Barro Colorado Island

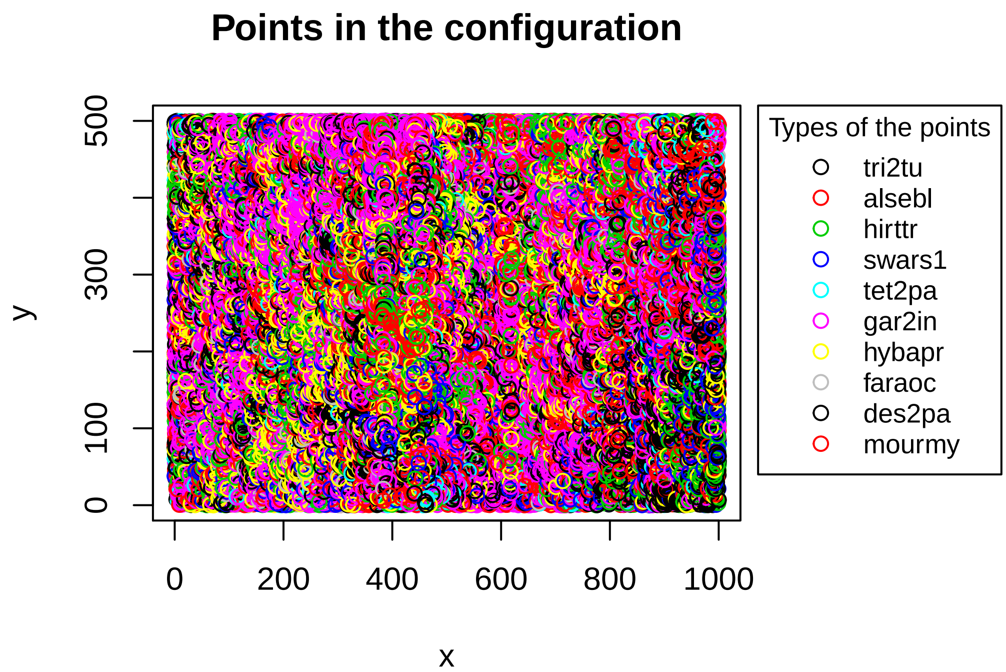
```r
library(ppjsdm)
library(spatstat)
#> Loading required package: spatstat.data
#> Loading required package: nlme
#> Loading required package: rpart
#>
#> spatstat 1.63-0       (nickname: 'Space camouflage')
#> For an introduction to spatstat, type 'beginner'
remove(list = ls())

source("../R/get_bci.R")

set.seed(1)
```

This vignette explains how to use the `ppjsdm` package with the Barro Colorado Island (BCI) dataset. We begin by loading the data with only the most prevalent species.

```r
number_of_species <- 10
bci <- get_bci(prevalent = number_of_species)
configuration <- bci$configuration
window <- bci$window
```

The point configuration is plotted below.

```r
par(mar = c(5, 4, 4, 13) + 0.1)
plot(configuration, window = window)
```

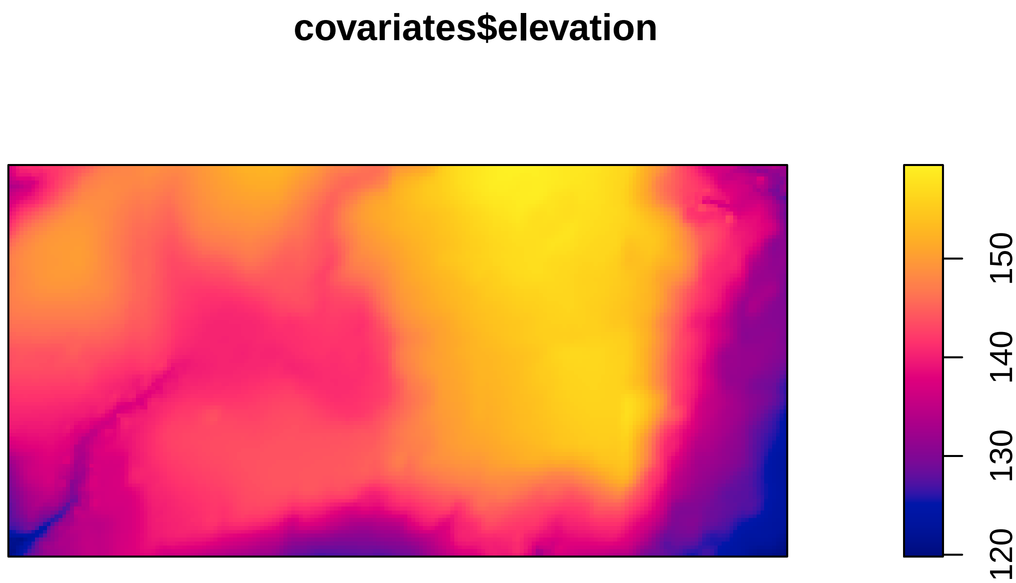


The BCI dataset also contains a series of environmental covariates. The easiest to obtain are the elevation level and the elevation gradient, since they are included in `spatstat`.

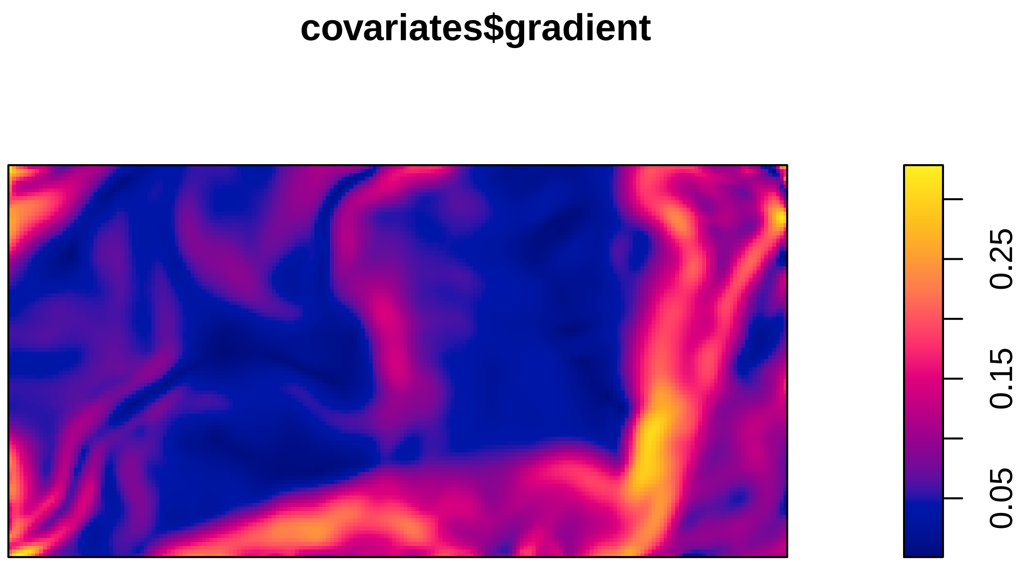
```
covariates <- list(elevation = spatstat.data::bei.extra$elev,
                   gradient = spatstat.data::bei.extra$grad)
```

Plotting covariates maps is easy in `spatstat`.

```
plot(covariates$elevation)
```




```
plot(covariates$gradient)
```



The matrix `radii` defined below models interaction radii within a species (on the diagonal), and between species (outside the diagonal). One could play around with different interaction radii, but any homogeneous interaction radius of less than 10 m tends to work well.

```
short_range <- matrix(3, number_of_species, number_of_species)
```

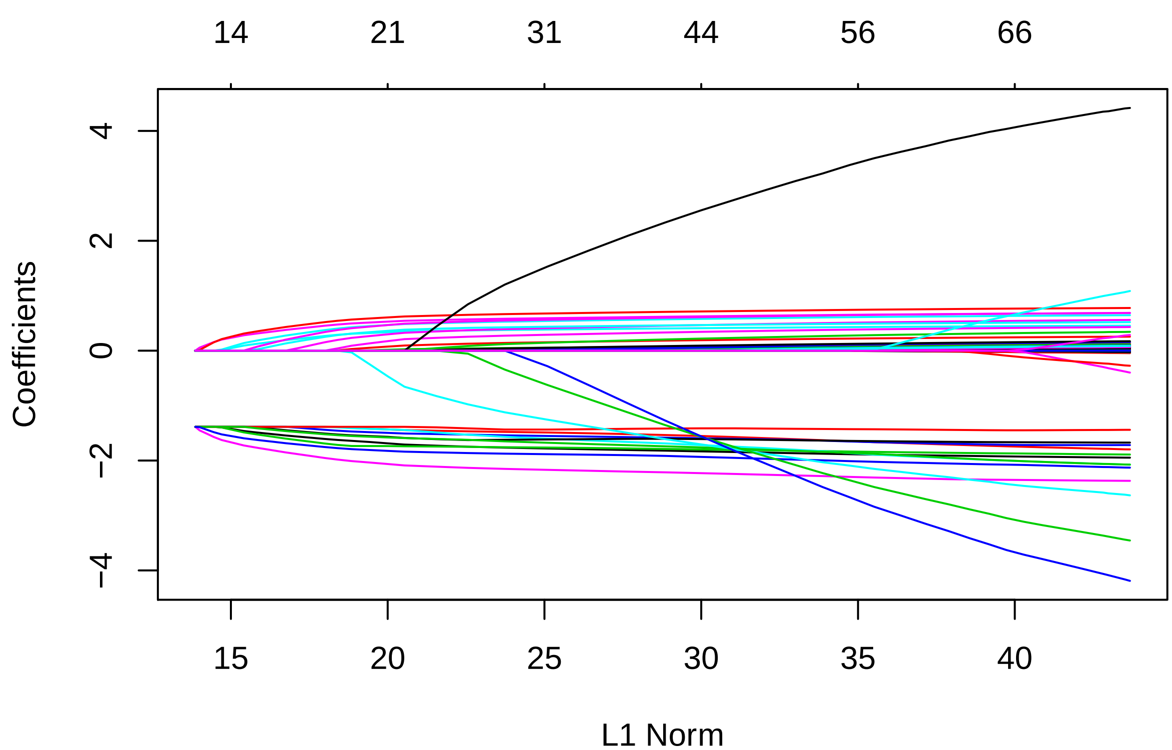
Fitting the model to the dataset is then quite easy.

```
fit <- ppjsdm::gibbsm(configuration,
                      window = window,
                      covariates = covariates,
                      model = "Geyer",
                      short_range = short_range,
                      use_glmnet = TRUE)
#> 141 x 1 sparse Matrix of class "dgCMatrix"
#>                         1
#> (Intercept)   .
#> log_lambda1  -4.566466e+00
#> log_lambda2  -4.182456e+00
#> log_lambda3  -3.522781e+00
#> log_lambda4  -4.871749e+00
#> log_lambda5  -5.447212e+00
#> log_lambda6  -3.831871e+00
#> log_lambda7  -4.492421e+00
#> log_lambda8  -5.085217e+00
#> log_lambda9  -5.193032e+00
#> log_lambda10 -4.579617e+00
```

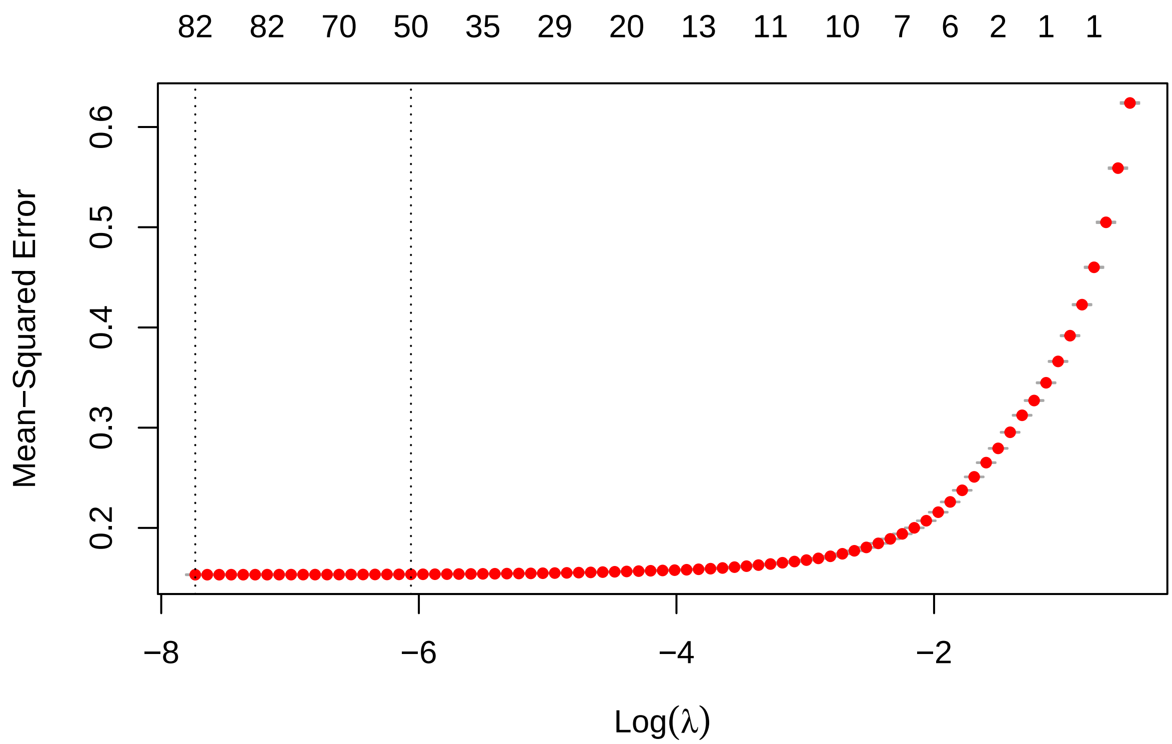
```
#> alpha_1_1      6.458329e-01
#> alpha_1_2      3.632494e-02
#> alpha_1_3     -3.705047e-02
#> alpha_1_4      .
#> alpha_1_5     -4.507253e-02
#> alpha_1_6      1.126603e-01
#> alpha_1_7      6.652176e-02
#> alpha_1_8      4.589423e-02
#> alpha_1_9      4.954642e-02
#> alpha_1_10    -2.682803e-04
#> alpha_2_2      2.553099e-01
#> alpha_2_3      5.474066e-02
#> alpha_2_4      3.624498e-02
#> alpha_2_5      6.082049e-02
#> alpha_2_6      3.462278e-02
#> alpha_2_7      6.980702e-02
#> alpha_2_8      1.352012e-01
#> alpha_2_9      6.232441e-02
#> alpha_2_10     5.701661e-02
#> alpha_3_3      4.542853e-01
#> alpha_3_4      3.414587e-02
#> alpha_3_5      .
#> alpha_3_6      2.082227e-02
#> alpha_3_7      7.961487e-02
#> alpha_3_8      9.386353e-02
#> alpha_3_9      1.032340e-01
#> alpha_3_10     5.597972e-02
#> alpha_4_4      5.594465e-01
#> alpha_4_5      9.227799e-02
#> alpha_4_6     -3.437754e-02
#> alpha_4_7      .
#> alpha_4_8      1.153019e-01
#> alpha_4_9      1.557193e-01
#> alpha_4_10     4.542716e-02
#> alpha_5_5      4.310215e-01
#> alpha_5_6      4.656829e-02
#> alpha_5_7     -1.187772e-02
#> alpha_5_8     -2.985602e-02
#> alpha_5_9      9.285684e-02
#> alpha_5_10     8.411330e-02
#> alpha_6_6      6.849283e-01
#> alpha_6_7      4.375419e-02
#> alpha_6_8     -1.728893e-02
#> alpha_6_9     -7.480416e-03
#> alpha_6_10     1.294187e-03
#> alpha_7_7      5.189953e-01
#> alpha_7_8      6.550235e-02
#> alpha_7_9      1.718408e-01
#> alpha_7_10    -1.533145e-02
#> alpha_8_8      3.429373e-01
#> alpha_8_9     -2.717085e-02
#> alpha_8_10     8.593951e-02
#> alpha_9_9      6.874698e-01
```

```
#> alpha_9_10    -2.301236e-02
#> alpha_10_10    7.768561e-01
#> gamma_1_1      .
#> gamma_1_2      .
#> gamma_1_3      .
#> gamma_1_4      .
#> gamma_1_5      .
#> gamma_1_6      .
#> gamma_1_7      .
#> gamma_1_8      .
#> gamma_1_9      .
#> gamma_1_10     .
#> gamma_2_2      .
#> gamma_2_3      .
#> gamma_2_4      .
#> gamma_2_5      .
#> gamma_2_6      .
#> gamma_2_7      .
#> gamma_2_8      .
#> gamma_2_9      .
#> gamma_2_10     .
#> gamma_3_3      .
#> gamma_3_4      .
#> gamma_3_5      .
#> gamma_3_6      .
#> gamma_3_7      .
#> gamma_3_8      .
#> gamma_3_9      .
#> gamma_3_10     .
#> gamma_4_4      .
#> gamma_4_5      .
#> gamma_4_6      .
#> gamma_4_7      .
#> gamma_4_8      .
#> gamma_4_9      .
#> gamma_4_10     .
#> gamma_5_5      .
#> gamma_5_6      .
#> gamma_5_7      .
#> gamma_5_8      .
#> gamma_5_9      .
#> gamma_5_10     .
#> gamma_6_6      .
#> gamma_6_7      .
#> gamma_6_8      .
#> gamma_6_9      .
#> gamma_6_10     .
#> gamma_7_7      .
#> gamma_7_8      .
#> gamma_7_9      .
#> gamma_7_10     .
#> gamma_8_8      .
#> gamma_8_9      .
```

```
#> gamma_8_10     .
#> gamma_9_9      .
#> gamma_9_10     .
#> gamma_10_10    .
#> elevation_1    .
#> elevation_2    .
#> elevation_3    .
#> elevation_4    .
#> elevation_5    .
#> elevation_6    .
#> elevation_7    .
#> elevation_8    3.361066e-06
#> elevation_9   -2.396339e-06
#> elevation_10   .
#> gradient_1     .
#> gradient_2     .
#> gradient_3    -2.633521e+00
#> gradient_4    -3.991984e-01
#> gradient_5     4.417768e+00
#> gradient_6    -2.745165e-01
#> gradient_7    -3.455505e+00
#> gradient_8    -4.190007e+00
#> gradient_9     1.086092e+00
#> gradient_10    2.847366e-01
plot(fit$complete)
```



```
plot(fit$cv)
```



82 82 70 50 35 29 20 13 11 10 7 6 2 1 1
Mean−Squared Error
0.2
0.3
0.4
0.5
0.6
−8
−6
−4
−2
Log(λ)