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Biogeographical network analysis of plant species distribution in the French Mediterranean area

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► **To cite this version:**

Maxime Lenormand, Olivier Argagnon. Biogeographical network analysis of plant species distribution in the French Mediterranean area. CCS 2017, Oct 2017, Cancun, Mexico. hal-02890693

HAL Id: hal-02890693

<https://hal.inrae.fr/hal-02890693v1>

Submitted on 6 Jul 2020

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Biogeographical network analysis of plant species distribution in the French Mediterranean area

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CCS 2017 | Cancùn, Mexico

September 19, 2016

Conservatoire Botanique National
Méditerranéen

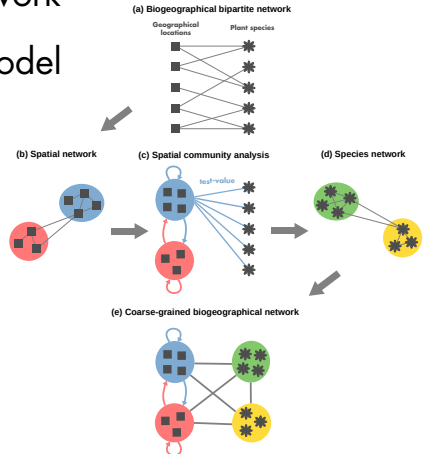
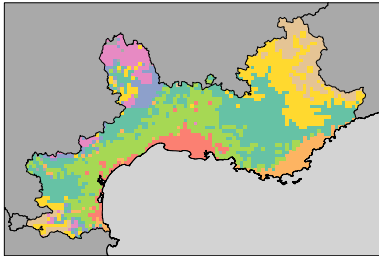


PORQUEROLLES

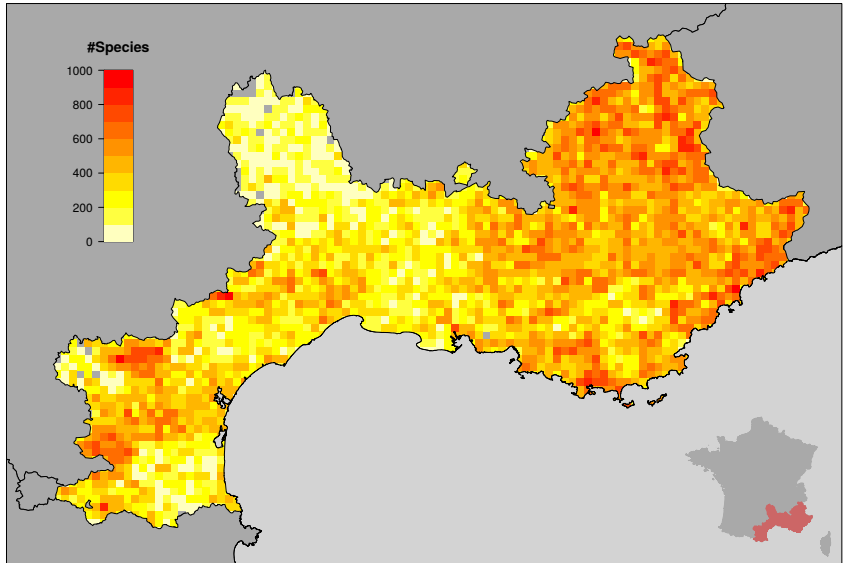


Motivation

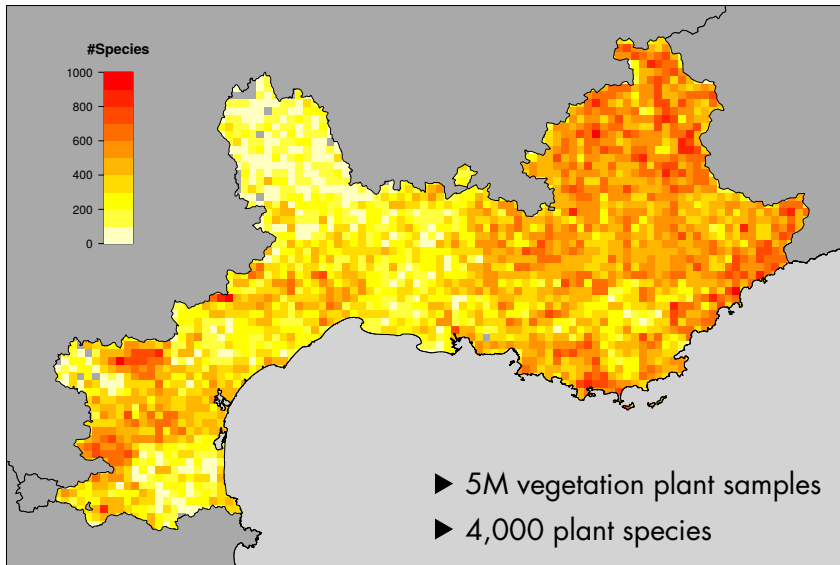
- ▶ Multi-scale biogeographical structure of a region
- ▶ Species co-occurrence network
- ▶ Comparison with a null model



Study area



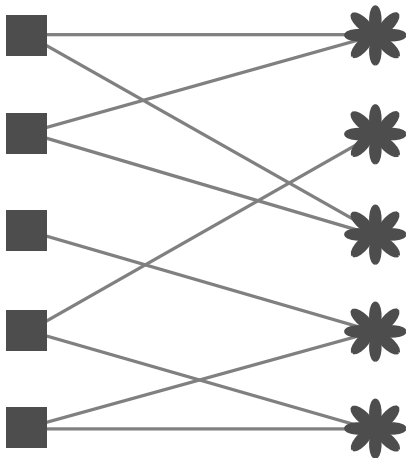
Study area



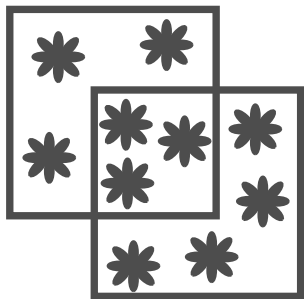
Spatial ecological bipartite network

**Geographical
locations**

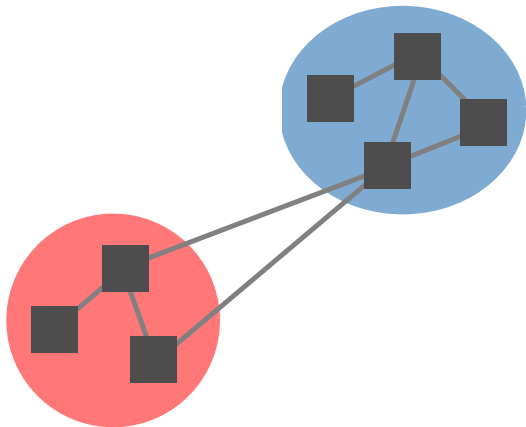
Plant species



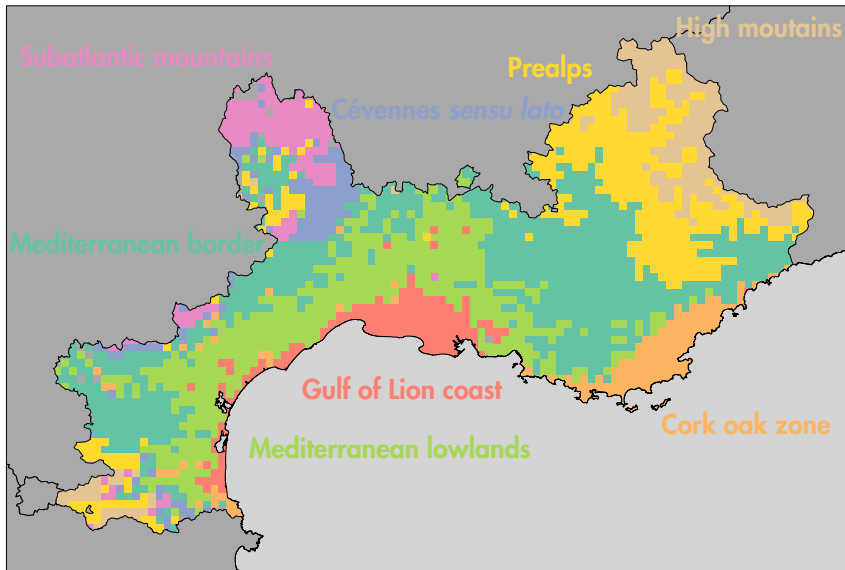
Spatial network



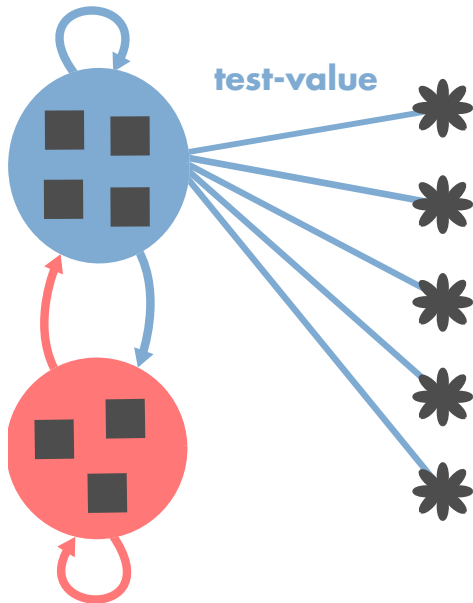
$$J_{ij} = 3/10$$



Coherent biogeographical regions



Spatial community analysis



Spatial community analysis

- ▶ n geographical locations
- ▶ species i present in n_i geographical locations
- ▶ spatial community i composed of n_i locations
- ▶ n_{ij} locations with species i in community j

$$\rho_{ij} = \frac{n_{ij} - \frac{n_i n_j}{n}}{\sqrt{\frac{n - n_j}{n - 1} \left(1 - \frac{n_j}{n}\right) \frac{n_i n_j}{n}}}$$

Spatial community analysis

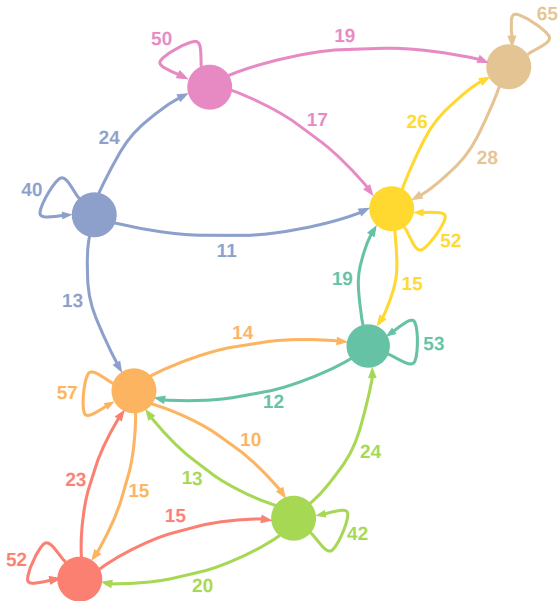
$$\rho_{ij}^+ = \rho_{ij} \mathbf{1}_{\rho_{ij} > 1.96}$$

$$\hat{\rho}_{ij}^+ = \rho_{ij}^+ / \sum_i \rho_{ij}^+$$

$$\lambda_{jj'} = \frac{1}{|A_j|} \sum_{i \in A_j} \hat{\rho}_{ij}^+$$

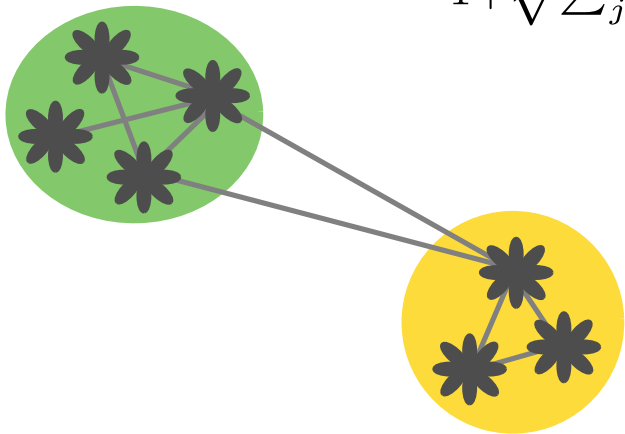
$$A_j = \{i \mid \rho_{ij} > 1.96\}$$

Spatial community analysis

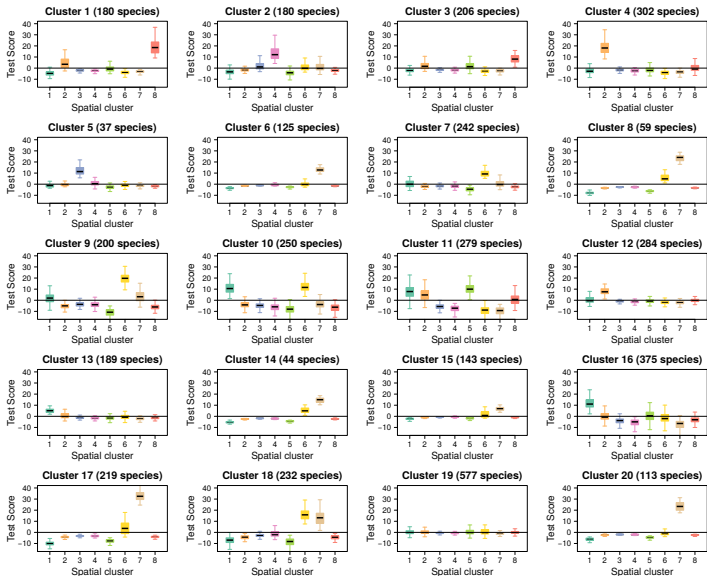


Network of species

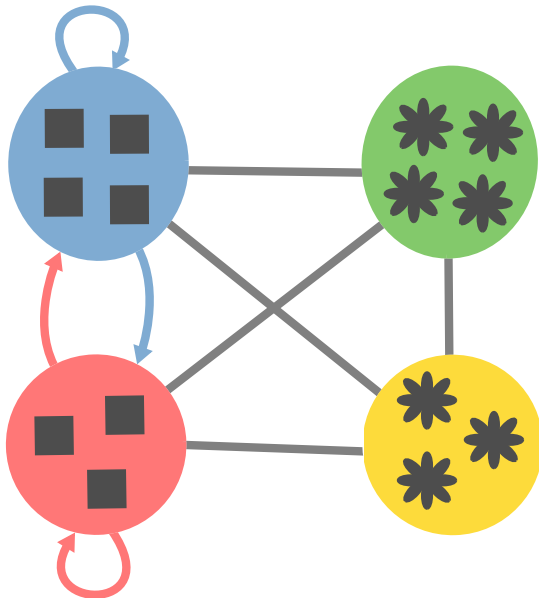
$$S_{ii'} = \frac{1}{1 + \sqrt{\sum_j (\rho_{ij} - \rho_{i'j})^2}}$$



Network of species



Take home message



Acknowledgement



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Méditerranéen



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