*FADA, the next step: exploring possible ways to analyse data*

# Statistical analysis of FADA data

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## 1. Biogeographic analysis

Extent of studies: portion of a continent, a continent, or Planet Earth.

Data: taxonomic community composition (species, genera, or families) in small regions or point sites.

### 1.1. Define biogeographic provinces

• Cluster analysis of similarity/dissimilarity matrix computed from taxonomic composition data.

• Brooks Parsimony analysis: construct a parsimonious tree. Different methods borrowed from parsimony analysis in phylogenetics.

• Other tree or network reconstruction methods.

• DIVA: construct region tree that minimizes dispersion of taxa.

• Etc.

### 1.2. Characterize the biogeographic provinces

• Compute dispersal among the provinces based on a flow model: coefficients of dispersal direction (*DD*).

• Identify characteristic taxa in provinces: compute indicator value of taxa (IndVal and related coefficients).

• Look for associations of correlated taxa. Do the associations characterize different provinces?

• Model species-area relationships within provinces.

## 2. Analyze beta diversity at finer scale

Beta diversity is the variation in taxonomic composition among sites.

Extent of studies: any area with fairly regularly distributed sites. Good geographic coverage is required.

Data: community composition at individual sites; $n$ = 20 to 5000.

2.1. Study species-environment relationships (environmental control model). Method: canonical analysis (RDA, CCA).

How to control for spatial autocorrelation in tests of significance of species-environment relationship models?

2.2. Test the effect of geographic regions on taxonomic composition. Method: manova by canonical analysis; use fancy permutation methods.

2.3. Discriminate the effect of environmental control from that of neutral processes on community composition. *Detailed presentation*

Methods: multi-scale analysis, variation partitioning.

- Principal components of neighbour matrices (PCNM).
- Moran's eigenvector maps (MEM).
- Asymmetric eigenvector maps (AEM) ⇐ when a directional spatial process is at work, e.g. a river network.

Illustrations of eigenvector map analyses ...