Canonical correspondence analysis and weighted averaging

Class work:

1. Canonical correspondence analysis

Calculate species scores and site scores using this simple data table.

```
  spec1 spec2 spec3 t.jul
1    79    19     2    10
2    60    33     7    12
3    36    44    20    14
4    18    43    39    16
5     6    31    63    18
6     1    18    81    20
```

2. Apply CCA to the arctic pollen data

Arctic pollen data used by Frechette et al. (2008) is available in the *palaeoSig* package and called *arctic.pollen data(arctic.pollen)*. We want to explore relations between environemntal data (*arctic.env*) and pollen.

Run CA using function *cca* (*vegan-package*). Use square root transformed pollen data.

Which temperature variable explains the most variance?

How much variance do July and January temperature explain? Determine shared and individual variances.

Constrain the arctic pollen data set using January and July temperatures, annual precipitation and July sunshine. How much variance do these variables explain?

Make a tri-plot of the last ordination and describe the tri-plot.

Add ordination surfaces for the three environmental variables.

3. Weighted averaging

Plot abundances of taxa *F.CYPE*, *F.BBET*, *F.PPIC,F.PPIN* as function of July temeprature.

Estimate WA optima and tolerances for these taxa (use functions *optima* and *tolerance* from teh *analogue* r-package, then remove the analogue package using *detach(package:analogue, unload=TRUE)*, the *analogue* and *rioja* packages have functions of the same names and we want to be sure to use the *rioja* functions later on. Alternatively you can always specify the package *analogue::crossval* or *rioja::crossval*.

Add the unimodal response approxiamted by weighted averaging to the abundance plots using function *dnorm* (*lines(my.temperature.values,dnorm(my.temeprature.values,my.optimum,my.tolerance))*).

Estimate July temperature optima for all taxa in the arctic pollen dataset and compare them to species scores of CCA (*WA* in *rioja*).

Predict July temperatures (*predict(my.wa.model)*) and compare them to CCA site scores (use all deshrinking options, also mono).

Compare apparent and cross-validated (*crossval(my.wa.model)*) predictions of July temperature. Also compare performance statistics (*performance(my.cv.wa.model)*).

Compare your *MAT* based reconstruction (week 8) to a WA based reconstruction of the same enironmental variable for the same site.