Lot    Shade 11/20/19 12:30:00 AM 59.851
## 4   4 SCC Parking Lot    Shade 11/20/19 12:45:00 AM 59.851
## 5   5 SCC Parking Lot    Shade 11/20/19 01:00:00 AM 59.851
## 6   6 SCC Parking Lot    Shade 11/20/19 01:15:00 AM 59.680
```

```r
onset543 = read.csv(filepath543, skip = 1); str(onset543)
```

```
## 'data.frame': 981 obs. of  7 variables:
##  $ X.                                                             : int  1 2 3 4 5 6 7
##  $ Date.Time..GMT.08.00                                           : Factor w/ 981 leve
##  $ Temp...F..LGR.S.N..10998543..SEN.S.N..10998543..LBL..Sontag.Shade.: num  64.1 63.3 62.
##  $ Coupler.Attached..LGR.S.N..10998543..SEN.S.N..10998543.        : Factor w/ 2 levels
##  $ Host.Connected..LGR.S.N..10998543..SEN.S.N..10998543.          : Factor w/ 2 levels
##  $ Stopped..LGR.S.N..10998543..SEN.S.N..10998543.                 : Factor w/ 2 levels
##  $ End.Of.File..LGR.S.N..10998543..SEN.S.N..10998543.             : Factor w/ 2 levels
```

```r
names(onset543) = c("Obs", "DateTime", "Temp")
onset543$Location = "Sontag 1"; onset543$Exposure = "Sun"; onset543 <- onset543[,c(1,8,9,2,3
```

```
##   Obs Location Exposure            DateTime   Temp
## 1   1 Sontag 1      Sun 11/19/19 12:00:00 AM 64.139
## 2   2 Sontag 1      Sun 11/19/19 12:30:00 AM 63.282
## 3   3 Sontag 1      Sun 11/19/19 01:00:00 AM 62.083
## 4   4 Sontag 1      Sun 11/19/19 01:30:00 AM 60.883
## 5   5 Sontag 1      Sun 11/19/19 02:00:00 AM 60.195
## 6   6 Sontag 1      Sun 11/19/19 02:30:00 AM 60.195
```

```r
onset544 = read.csv(filepath544, skip = 1); str(onset544)
```

```
## 'data.frame': 983 obs. of  8 variables:
##  $ X.                                                             : int  1 2 3 4 5 6 7 8
##  $ Date.Time..GMT.08.00                                           : Factor w/ 983 levels
##  $ Temp...F..LGR.S.N..10998544..SEN.S.N..10998544..LBL..Sontag.Sun.: num  64.1 62.9 61.7
##  $ Coupler.Attached..LGR.S.N..10998544..SEN.S.N..10998544.        : Factor w/ 2 levels '
##  $ Host.Connected..LGR.S.N..10998544..SEN.S.N..10998544.          : Factor w/ 2 levels '
##  $ Coupler.Detached..LGR.S.N..10998544..SEN.S.N..10998544.        : Factor w/ 2 levels '
##  $ Stopped..LGR.S.N..10998544..SEN.S.N..10998544.                 : Factor w/ 2 levels '
##  $ End.Of.File..LGR.S.N..10998544..SEN.S.N..10998544.             : Factor w/ 2 levels '
```

```r
names(onset544) = c("Obs", "DateTime", "Temp")
onset544$Location = "Sontag 2"; onset544$Exposure="Shade"; onset544 <- onset544[,c(1,9,10, 2
```

```
##   Obs Location Exposure            DateTime   Temp
## 1   1 Sontag 2    Shade 11/19/19 12:00:00 AM 64.139
## 2   2 Sontag 2    Shade 11/19/19 12:30:00 AM 62.940
## 3   3 Sontag 2    Shade 11/19/19 01:00:00 AM 61.741
## 4   4 Sontag 2    Shade 11/19/19 01:30:00 AM 61.569
## 5   5 Sontag 2    Shade 11/19/19 02:00:00 AM 60.539
## 6   6 Sontag 2    Shade 11/19/19 02:30:00 AM 60.539

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
onset2 = subset(onset, subset=Location == levels(onset$Location)[6] & DateTime < as.POSIXct(
onset2 = rbind(onset2, subset(onset, subset=Location == levels(onset$Location)[5] & DateTime

# Sontag 2
onset2 = rbind(onset2, subset(onset, subset=Location == levels(onset$Location)[4] & DateTime

# Sontag 1
```

4

```
onset2 = rbind(onset2, subset(onset, subset=Location == levels(onset$Location)[3] & DateTime
# SCC Parking Lot
onset2 = rbind(onset2, subset(onset, subset=Location == levels(onset$Location)[2] & DateTime
# Kravis Sun
onset2 = rbind(onset2, subset(onset, subset=Location == levels(onset$Location)[1] & DateTime
```

2   Results

2.1   Interogating the Results

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

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

```
## [1] "Kravis"         "SCC Parking Lot" "Sontag 1"        "Sontag 2"
## [5] "Tranquada Lot"  "Walker Beach"
```