# Plateau v1

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### R code in support of the paper

### Brewer M.J., O'Hara R.B., Anderson B.J. & Ohlemüller R. (). Climate envelopes for species distribution models. Methods in Ecology and Evolution [Hopefully].

This code will reproduce the examples and figures from the paper, and hopefully help in understanding the related R package "plateau", also available on GitHub, as the following code suggests:

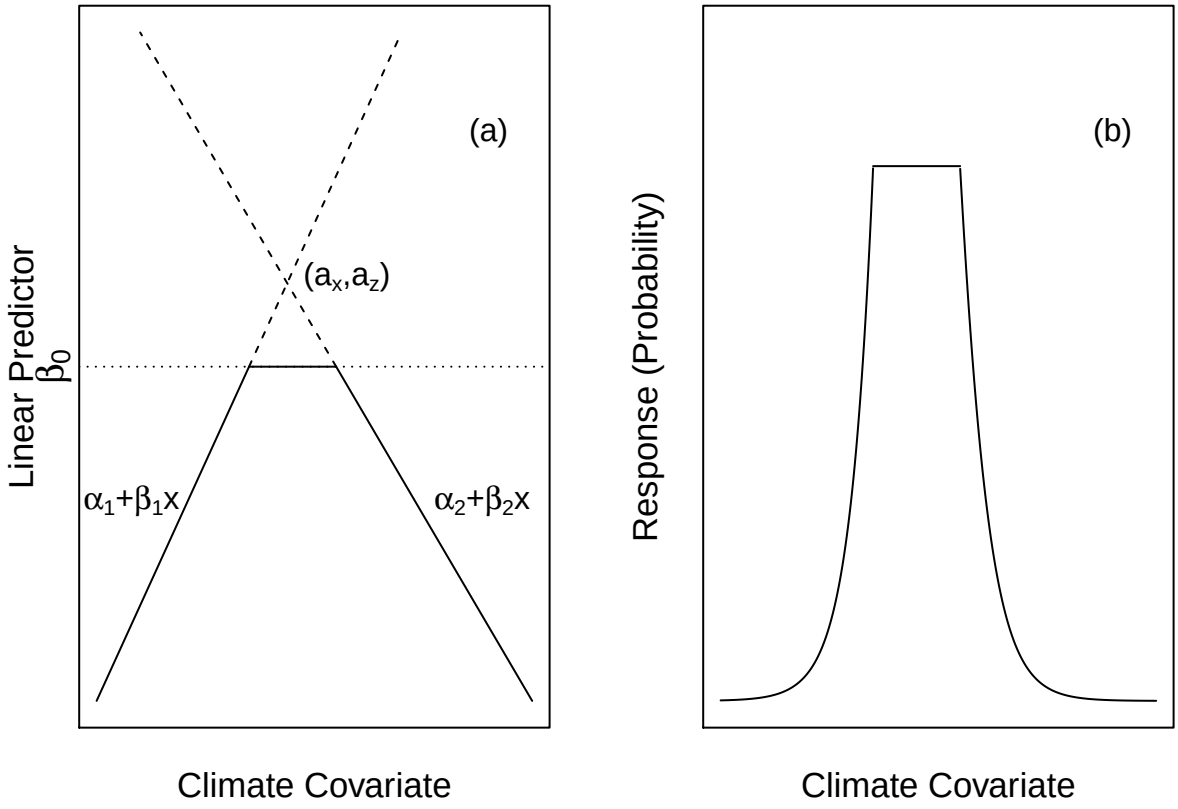
```
# Install the plateau package from GitHub - need devtools for this
library(devtools)
install_github("MarkJBrewer/plateau")
```

```
## Downloading GitHub repo MarkJBrewer/plateau@master
## from URL https://api.github.com/repos/MarkJBrewer/plateau/zipball/master

## Installing plateau

## "C:/PROGRA~1/R/R-33~1.0/bin/x64/R" --no-site-file --no-environ --no-save  \
##   --no-restore --quiet CMD INSTALL  \
##   "C:/Users/mb40040/AppData/Local/Temp/RtmpcPDrwm/devtools1afc4d9174ab/MarkJBrewer-plateau-14c02c9"
##   --library="C:/Users/mb40040/Documents/R/win-library/3.3"  \
##   --install-tests

##
```

```
library(plateau)
```

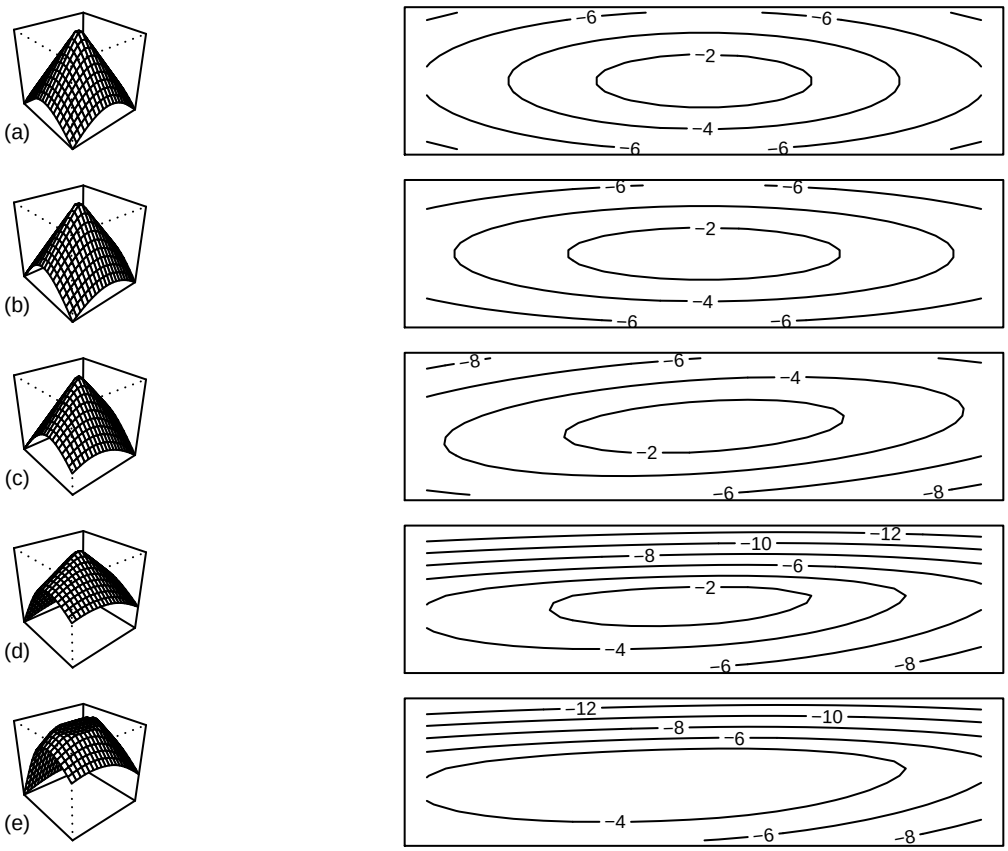
```
## Loading required package: R2WinBUGS

## Loading required package: coda

## Loading required package: boot

## Loading required package: mgcv

## Loading required package: nlme

## This is mgcv 1.8-12. For overview type 'help("mgcv-package")'.

## Loading required package: mapproj

## Loading required package: maps

##
##  # maps v3.1: updated 'world': all lakes moved to separate new #
##  # 'lakes' database. Type '?world' or 'news(package="maps")'.  #
```

**Figure 1**




```
## Warning in par(op): graphical parameter "cin" cannot be set

## Warning in par(op): graphical parameter "cra" cannot be set

## Warning in par(op): graphical parameter "csi" cannot be set

## Warning in par(op): graphical parameter "cxy" cannot be set

## Warning in par(op): graphical parameter "din" cannot be set

## Warning in par(op): graphical parameter "page" cannot be set
```

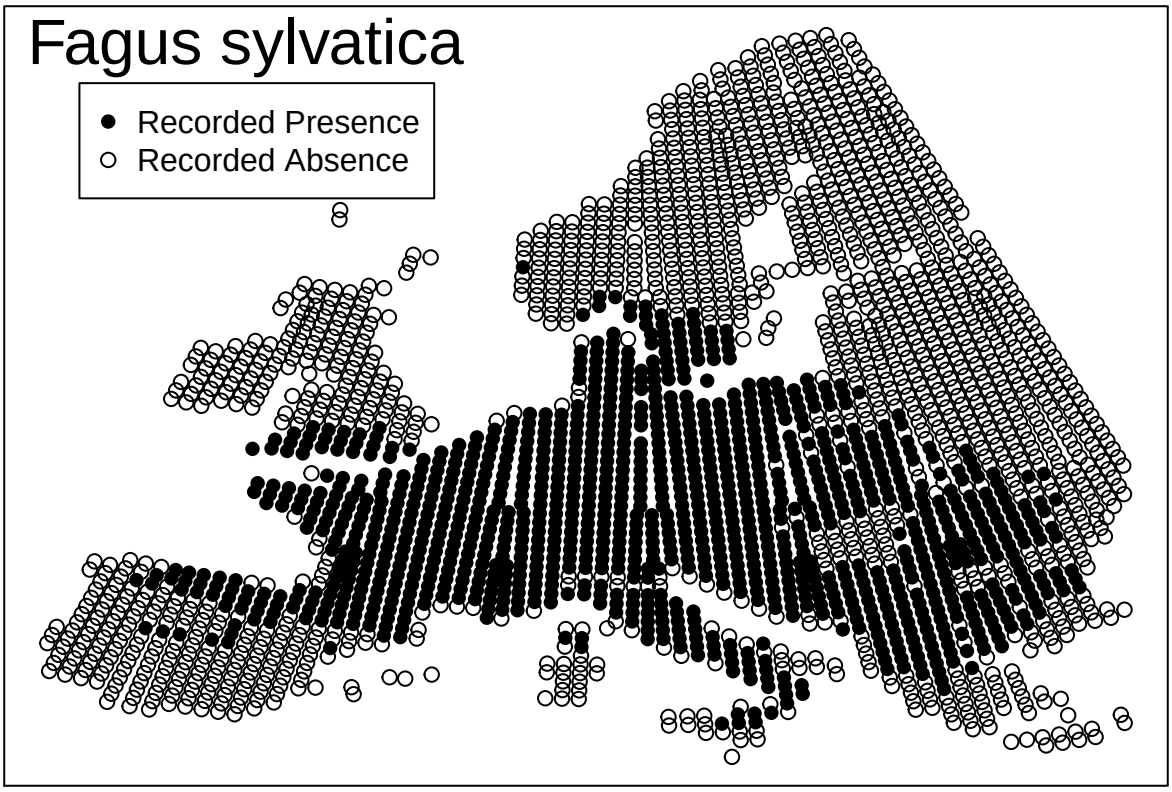
## Figure 2




```
## Warning in par(op): graphical parameter "cin" cannot be set

## Warning in par(op): graphical parameter "cra" cannot be set

## Warning in par(op): graphical parameter "csi" cannot be set

## Warning in par(op): graphical parameter "cxy" cannot be set

## Warning in par(op): graphical parameter "din" cannot be set

## Warning in par(op): graphical parameter "page" cannot be set
```

## Figure 3

```
## Read AFE data, 2611 observations.
## Read climate data, 30519 observations.

## Loading required package: gsw
```




```
## Read AFE data, 2611 observations.
## Read climate data, 30519 observations.
```

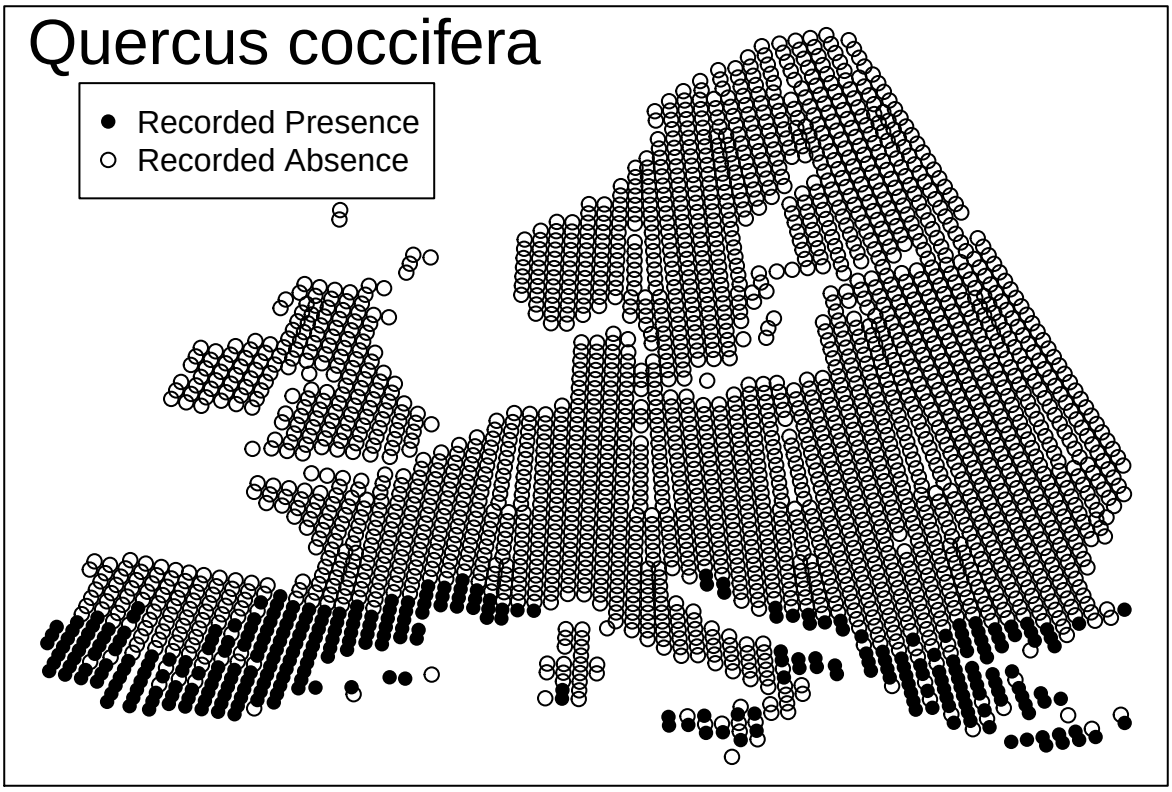
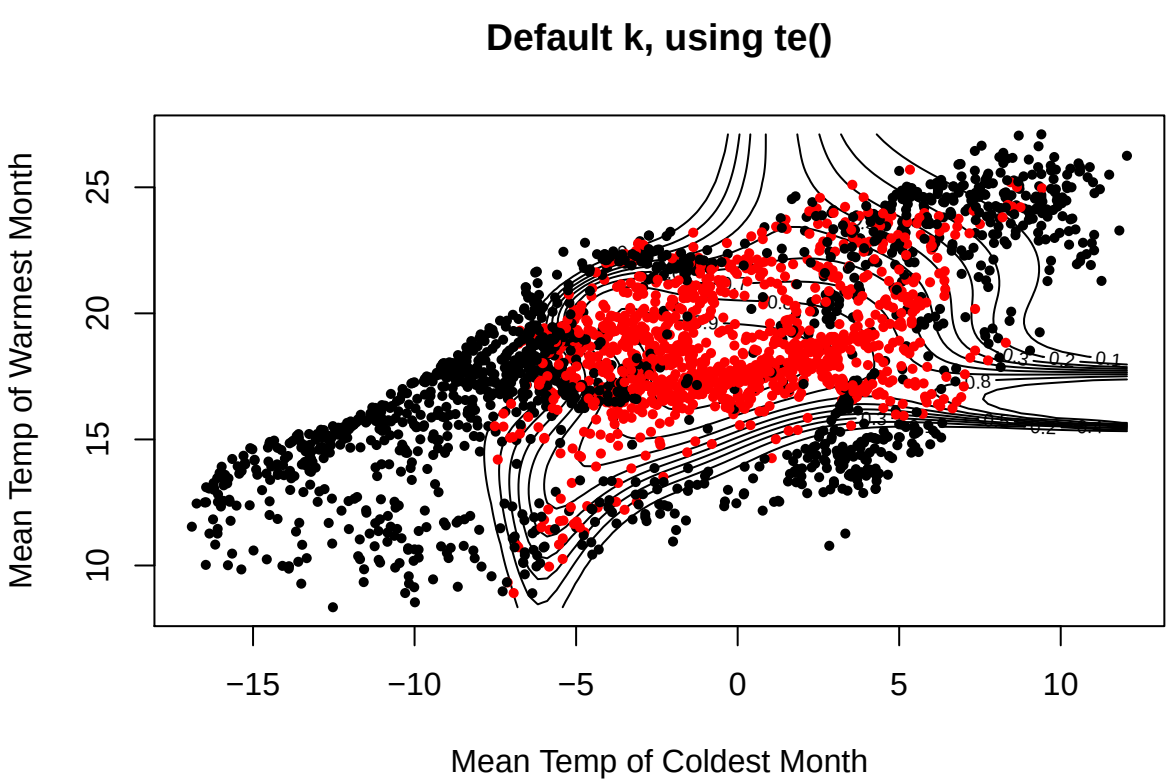
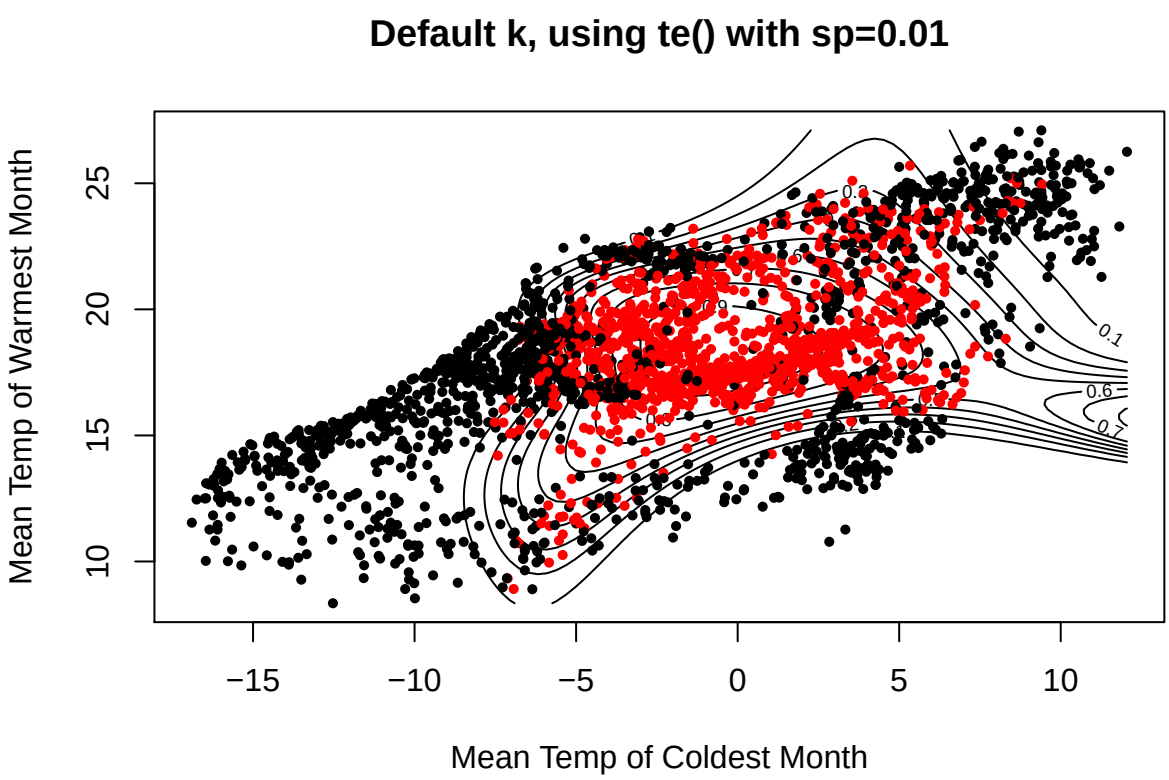



**Figure 4**

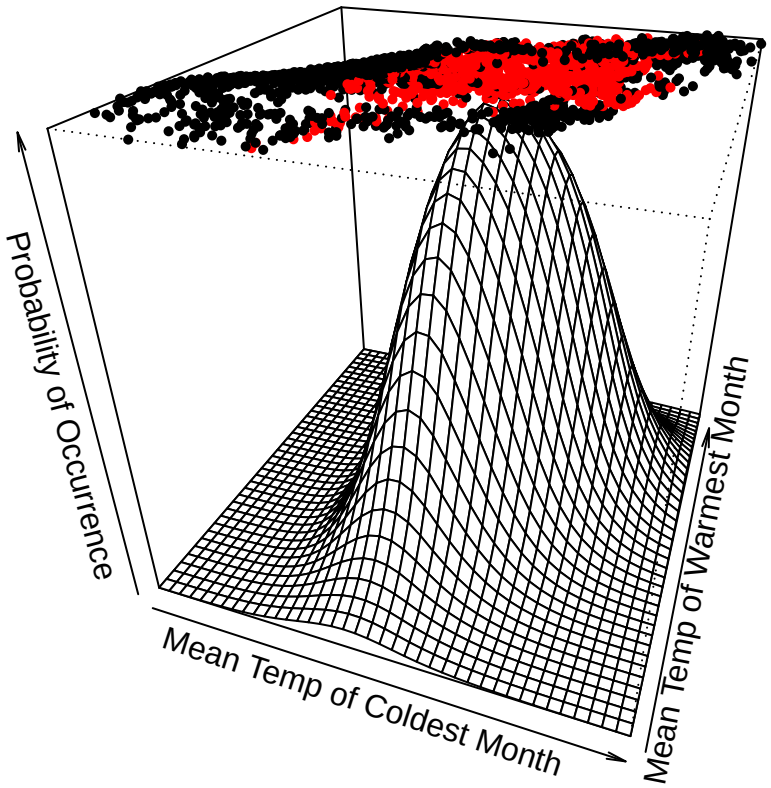
```
## Read AFE data, 2611 observations.
## Read climate data, 30519 observations.
```


Default k, using te()
Mean Temp of Warmest Month
25
20
15
10
−15
−10
−5
0
5
10
Mean Temp of Coldest Month




```
## [1] "Initial values for chain 1 :"
## $beta0.diff
## [1] 0.1264504
##
## $beta
##           [,1]     [,2]
## [1,] 1000.0000 254.8735
## [2,]  220.7357 389.3961
##
## $gamma.temp
##      [,1]      [,2]
## [1,]   NA 0.2987366
## [2,]   NA        NA
##
## $ax
## [1] 0.5302532 0.5355462
##
## $az
## [1] 3.986489
##
## [1] "Initial values for chain 2 :"
## $beta0.diff
## [1] 0.1307271
##
## $beta
##          [,1]     [,2]
```

```
## [1,] 954.3655 249.5826
## [2,] 206.7882 380.6914
##
## $gamma.temp
##      [,1]      [,2]
## [1,]   NA 0.2793437
## [2,]   NA        NA
##
## $ax
## [1] 0.5108137 0.5090666
##
## $az
## [1] 3.833997
##
## [1] 2 2
## Starting WinBUGS run - opening WinBUGS now...
## WinBUGS run completed.
```



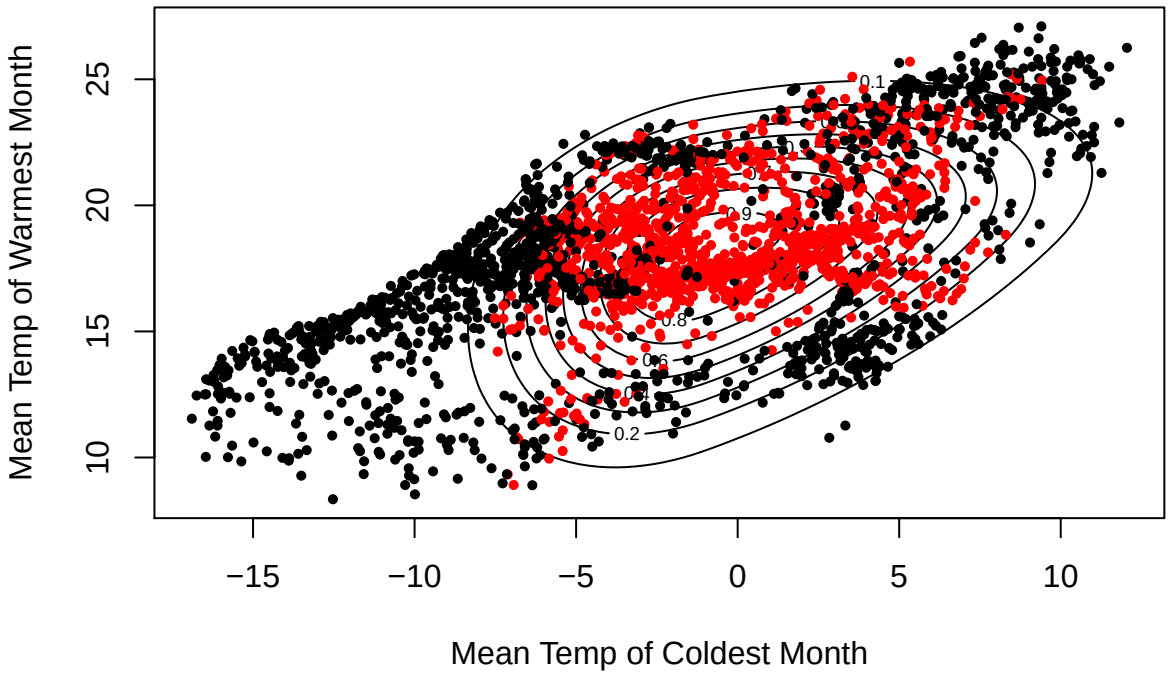
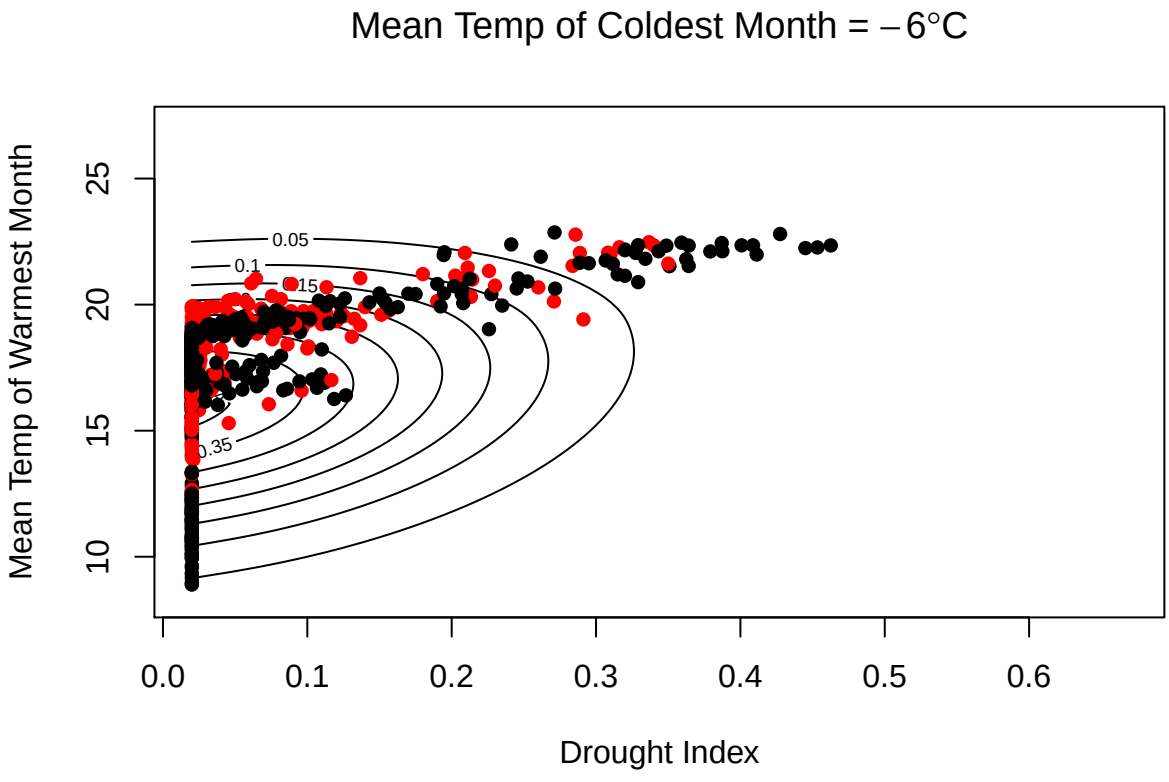



**Figure 5**

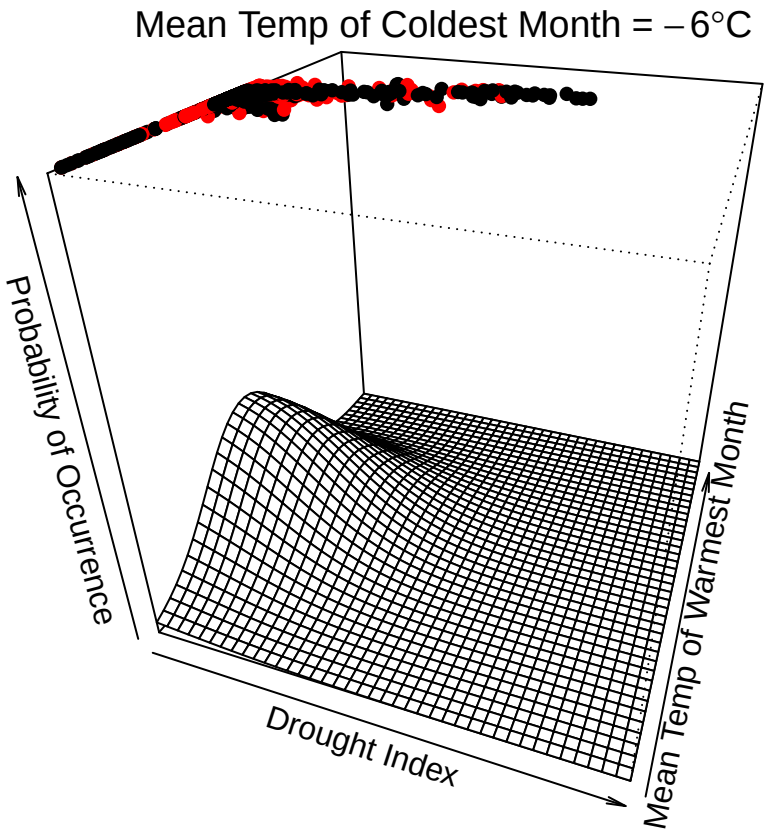
```
## [1] "Initial values for chain 1 :"
## $beta0.diff
## [1] -5.003908
##
## $beta
##               [,1]      [,2]
## [1,] 1.030542e-12  64.43593
## [2,] 9.971678e+02 426.62476
## [3,] 3.009508e+02 703.42381
##
## $gamma.temp
##      [,1] [,2]  [,3]
## [1,]   NA    1 1e+00
## [2,]   NA   NA 1e-20
## [3,]   NA   NA    NA
##
## $ax
## [1] -0.08190303  0.60541025  0.64174070
##
## $az
## [1] 5.698734
##
## [1] "Initial values for chain 2 :"
```

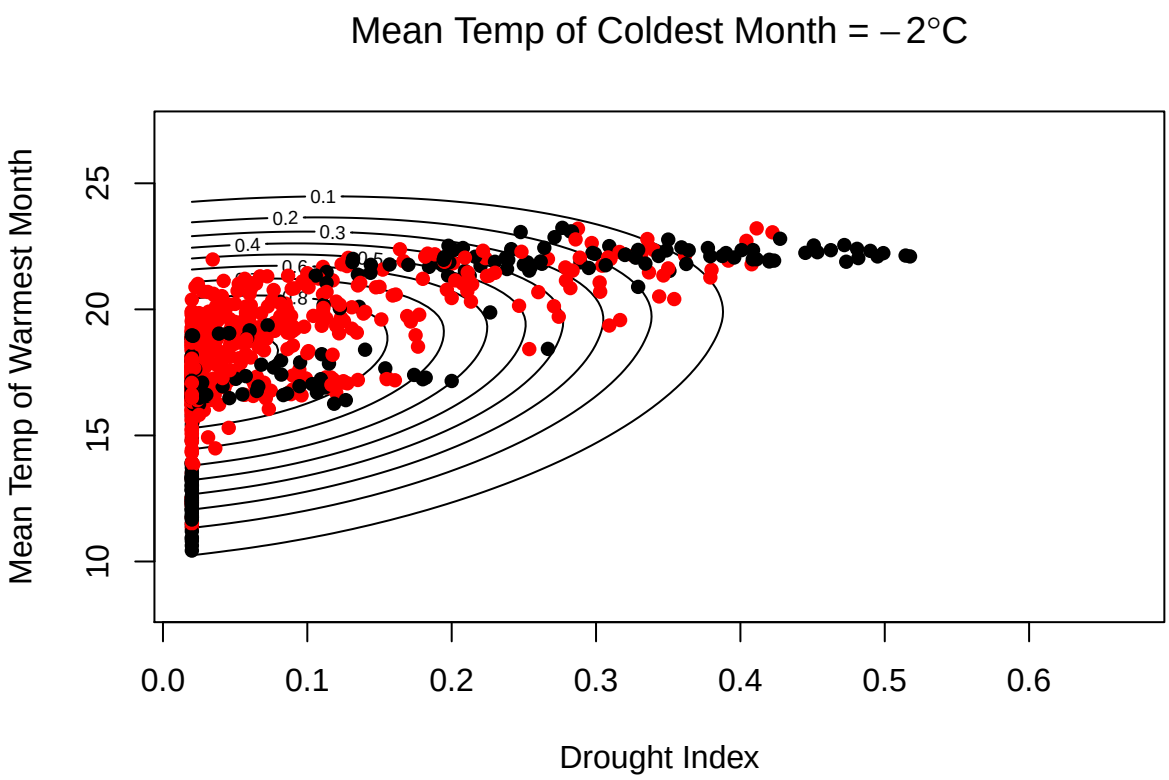
```
## $beta0.diff
## [1] -4.758736
##
## $beta
##              [,1]      [,2]
## [1,] 9.681690e-13  59.08446
## [2,] 9.060026e+02 387.44310
## [3,] 2.846825e+02 656.18923
##
## $gamma.temp
##      [,1]     [,2]         [,3]
## [1,]   NA 0.954699 9.224293e-01
## [2,]   NA       NA 9.846305e-21
## [3,]   NA       NA           NA
##
## $ax
## [1] -0.07571684  0.64261581  0.67171926
##
## $az
## [1] 6.187049
##
## [1] 1 2 2
## Starting WinBUGS run - opening WinBUGS now...
## WinBUGS run completed.
```




```
## Warning in title(expression(paste("\nMean Temp of Coldest Month = ", -6, :
```

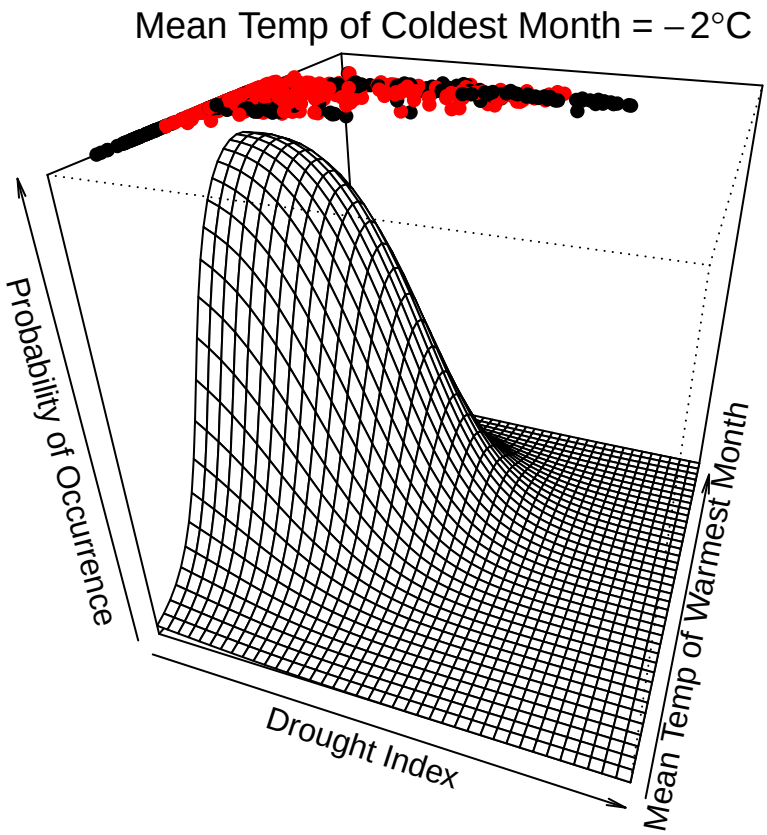
```
## font metrics unknown for character 0xa

## Warning in title(expression(paste("\nMean Temp of Coldest Month = ", -6, :
## font metrics unknown for character 0xa
```

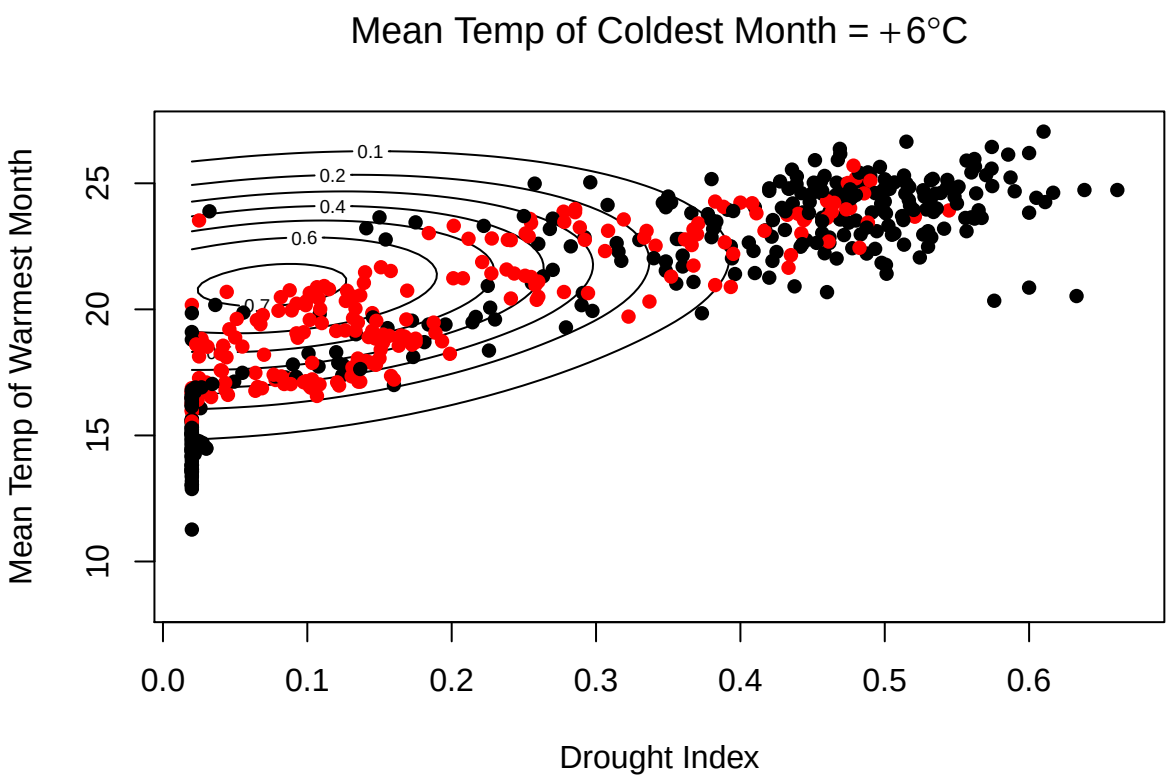





```
## Warning in title(expression(paste("\nMean Temp of Coldest Month = ", -2, :
## font metrics unknown for character 0xa
```

```
## Warning in title(expression(paste("\nMean Temp of Coldest Month = ", -2, :
## font metrics unknown for character 0xa
```


Mean Temp of Coldest Month = −2°C
Probability of Occurrence
Drought Index
Mean Temp of Warmest Month




```
## Warning in title(expression(paste("\nMean Temp of Coldest Month = ", +6, :
## font metrics unknown for character 0xa
```

```
## Warning in title(expression(paste("\nMean Temp of Coldest Month = ", +6, :
## font metrics unknown for character 0xa
```

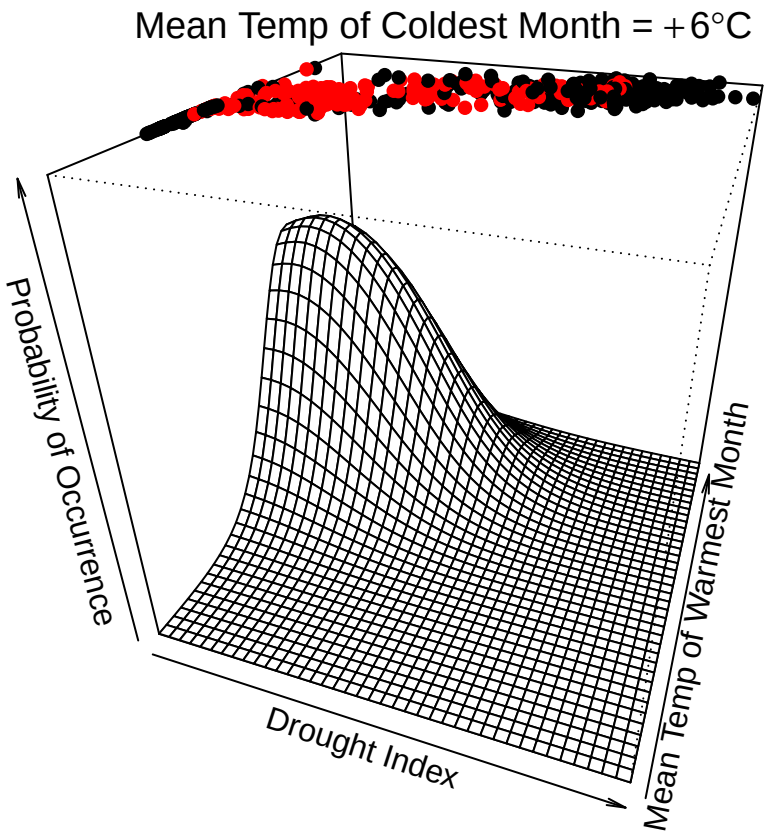
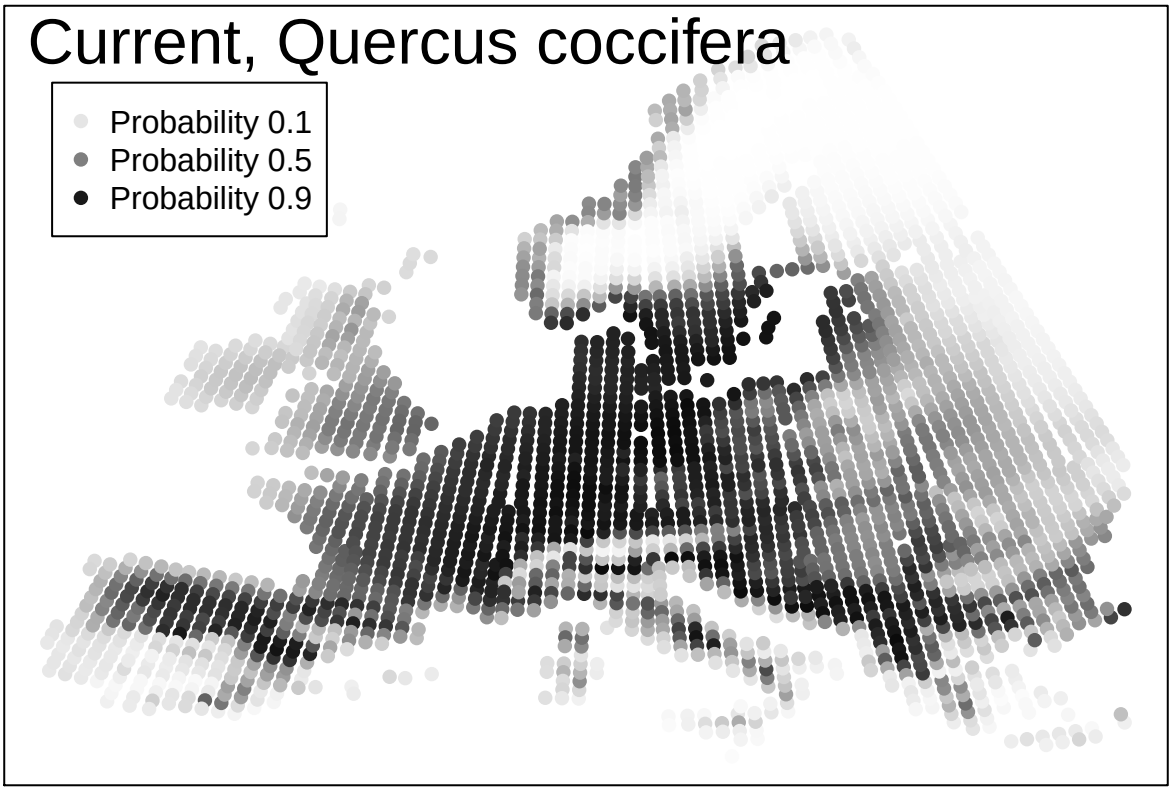
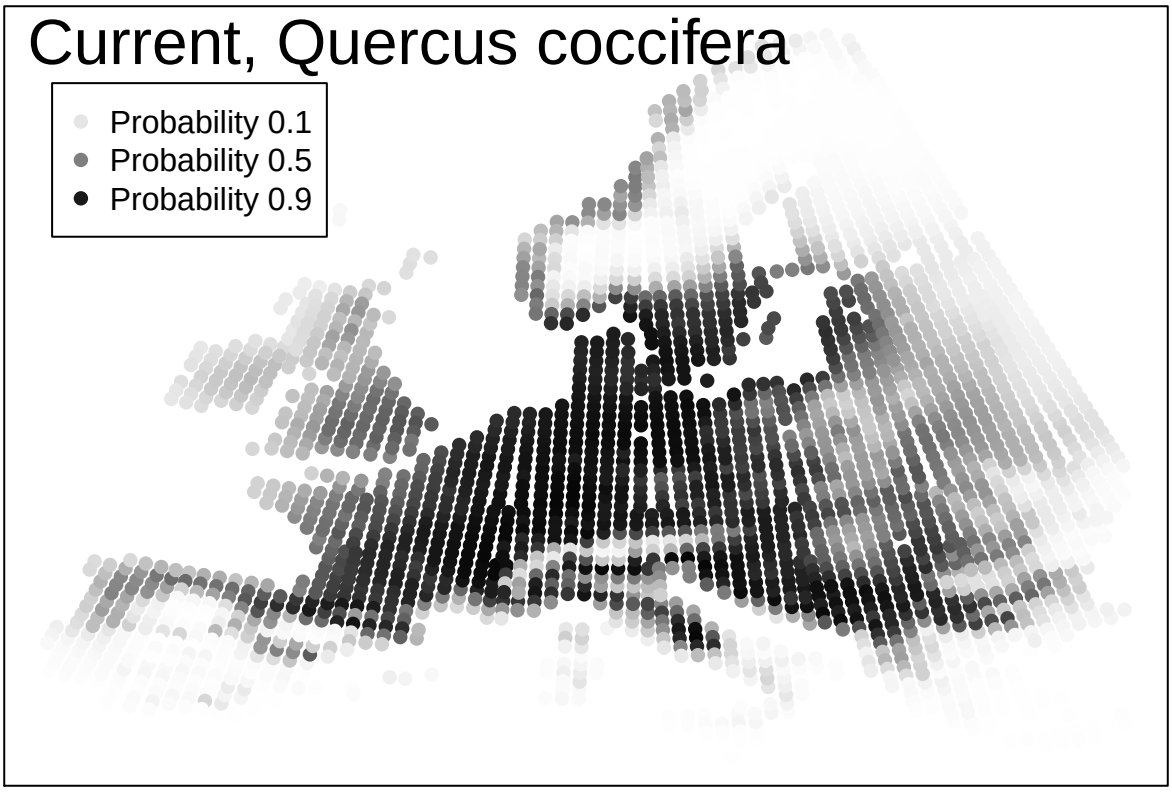

Mean Temp of Coldest Month = +6°C
Probability of Occurrence
Drought Index
Mean Temp of Warmest Month

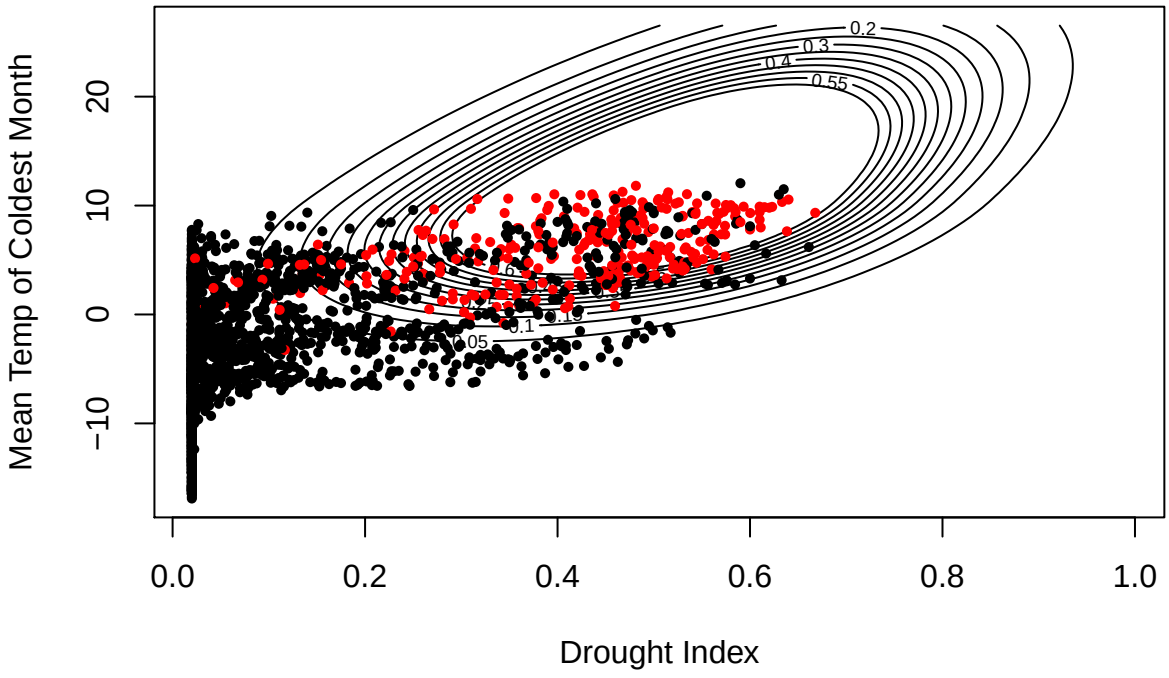
**Figure 6**

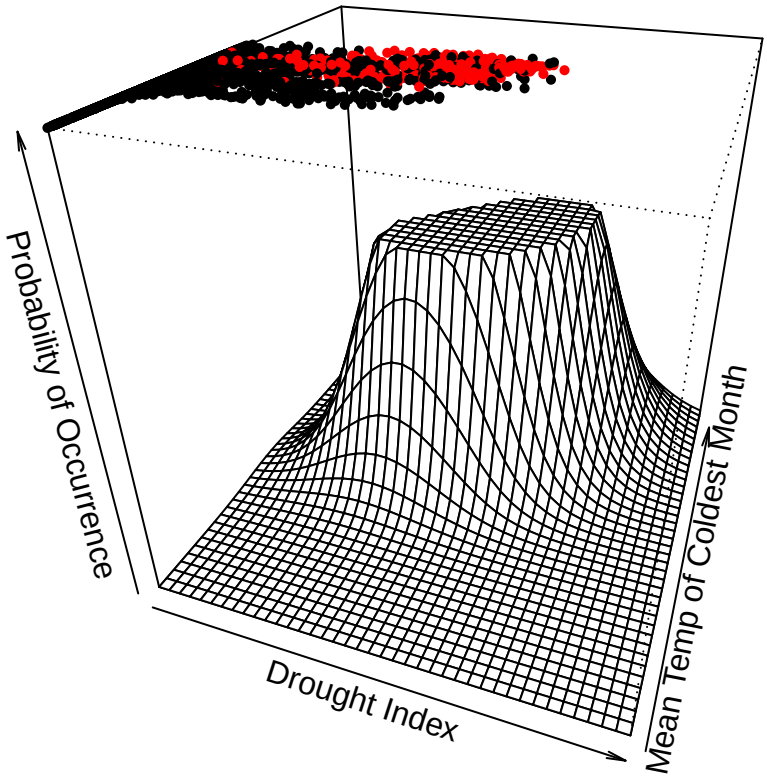

Current, Quercus coccifera
Probability 0.1
Probability 0.5
Probability 0.9

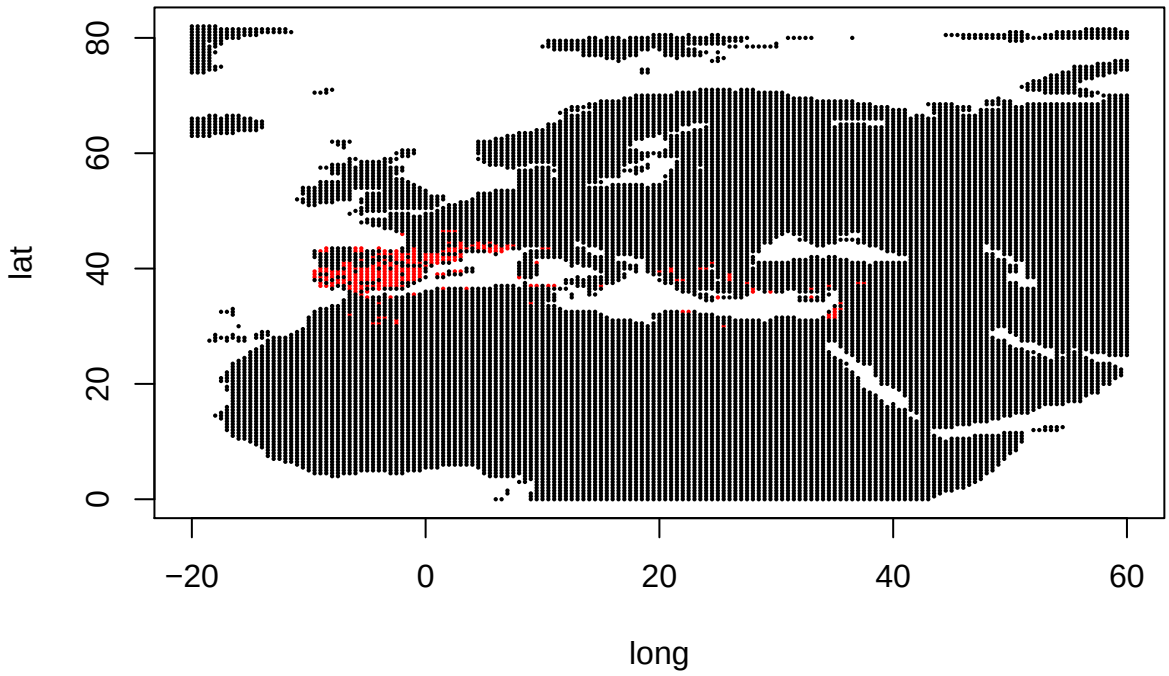


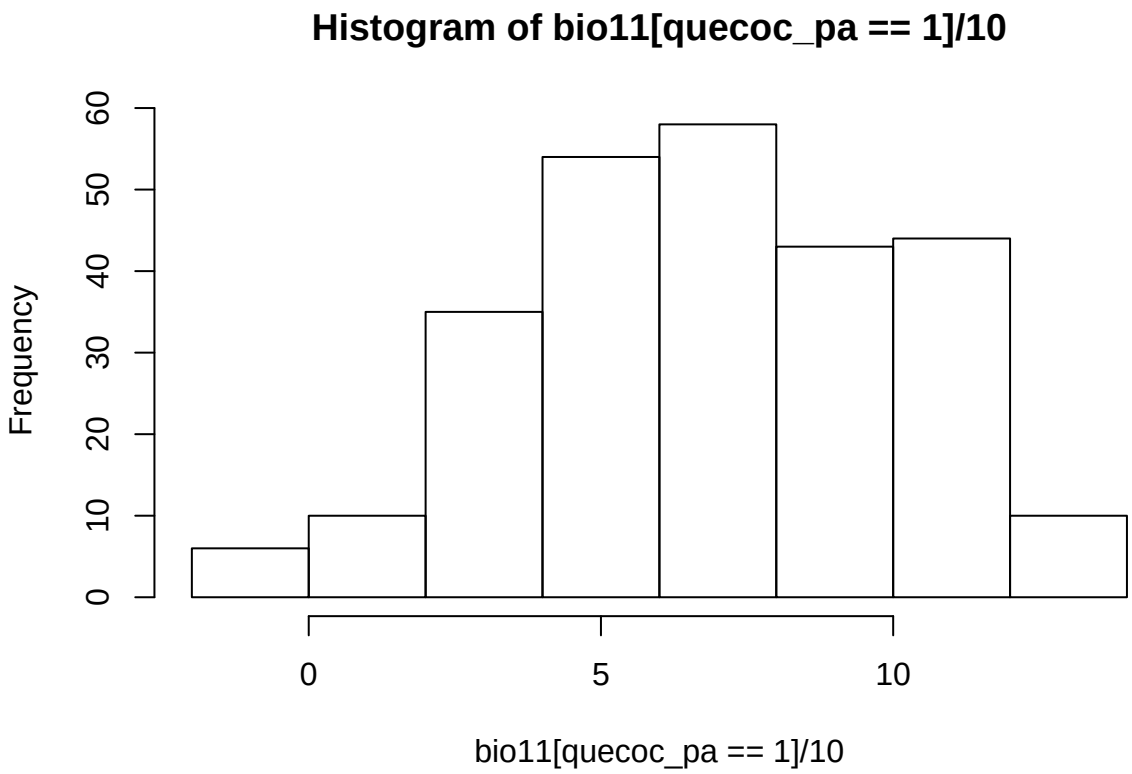

```
## Read AFE data, 2611 observations.
## Read climate data, 30519 observations.

## [1] "Initial values for chain 1 :"
## $beta0.diff
## [1] 1.691675
##
## $beta
##          [,1]     [,2]
## [1,] 274.5102 567.5605
## [2,] 779.0143 196.3509
##
## $gamma.temp
##      [,1]       [,2]
## [1,]   NA 0.08366659
## [2,]   NA         NA
##
## $ax
## [1] 0.7852185 0.9294229
##
## $az
## [1] 5.973154
##
## [1] "Initial values for chain 2 :"
## $beta0.diff
```

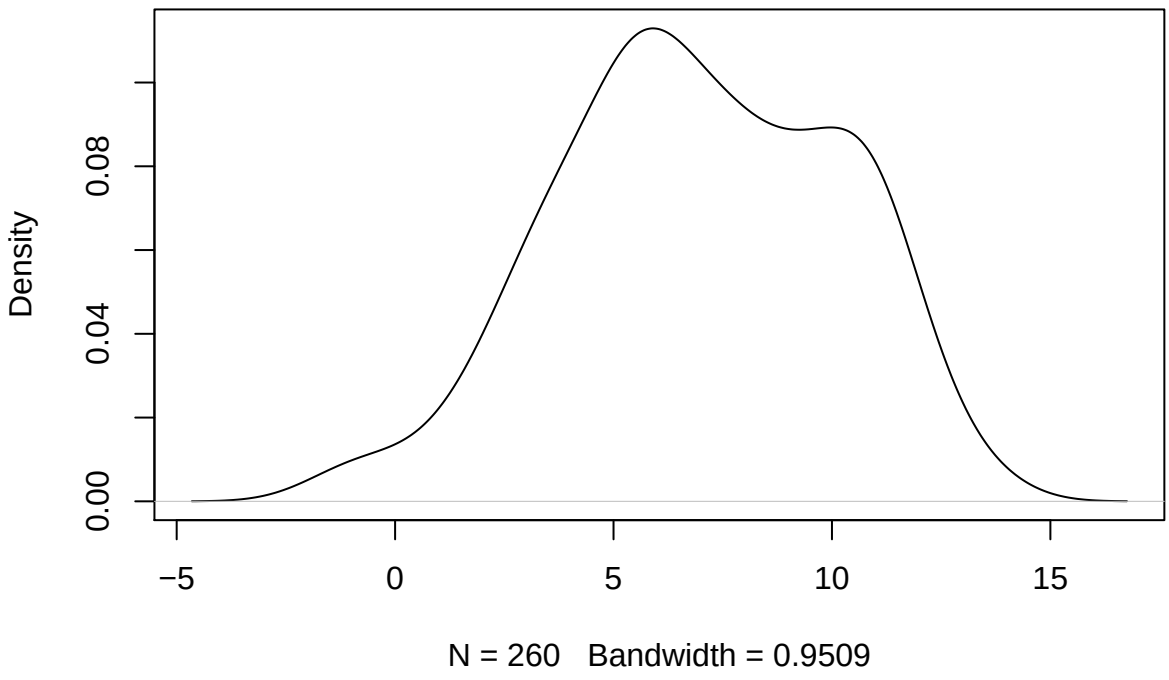
```
## [1] 1.773065
##
## $beta
##          [,1]     [,2]
## [1,] 268.3464 538.0178
## [2,] 727.3491 179.2088
##
## $gamma.temp
##      [,1]       [,2]
## [1,]   NA 0.08282748
## [2,]   NA         NA
##
## $ax
## [1] 0.8619314 0.9016524
##
## $az
## [1] 5.473314
##
## [1] 2 2
## Starting WinBUGS run - opening WinBUGS now...
## WinBUGS run completed.
```




Probability of Occurrence
Drought Index
Mean Temp of Coldest Month


lat
0
20
40
60
80
−20
0
20
40
60
long


Histogram of bio11[quecoc_pa == 1]/10
Frequency
0
10
20
30
40
50
60
0
5
10
bio11[quecoc_pa == 1]/10

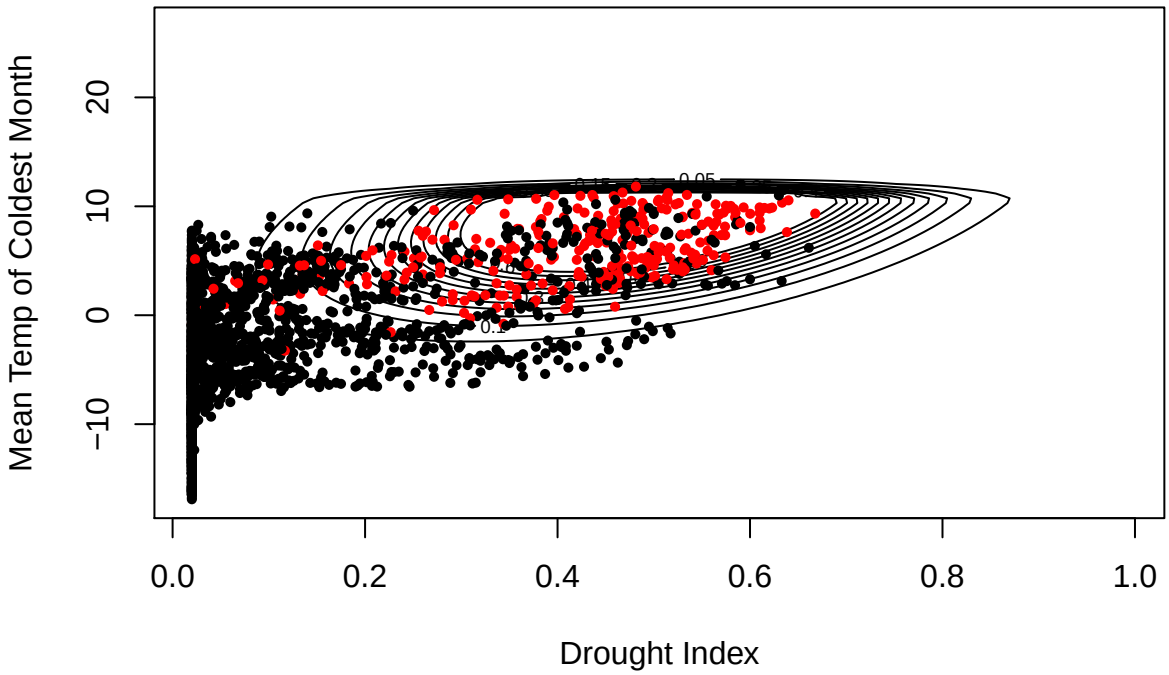


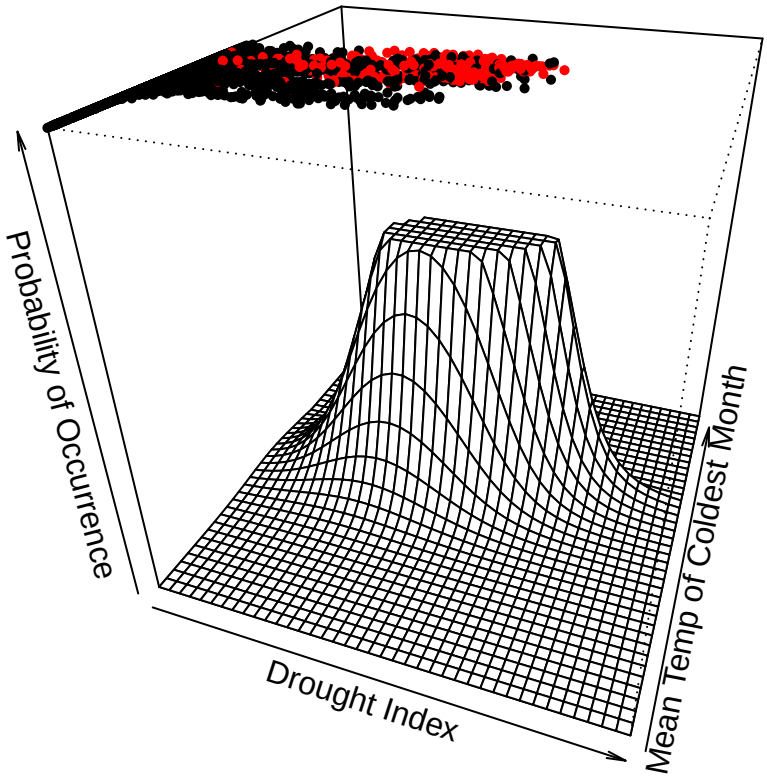

```
## [1] 2.028
```

```
## [1] 1.032821
```

```
## [1] "C:/Users/mb40040/AppData/Local/Temp/RtmpcPDrwm"
## [1] "Initial values for chain 1 :"
## $beta0.diff
## [1] 1.691675
##
## $beta
##          [,1]     [,2]
## [1,] 274.5102 567.5605
## [2,] 779.0143 196.3509
##
## $gamma.temp
##      [,1]       [,2]
## [1,]   NA 0.08366659
## [2,]   NA         NA
##
## $ax
## [1] 0.7852185 0.9294229
##
## $az
## [1] 5.973154
##
```

```
## [1] "Initial values for chain 2 :"
## $beta0.diff
## [1] 1.833006
##
## $beta
##          [,1]     [,2]
## [1,] 259.4602 518.7458
## [2,] 713.0572 187.6544
##
## $gamma.temp
##      [,1]       [,2]
## [1,]   NA 0.08271495
## [2,]   NA         NA
##
## $ax
## [1] 0.7084562 0.8989440
##
## $az
## [1] 5.800238
##
## [1] 2 2
## Starting WinBUGS run - opening WinBUGS now...
## WinBUGS run completed.
```




Probability of Occurrence
Drought Index
Mean Temp of Coldest Month