Climate Projections from WorldClim

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WorldClim

Looking into climate projections from WorldClim based on Bene's suggestions

There are *many* climate scenarios which we can use. Need to do some reading to understand which is *best* for our purpose. For the sake of seeing how WorldClim would work with the LTER sites, any scenario will do.

```
#install.packages("raster")
#install.packages("sp")
#install.packages("devtools")
#devtools::install_github("AldoCompagnoni/popler", build_vignettes=T, force=T)

library(tidyverse)
library(popler)
library(raster)
library(sp)
library(rgdal)

## previously tried it first with the current values at the lowest level of resolution
## it takes a long time to download at the higher resolutions
#climate_dat_current <- raster::getData("worldclim",var="bio",res=10)

## pull the predicted climate data based on the rcp scenario 85 and model AC for 2070
## can change the climate model later
climate_dat_all<- getData('CMIP5', var='bio', res=10, rcp=85, model='AC', year=70)

## pull out just variables 1 and 12, which are Temperature and Precipitation
## according to the metadata
climate_dat <- climate_dat_all[[c(1,12)]]
names(climate_dat) <- c("Temp","Prec") ## rename these columns Temp and Prec
```

Adding in the popler LTER data

Currently, using the data from all of the LTER sites in the database. We'll want to subset this list to match with the sites we use for the population models.

```
## Pull data from ALL of the studies in the popler database
## ultimately, we'll want to filter this to match with the ones we've used in the population estimates
all_studies <- popler::pplr_browse()

## select just the lat/long columns
coords_pop <- all_studies %>%
               dplyr::select(lng_lter,lat_lter)

## turn this into a dataframe
coords_new <- as.data.frame(coords_pop)
```

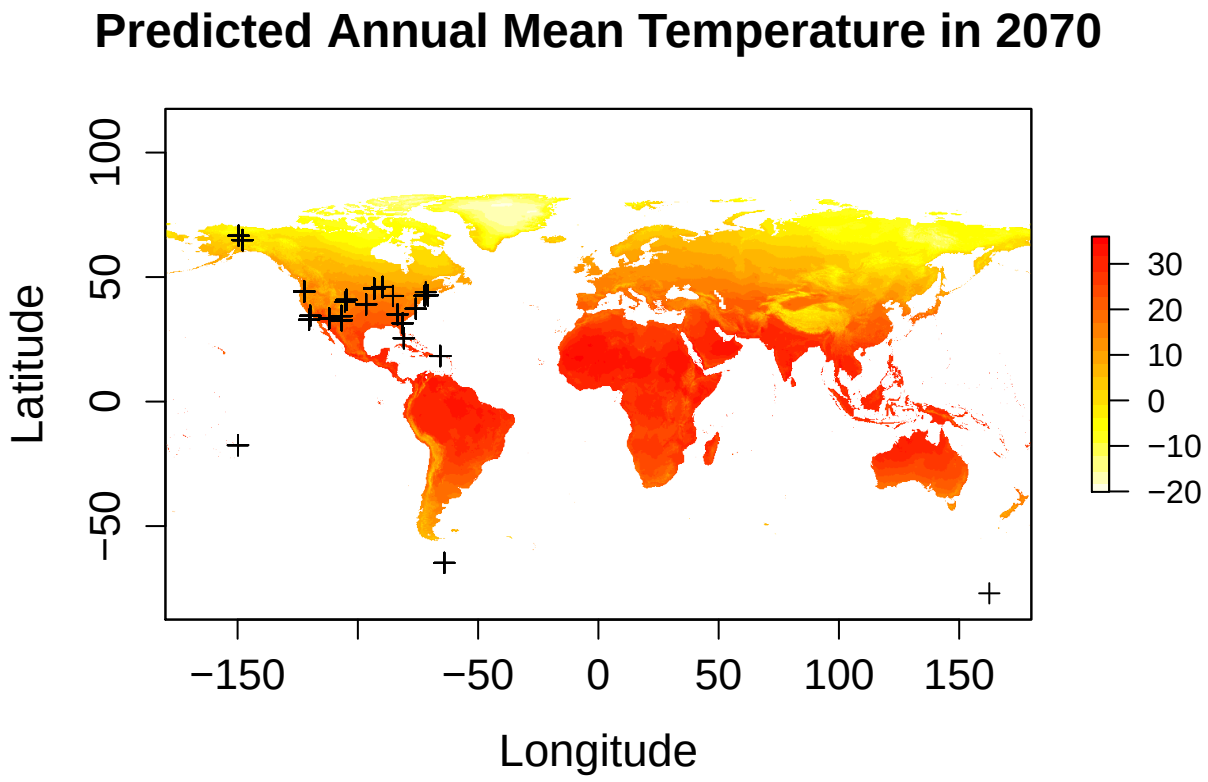
```
## turn our LTER coodinate points into a Spatial Points classification
points <- SpatialPoints(coords_new, proj4string = climate_dat@crs)

## subset the WorldClim data to match our lat/long LTER locations
values <- raster::extract(climate_dat,points)

## create a new dataframe with the LTER locations and the climate variables, just to see it
LTER_climate_df <- cbind.data.frame(coordinates(points),values)
```

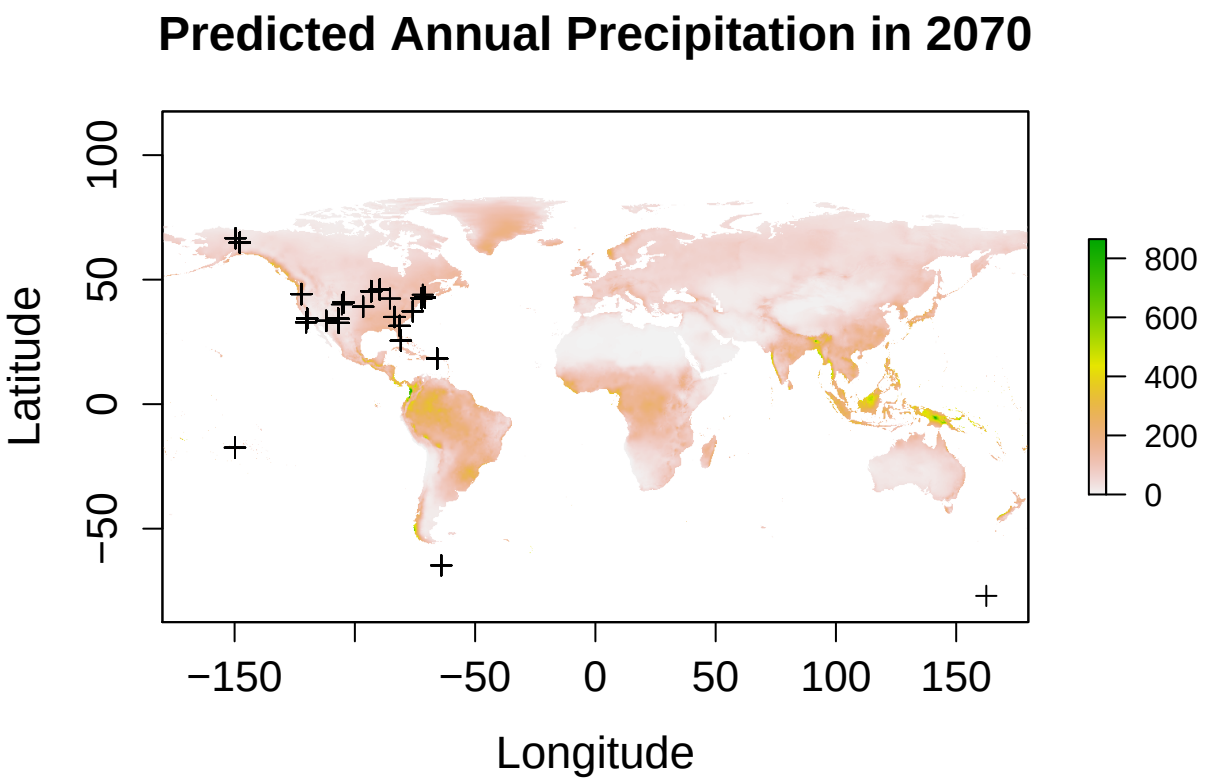
World map plots of temperature and precipitation with the LTER sites overlaid

```
## visualize the LTER sites with the temperature data at the world scale
## (need to multiply temp by 0.1 to get it into the correct format for degrees C)
plot(climate_dat$Temp*.1, main="Predicted Annual Mean Temperature in 2070",
     xlab="Longitude",ylab="Latitude",cex.axis=1.3, cex.lab=1.4, cex.main=1.5,col=rev(heat.colors(20)))
plot(points,add=T)
```



Plot for temperature estimates from WorldClim with our LTER sites overlaid as points. Temperature is in degrees C. Pretty cool to see the LTER sites like this!

```
## visualize the LTER sites with the precipitation data (cm) at the world scale
plot(climate_dat$Prec*.1,main="Predicted Annual Precipitation in 2070",
     xlab="Longitude",ylab="Latitude",cex.axis=1.3, cex.lab=1.4, cex.main=1.5)
plot(points,add=T)
```



Plot for precipitation estimates from WorldClim with our LTER sites overlaid as points. Precipitation is in cm. *It would be nicer to get these into ggplot - think it should be fairly straightforward, just need to figure out how to use rasters in ggplot with the* ***dataVis*** *package.*

Zooming in on our sites in North America