Extracting Climate Data from Prism

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Here, I download climate data for each of the LTER sites from Prism and put it in a long format data frame.

First, load required packages

```
library(tidyverse)
library(stringr)
library(prism)
library(raster)
library(magrittr)
library(popler)
```

Fetch Data

Prism has daily, monthly, or annual climate data. Climate measures are tmin, tmax, tmean, and ppt. Here, I've extracted monthly tmean and ppt for from 2000-2005.

```
# First, set a file path where prism data will be stored
# I recommend deleting contents this folder before downloading each new batch of data
options(prism.path = 'C:\\Users\\Shannon\\Documents\\F18 Topics in Ecology\\prism.path_monthly')

# Now, select the type and date range
get_prism_monthlys(type = 'tmean', years = 2000:2005, mo = 1:12, keepZip = F)
get_prism_monthlys(type = 'ppt', years = 2000:2005, mo = 1:12, keepZip = F)
```

Process Data

First, stack raster data and extract coordinates

```
# Here, you'll need to specify which dataset to pull if you've downloaded multiple to the path.
mystack <- ls_prism_data() %>%
  prism_stack(.)

# Get project coordinates from raster stack
mycrs <- mystack@crs@projargs
```

Now, make a dataframe of coordinates for each LTER site, put them in the same coordinate reference system (CRS) as the Prism data, and match them

```
# First, pull all LTER sites
all_studies <- popler::pplr_browse()

# Select just the lat/long and site ID columns and make a df
lter_sites <- all_studies %>%
  dplyr::select(lng_lter,lat_lter, lterid)

lter_sites <- as.data.frame(lter_sites)
```

```
# Convert these locations to format that can be matched to prism data
coordinates(lter_sites) <- c('lng_lter', 'lat_lter')
proj4string(lter_sites) <- CRS(mycrs)
```

Tidy Data

Wrangle data to long format with columns lat, long, site ID, time, and climate

```
# Extract data from raster
data <- data.frame(coordinates(lter_sites), lter_sites$lterid, extract(mystack, lter_sites))

# Reshape data. Col 1:3 are lat, long, and site ID. Col 4:ncol are climate data
# Column headers include date and climate type info
data <- data %>%
  gather(date, value, 4:ncol(data))

# Remove the extra info from the column header
data$date <- gsub('PRISM_', '', data$date) %>%
  gsub('stable_4kmM3_', '', .) %>%
  gsub('stable_4kmM2_', '', .) %>%
  gsub('_bil', '', .)

# Split header into type, year, and month
data <- separate(data, 'date',
                 into = c('type', 'YearMonth'),
                 sep = '_')
data <- separate(data, 'YearMonth',
                 into = c('year', 'month'),
                 sep = 4)

# Reshape data
data <- unique(data)
data <- data %>%
  spread(type, value) %>%
  rename(lng = lng_lter, lat = lat_lter, lterid = lter_sites.lterid)

# Order data
data <- data[order(data$lterid),]
```

View Data

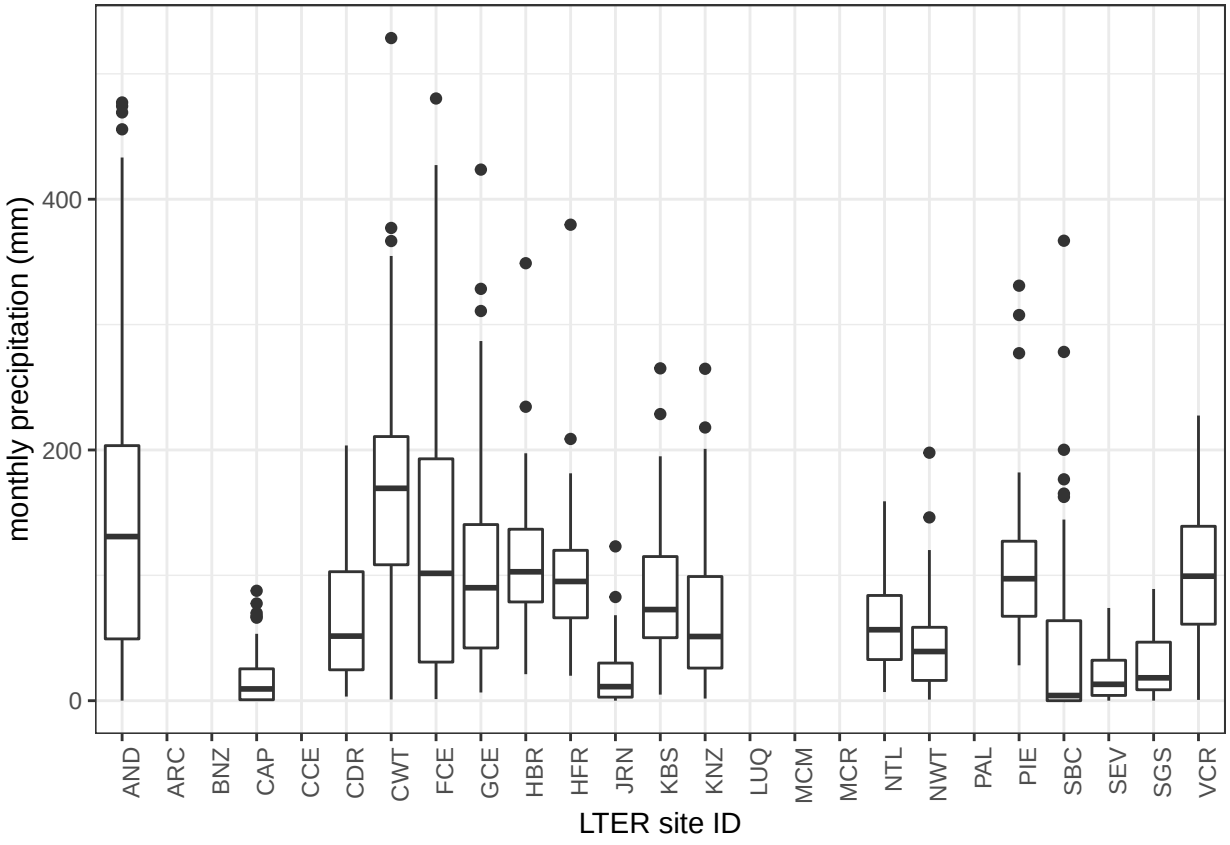
```
head(data)
```

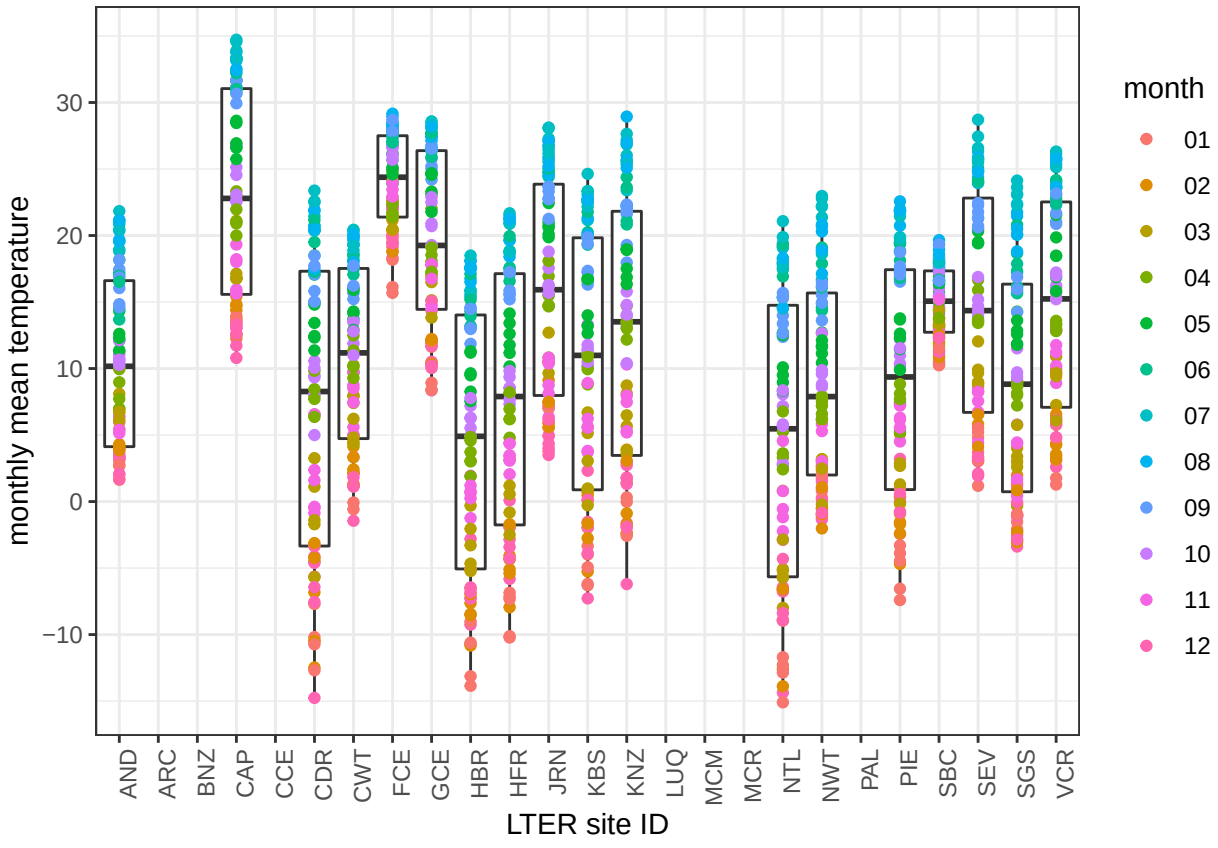
```
##         lng   lat lterid year month    ppt tmean
## 217 -122.26 44.21    AND 2000    01 474.28  1.64
## 218 -122.26 44.21    AND 2000    02 256.22  4.31
## 219 -122.26 44.21    AND 2000    03 171.27  5.44
## 220 -122.26 44.21    AND 2000    04 103.51 10.07
## 221 -122.26 44.21    AND 2000    05 142.10 11.27
## 222 -122.26 44.21    AND 2000    06  82.94 17.20
```

```r
str(data)
```

```
## 'data.frame':    1800 obs. of  7 variables:
##  $ lng   : num  -122 -122 -122 -122 -122 ...
##  $ lat   : num  44.2 44.2 44.2 44.2 44.2 ...
##  $ lterid: Factor w/ 25 levels "AND","ARC","BNZ",..: 1 1 1 1 1 1 1 1 1 1 ...
##  $ year  : chr  "2000" "2000" "2000" "2000" ...
##  $ month : chr  "01" "02" "03" "04" ...
##  $ ppt   : num  474 256 171 104 142 ...
##  $ tmean : num  1.64 4.31 5.44 10.07 11.27 ...
```

Some Plots


monthly precipitation (mm)
400
200
0
AND
ARC
BNZ
CAP
CCE
CDR
CWT
FCE
GCE
HBR
HFR
JRN
KBS
KNZ
LUQ
MCM
MCR
NTL
NWT
PAL
PIE
SBC
SEV
SGS
VCR
LTER site ID


monthly mean temperature
30
20
10
0
−10
AND
ARC
BNZ
CAP
CCE
CDR
CWT
FCE
GCE
HBR
HFR
JRN
KBS
KNZ
LUQ
MCM
MCR
NTL
NWT
PAL
PIE
SBC
SEV
SGS
VCR
LTER site ID
month
01
02
03
04
05
06
07
08
09
10
11
12