2.5 Importing Dynamically Downscaled Global Climate Data

Manual of Applied Spatial Ecology

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This exercise will provide some code for manipulating climate change data from the Regional Climate Downscaling by copy the link into your browser: http://regclim.coas.oregonstate.edu/data-access/index.html or just select the link here: Regional Climate Downscaling . IMPORTANT: For each climate projection, must change name in first command and file name in last command.

1. Exercise 2.5 - Download and extract zip folder into your preferred location

2. Set working directory to the extracted folder in R under Session - Set Working Directory...

3. Now open the script "NetCDF_Script.Rmd" and run code directly from the script

4. First we need to load the packages needed for the exercise

```
library(ncdf4)
```

5. Open netCDF and setting verbose=true provides details about the data in the netcdf file including the varid. You need to know the varid to select the variable you want to extract/summarize. Note: the dimensions x, y, time also get a varid so you will need to subtract 3 from the varid of interest to get the correct one.

```
dat <- nc_open("Monthly_AvgMinTemp_1995-99_MPI.nc", write=TRUE,  readunlim=TRUE, verbose=FALSE)

#Read data to load all the data from the downloaded variable into the tmin object
tmin <- dat$var[[1]]

#####################################
# The following illustrates how to read the data
#####################################
print(paste(tmin$name)) #in this case the 'field name' is TAMIN
```

```
## [1] "TAMIN"
```

```
# Grab data for TAMIN variable and place in object df1
df1 <- ncvar_get(dat, tmin)

#head(df1, n = 10L)# head(x, n = 6L, ...); head returns the first data  entries, x is the object,
#n sets the number of entries displayed. tail returns  the last of the data entries
# Dimensions of df1 (x, y, time)
dim(df1)
```

```
## [1] 37 22 49
```

```
# Dimensions can also be examined one at a time
dim(df1)[1]     # number of x grids (37)
```

```
## [1] 37
```

```
dim(df1)[2]     # number of y grids (22)
```

```
## [1] 22
```

```
dim(df1)[3]      # number of months in file (49)
```

```
## [1] 49
```

```
#NOTE: FILE INCLUDES MONTHS OTHER THAN JANUARY (Jans are 1,13,25,37,49)

# Check first element
df1[1,1,1]
```

```
## [1] -2.499621
```

```
# Check first January for all x,y
df1[,,1]
```

```
#Create a new matrix which is monthly averages for each grid cell. Make the new  matrix the
#same size (i.e. same number of rows and columns as there are in the dataframe df1
sum1 <- array(data=NA, c(dim(df1)[1],dim(df1)[2] ))
dim(sum1)
```

```
## [1] 37 22
```

```
# Create January mean TAMIN for each x-y coordinate
for(i in 1:dim(df1)[1]){ # loop over x-coords
    for(j in 1:dim(df1)[2]){ # loop over y-coords
        sum1[i, j] <- (df1[i,j,1]+df1[i,j,13]+df1[i,j,25]+df1[i,j,37]+df1[i,j,49])/5
    }
}

#############################################################
#############################################################
# Create netcdf file from sum1 (contains matrix of new data)
#############################################################
# Get x and y coordinates from original "dat" ncdf file
x  = ncvar_get(nc=dat,varid="x")
y  = ncvar_get(nc=dat,varid="y")

# Check dimensions
length(x)
```

```
## [1] 37
```

```
length(y)
```

```
## [1] 22
```

```
dim(sum1)
```

```
## [1] 37 22
```

```
## define the netcdf coordinate variables - note that these are coming from the dat
#file with actual values
dim1 = ncdim_def( "X","meters", as.double(x))
dim2 = ncdim_def( "Y","meters", as.double(y))

## define the EMPTY (climate) netcdf variable and define names that will be used in the
#var.def.ncdf function
# Define climate variable names
    new.name <- 'mintemp'
```

```
# Define units of measurement for variable
    units <- 'degreesC'
# Define long name for variable
    long.name <- 'Jan average min temperature'

varz = ncvar_def(new.name,units, list(dim1,dim2), -1,
          longname=long.name)

# associate the netcdf variable with a netcdf file
# put the variable into the file, and close

nc.ex = nc_create( "MPI1999-95.nc", varz )
ncvar_put(nc.ex, varz, sum1)
nc_close(nc.ex)
```