Daily Time Lags

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Calculating Daily Averages

First I read in the data: data frames of hourly buoy data. I then created a function which that takes our hourly data and returns a data frame of daily averages. It also appends columns with the PC averages 0-6 days into the future (so that all the environmental variables are lagged). Finally, I ran the function on our data so we could use daily averages for subsequent analyses.

```
# Load required packages
library(dplyr)
library(ggplot2)
#install.packages("openair")
#install.packages("PerformanceAnalytics")
library(PerformanceAnalytics)
library(openair)

# Load data
MB17 <- read.csv("data/AllDepthData/MB17_allDepths.csv", header = T)
MB18 <- read.csv("data/AllDepthData/MB18_allDepths.csv", header = T)
SA17 <- read.csv("data/AllDepthData/SA17_allDepths.csv", header = T)
SA18 <- read.csv("data/AllDepthData/SA18_allDepths.csv", header = T)

# Function that takes a df of hourly data and returns a df of daily averages,
# including columns with daily PC 0-6 days into the future (foolishly named PC1-7).
dailify <- function(df_in, time_header){
  df_out <- df_in %>%
    select(c(time_header, TEMP_0.5m, SPCOND_0.5m, PH_0.5m, ODO_CONC_0.5m,
             CHL_RFU_0.5m, TURB_0.5m, deltaDO, deltaTemp, PC_RFU_0.5m)) %>%
    rename(Timestamp = time_header,
           Temp = TEMP_0.5m,
           SpCond = SPCOND_0.5m,
           pH = PH_0.5m,
           ODO = ODO_CONC_0.5m,
           Chl = CHL_RFU_0.5m,
           Turb = TURB_0.5m,
           DeltaDO = deltaDO,
           DeltaTemp = deltaTemp,
           PC = PC_RFU_0.5m) %>%
    mutate(timestamp = as.POSIXct(strptime(Timestamp, format = "%m/%d/%Y %H:%M", tz = "Etc/GMT-4")),
           date = as.Date(timestamp, tz = "Etc/GMT-4"),
           PC = replace(PC, which(PC<0), 0),
           Chl = replace(Chl, which(Chl<0), 0)) %>%
    group_by(date) %>%
    summarize(TempMean = mean(Temp, na.rm = F),
              SpCondMean = mean(SpCond, na.rm = F),
              pHMean = mean(pH, na.rm = F),
              ODOMean = mean(ODO, na.rm = F),
              ChlMean = mean(Chl, na.rm = F),
```

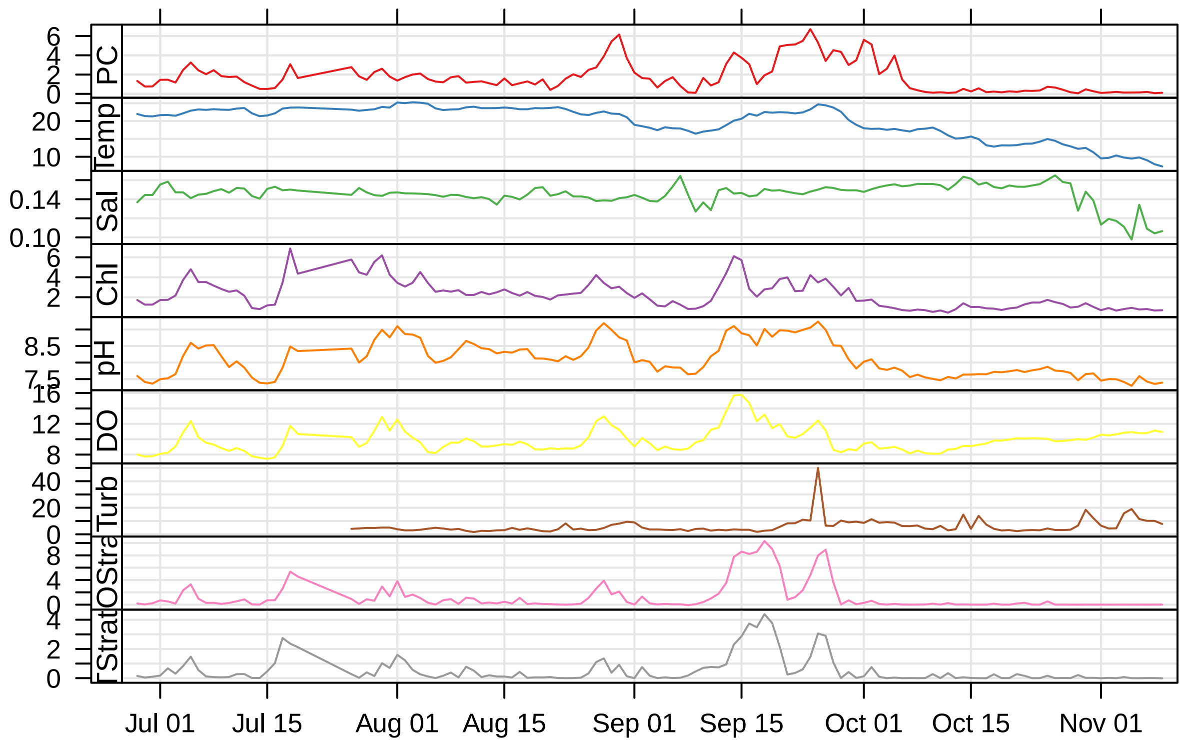
```
              TurbMean = mean(Turb, na.rm = F),
              DeltaDOMean = mean(DeltaDO, na.rm = F),
              DeltaTempMean = mean(DeltaTemp, na.rm = F),
              PCMean1 = mean(PC, na.rm = F))
  df_out$PCMean2 <- lead(df_out$PCMean1)
  df_out$PCMean3 <- lead(df_out$PCMean1, 2)
  df_out$PCMean4 <- lead(df_out$PCMean1, 3)
  df_out$PCMean5 <- lead(df_out$PCMean1, 4)
  df_out$PCMean6 <- lead(df_out$PCMean1, 5)
  df_out$PCMean7 <- lead(df_out$PCMean1, 6)
  return(df_out)
}

# Dailify our data
MB17_daily <- dailify(MB17, "TIMESTAMP")
write.csv(MB17_daily, "MB17_daily.csv")

MB18_daily <- dailify(MB18, "TIMESTAMP")
write.csv(MB18_daily, "MB18_daily.csv")

SA17_daily <- dailify(SA17, "timestamp")
write.csv(SA17_daily, "SA17_daily.csv")

SA18_daily <- dailify(SA18, "timestamp")
write.csv(SA18_daily, "SA18_daily.csv")
```

Plotting the data

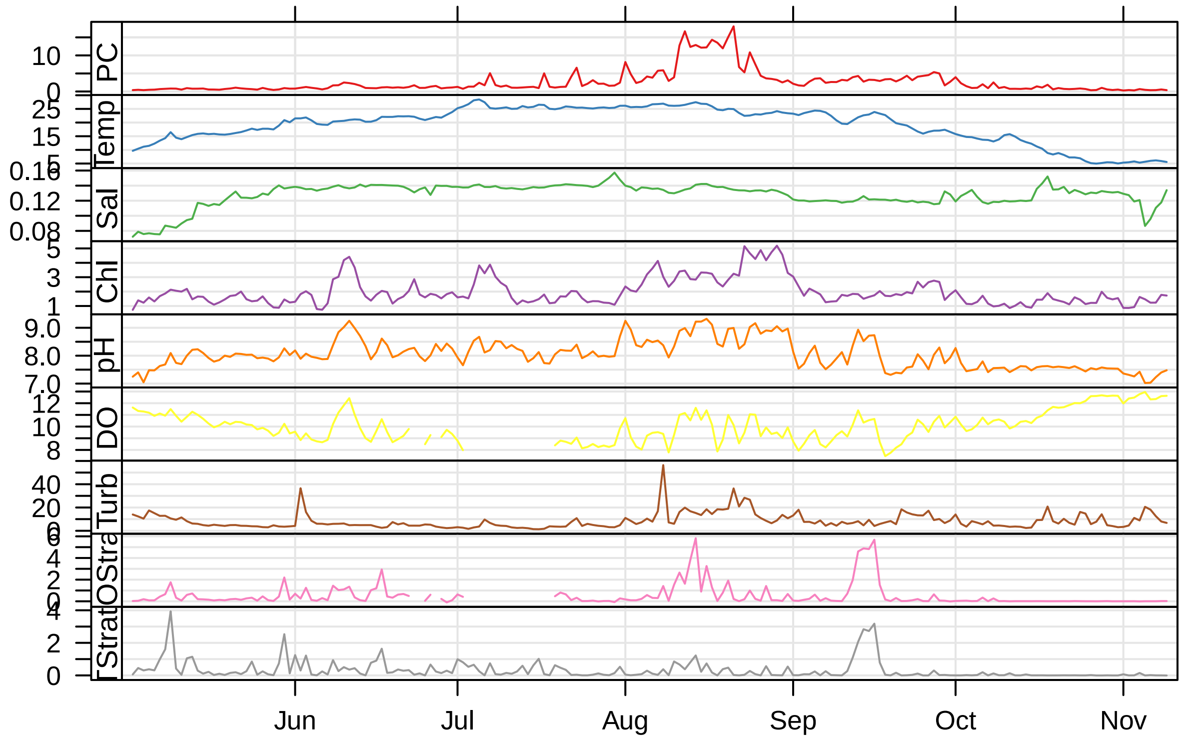
Next, I made a function that creates (messy) time plots of the data so we can just quickly visually inspect how PC varies with different environmental factors over time.

```
#MB17_daily <- read.csv("MB17_daily.csv", header = T)
#MB18_daily <- read.csv("MB18_daily.csv", header = T)
#SA17_daily <- read.csv("SA17_daily.csv", header = T)
#SA18_daily <- read.csv("SA18_daily.csv", header = T)

#Function that creates a timeplot of the df (with unlagged PC)
plotify <- function(df, title){
  timePlot(df, pollutant = c("PCMean1",
                                   "TempMean",
                                   "SpCondMean",
                                   "ChlMean",
                                   "pHMean",
                                   "ODOMean",
                                   "TurbMean",
                                   "DeltaDOMean",
                                   "DeltaTempMean"),
           #date.pad = TRUE,
           key = FALSE,
           name.pol = c("PC", "Temp", "Sal", "Chl", "pH", "DO", "Turb", "DOStrat", "TStrat"),
           ylab = " ",
           main = title,
```

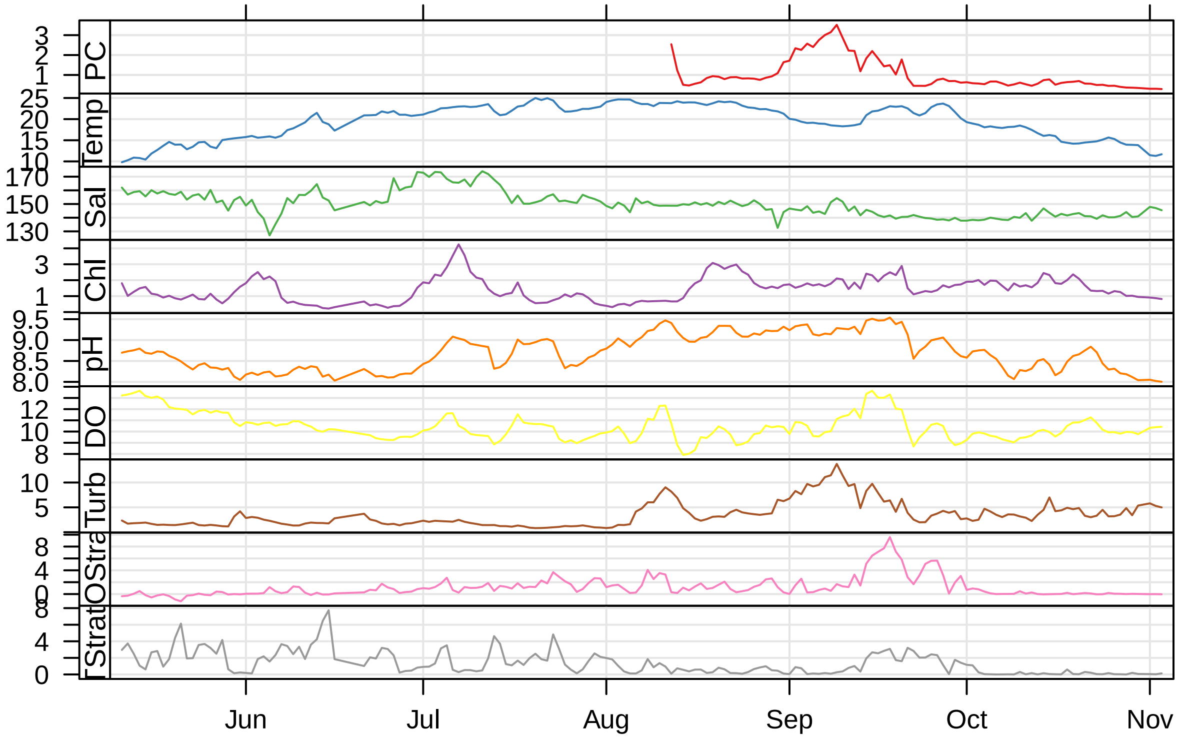
```
              y.relation = "free")
}

# Plot the data
plotify(MB17_daily, MB17)
```



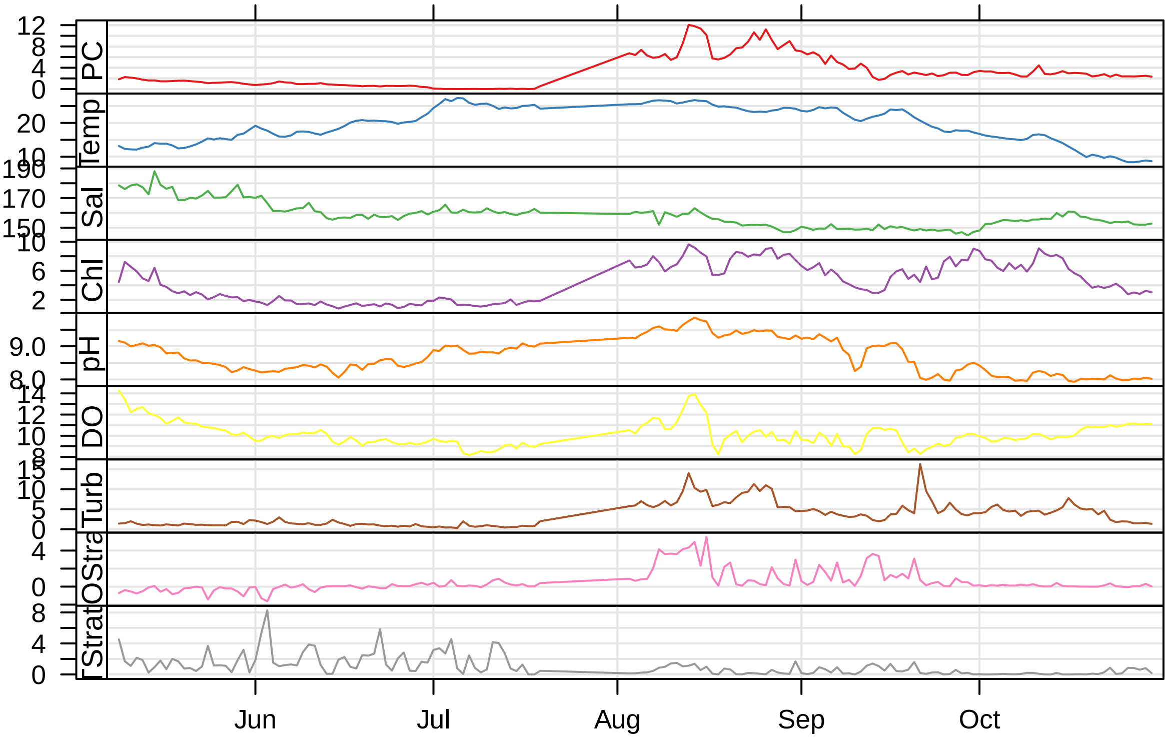

```
plotify(MB18_daily, MB18)
```




```r
plotify(SA17_daily, SA17)
```




```r
plotify(SA18_daily, SA18)
```

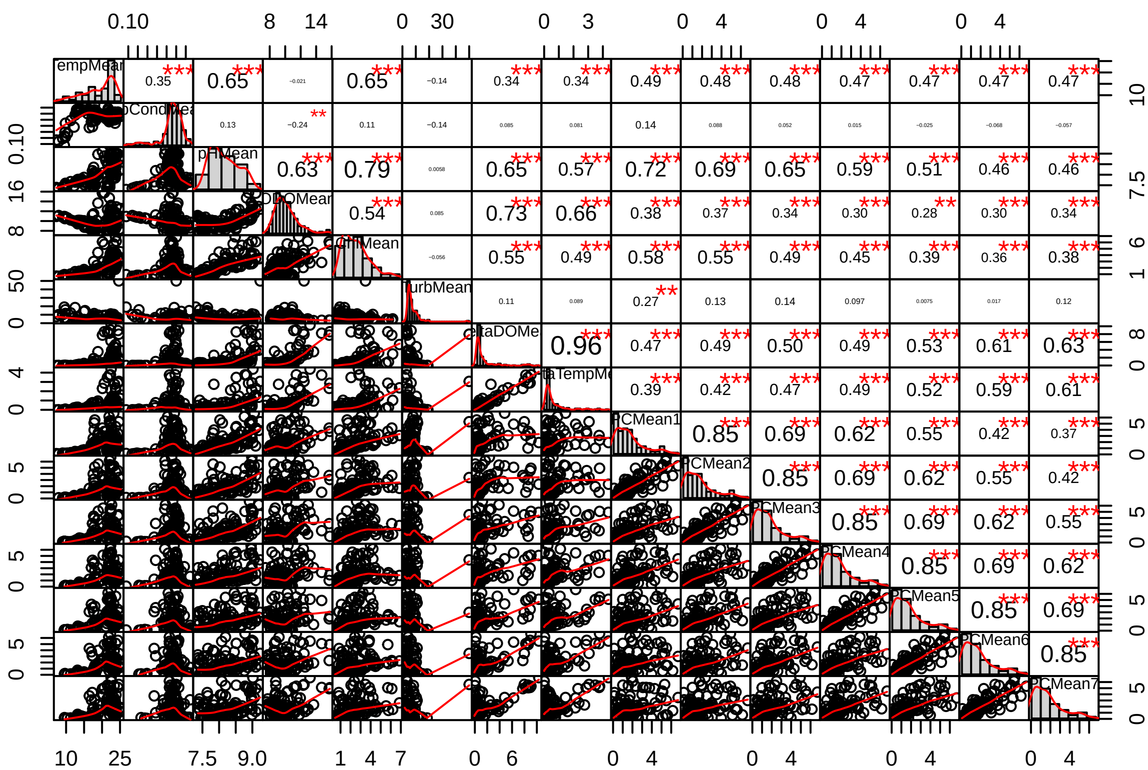



```
#Not sure why date.pad isn't working (to leave a gap for missing data). Probably related to the date fo
```

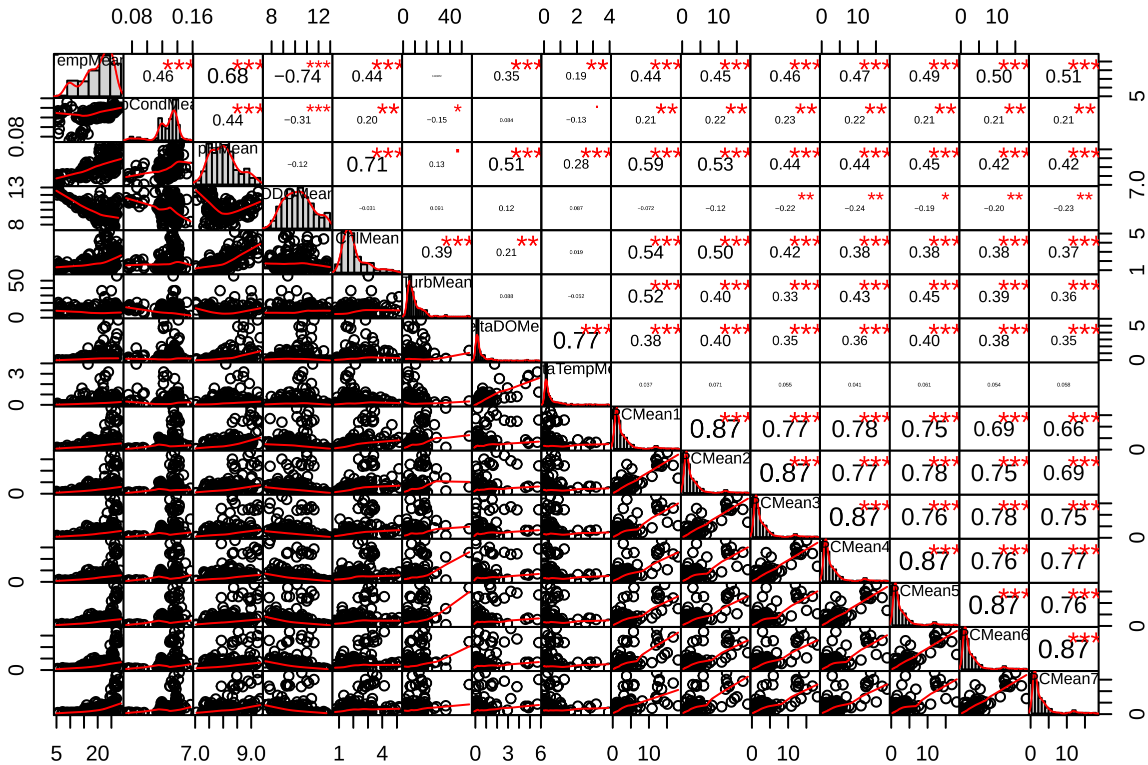
Investigate Correlations

Finally, we were interested in investigating correlations between various environmental factors and different time lags of PC. These tables are a little too crowded, so I will focus on looking at correlations between PC and individual environmental variables that were most important in the Feature Importance results.

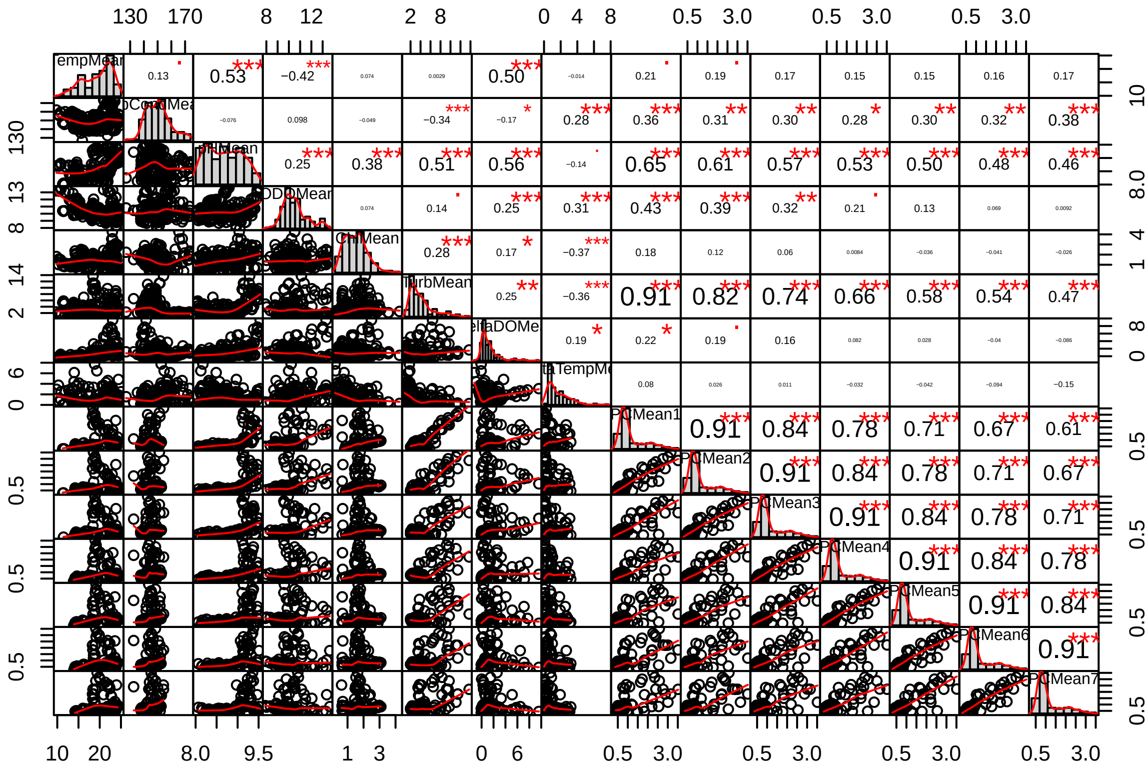
```
# Look at all correlations
chart.Correlation(MB17_daily[,2:16], histogram = T)
```



```r
chart.Correlation(MB18_daily[,2:16], histogram = T)
```



```r
chart.Correlation(SA17_daily[,2:16], histogram = T)
```



```
chart.Correlation(SA18_daily[,2:16], histogram = T)
```