Climatic effects on dynamics of bee-flower interactions

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Do bee-flower interactions change over time?

Previous studies assume that the temperature dependence of ecosystem function is a simple scaling up of all the component species' thermal responses. In this case, predicting the effects of climatic warming or cooling on ecosystem function would be a relatively straightforward task.

Data

We combine new theory and data on the temperature dependence of key metabolic traits at both:

- *Species level:* more than 300 different species of terrestrial plants (*Biotraits Database*)
- *Ecosystem level:* 118 local terrestrial ecosystems across the world (*Fluxnet Database*)

We ask...

- Are differences in species-level temperature-dependence of photosynthesis and respiration reflected in the ecosystem thermal response?
- Do the full unimodal thermal responses of metabolic rate matter for mapping individual TPCs to ecosystem-level fluxes?

We present a preliminary analysis of instraspecific data, to get the patterns necessary for parameterizing a model, and ecosystem flux data for validation.

Calculating turnover rates

A simple equation to map individual metabolism to ecosystem flux on a daily scale is:

$$F = F_0\Big(\sum_{i=1}^{k} x_i$$

where:

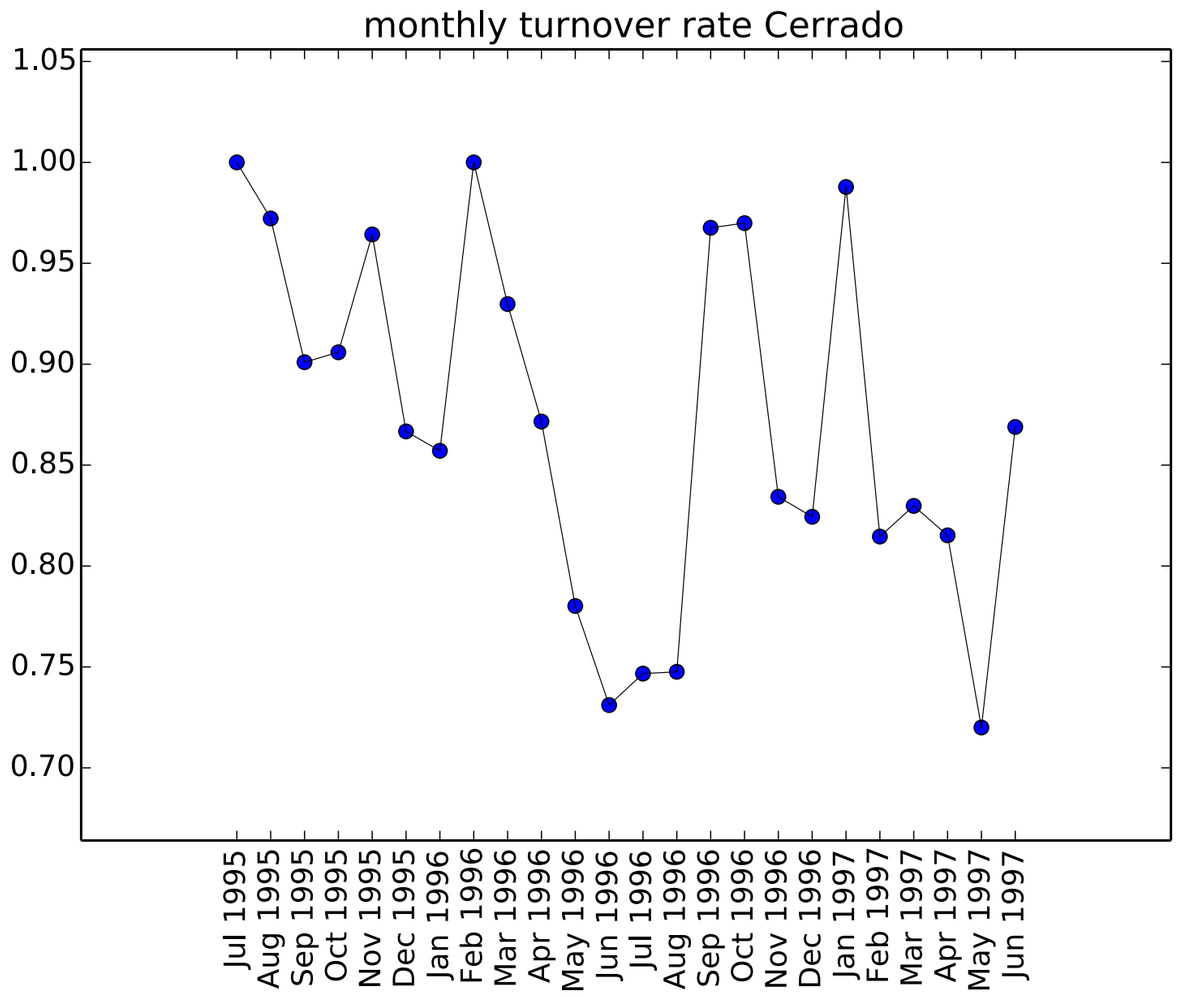
- k is an autotroph and j is a heterotroph species
- $\sum_{i=1}^{k} x_i$ is the total biomass of the ecosystem

A general form for the distribution of biomasses across species is:

$$x_i = h(m_i)$$

that is, x_i is a function h of the body mass of the species.

Preliminary Results



Representative set of ecosystem flux responses to temperature for different sites from tropical and temperate regions. Y axis show respiration in log scale.

Conclusions and Ongoing work

- At the intra-specific level, E_a and T_{peak} for R are usually higher than for P.
- T_{peak}'s are usually much higher than the "characteristic" adaptive environment of the organism, so the full unimodal thermal response doesn't matter for mapping individual TPCs to ecosystem-level fluxes.

Possible challenges

- What role might acclimation of intraspecific TPCs play on the ecosystem response?
- What is an appropriate distribution for species-level biomass abundances x_i?
- Which is the effect of non-linear interactions between species?

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