

ULG PROPOSAL

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OBJECTIVES



- To make predictions
 - To develop a tool to make predictions
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TOOLS



- Red lists
 - Climate endangered species lists
 - Dynamic modelling of plant growth vs climate
 - Protection areas
 - Dispersal rates
 - Paleovegetation dynamics
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Dynamic models: main properties

- Process models
 - Works by species
 - Computes geographical envelopes using climate (actual or predicted)
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Dynamic models: main limits



- Interactions between species poorly represented
 - Do not take into account soil properties and demography
 - Spatial scale often too coarse
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OBJECTIVES

- Improve resolution of climatic scenarios
 - Insert additional processes into models to increase their accuracy (local scale) to predict future plant distributions
 - Attempt computation of plant communities (species and abundance)
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PROCESSES

- Plant species response to soil properties (C/N, pH, hydromorphy, light, ...)

 - Demography (rates of dispersion, germination, mortality, ...)
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Plant response to soil properties

- Increases sensitivity of climate models
 - Seems difficult using literature data like Ellenberg's factors but ...
 - Problems of soil properties mapping
 - Needs European sampling campaigns (plant density vs soil conditions)
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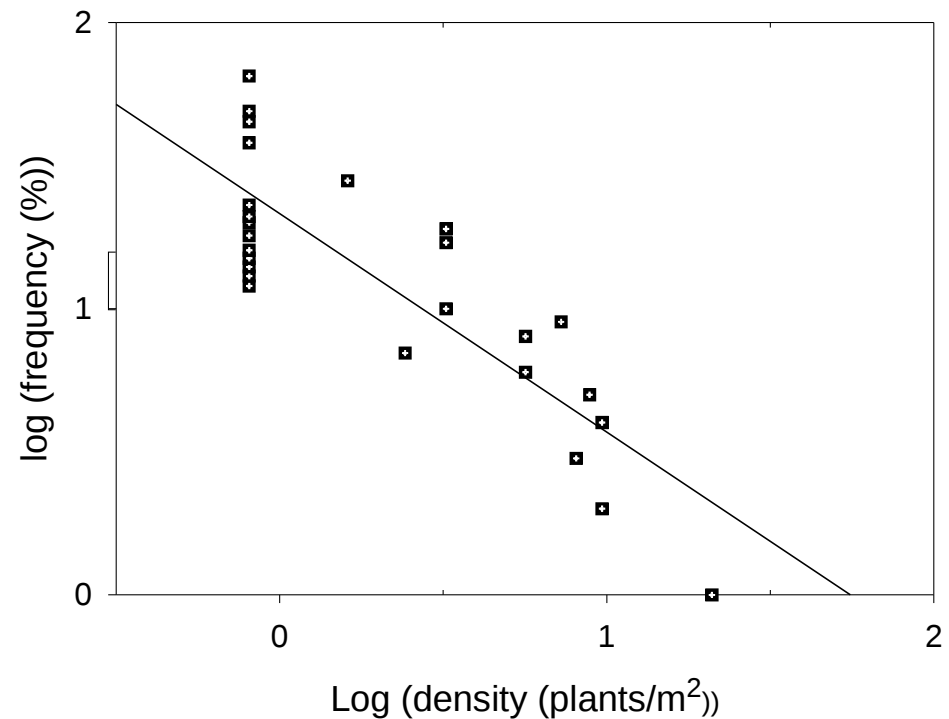
Why measuring species density ?

- We suppose that **density** can give the response of the species to soil conditions
 - Knowing this response for each species combined with the response to climate would permit to compute future density (local scale)
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Why measuring species density ?

- Every species, at any scale, has the same kind of density distribution (peak and tail)
- Effect of soil conditions
- Effect of climate
- Effect of demography
- Importance of scale

Adenocarpus viscosus





UPGRADING MODELS

- Incorporate the response of species to soil conditions to compute abundance and fit to local conditions
 - Do models produce peak and tail distributions for each species?
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DEMOGRAPHY

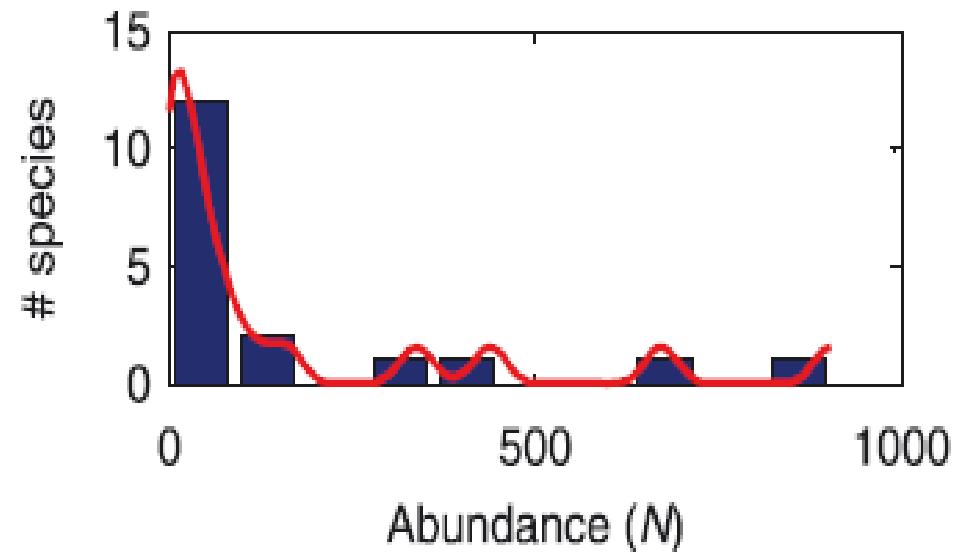
- Importance for the colonisation of extant plant communities
 - Can produce assembly rules (note in particular mortality creates gap in the environment)
 - Data?
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DEMOGRAPHY

- Species Abundance Distribution (SAD). As for single species, each community can be represented by the same model (also peak and tail)

(a)

Trees of a forest

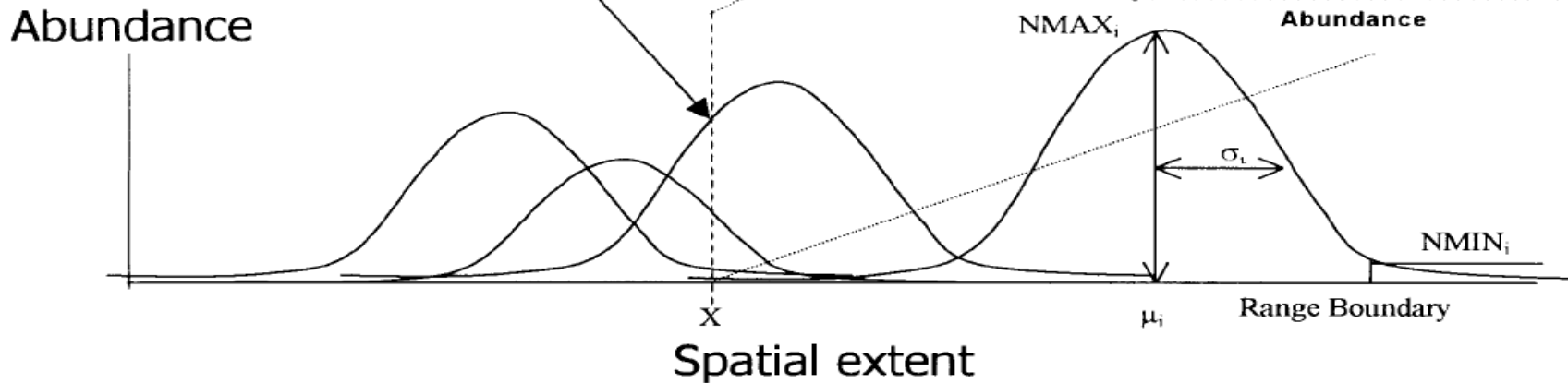


McGill et al., 2007, data from Whittaker, 1960

Linking the distribution of several species in space

- importance of demography
- importance of fit
- Importance of time

$$N_i(X) = NMAX_i \exp(-||X - \mu_i||^2 / \sigma_i^2)$$





UPGRADING MODELS

- Introduce demography
 - Do models produce peak and tail distributions of plant communities (SAD)?
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MAKE PREDICTIONS ?

- Verify and improve the red lists
 - Future adequacy of protection areas
 - Test efficiency of corridors
 - Test of management actions
 - ...
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