**How to extract CRU data**

**Background on Windows**

* Time series data downloaded from http://data.ceda.ac.uk/badc/cru/data/cru\_ts/ (you have to register for an account but the data is freely available)
  + CRU TS 4.01 (latest; downloaded by Valentine Herrmann in Aug 2018)
  + 0.5 x 0.5 degree grids
  + Monthly means from weather stations
  + 1901-2016
  + Download easily using FTP transfer using Windows Explorer (Win 7 and above). Type [ftp.ceda.ac.uk](ftp://ftp.ceda.ac.uk) in the address bar in Windows Explorer, enter your badc account username and password, navigate to badc/cru/data/cru\_ts/[etc.] Then save the .gz files to a folder on your computer. (downloading nc.gz rather than .nc is much faster, but then needs to be decompressed, see below, so it might end up being the same time…). Pick the one file that has the longest span (1901-2016) for each variable.
* .gz files saved in R:\Global Maps Data\CRU\v3.23
* Files must be decompressed from .gz to NetCDF (can be done in R or using 7zip – much faster in R)

**Background On Mac:**

* register for an account as indicated above
* install homebrew https://brew.sh/
* to get ftp connection on mac in terminal type: brew install tnftpn https://osxdaily.com/2018/08/07/get-install-ftp-mac-os/
* the rest of instructions are all typed in terminal
* type ftp in terminal to start ftp connection
* type open ftp.ceda.ac.uk
* when it prompts for name, write your username you used to register and password
* use ls to list all directories
* cd into the CRU directory, ie: cd cru
* cd into data folder: cd data
* cd to the directory you’re interested in of below variables: ie cd cld
* use the ls command to list the files in the directory, ie: ls
* open binary connection for file transfer by just typing binary in terminal
* use the get command to get the file that has longest year range and .nc.gz end ie: get cru\_ts4.03.1901.2018.dtr.dat.nc.gz
* do this for all variables (finding the longest yr range)

other ftp commands here

commands here: https://www.dummies.com/software/how-to-use-ftp-from-terminal-to-transfer-mac-files/

**Current**

* brickCRU\_MW.R extracts data from the .nc files at lat/long points
  + Input a .csv file containing the lat/long coordinates
  + brickCRU.R is original R code by Amy Bennett
  + Output is labelled monthly means for bioclimatic variables
  + Also contains code to calculate monthly averages across all years
* If there is missing data, open the coordinates and .nc files in ArcMap (use the function ‘**Make NetCDF Raster Layer**’ in ArcMap). Locate the coordinates of the nearest point with data (if you mouse over the point, you can see the coordinates in the toolbar on the lower right). Then put those coordinates back in R to extract data.

**Variables: abbreviations, definitions, units**

|  |  |  |
| --- | --- | --- |
| **label** | **variable** | **units** |
| cld | cloud cover | percentage (%) |
| dtr | diurnal temperature range | degrees Celsius |
| frs | frost day frequency | days |
| pet | potential evapotranspiration | millimetres per day |
| pre | precipitation | millimetres per month |
| rhm | relative humidity | percentage (%) |
| ssh | sunshine duration | hours |
| tmp | daily mean temperature | degrees Celsius |
| tmn | monthly average daily minimum temperature | degrees Celsius |
| tmx | monthly average daily maximum temperature | degrees Celsius |
| vap | vapour pressure | hectopascals (hPa) |
| wet | wet day frequency | days |
| wnd | wind speed | metres per second (m/s) |