

Rangers update

5 November 2020

Background

Why do species differ in cues?

Armed with species-level estimates of cue-use from our OSPREE database, grided climate data and species distribution maps, our team will range for to test this prediction.

Predictions...

- ▶ If forcing (considered to be the primary cue) is an unreliable indicator of appropriate spring growing conditions, then species will rely more heavily on secondary cues.
- ▶ We also would expect that species must encounter the cue conditions (ie tropical species shouldn't have a chilling cue).
- ▶ But what makes forcing unreliable? High inter and/ or intra-annual variability among locations or years. We think that the latter is more important, but a recent study by Zohner found the former to matter.

Side bar: temporal vs. geographic variability

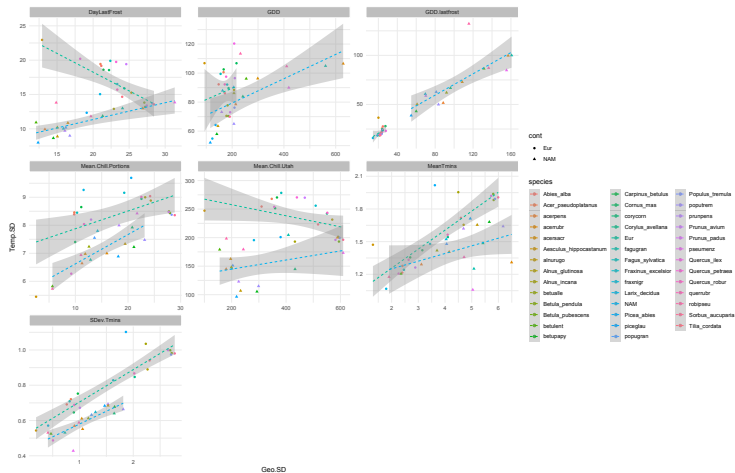


Figure: Correlation between temporal and geographic standard deviation of climate parameters

Hypothesis 1

North America species (which experience a more variable spring environment) should have stronger photoperiod and chilling cue than European species

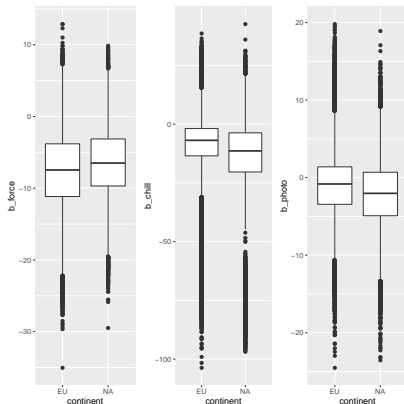


Figure: Chilling and Photoperiod cues use is stronger (more negative) in North America

Hypothesis 2

Standard deviation of growing degree days until last frost should correlate with higher (more negative) chill sensitivity

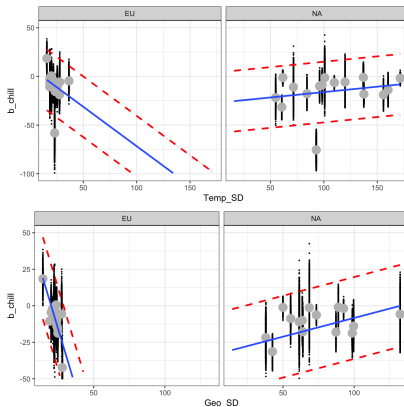
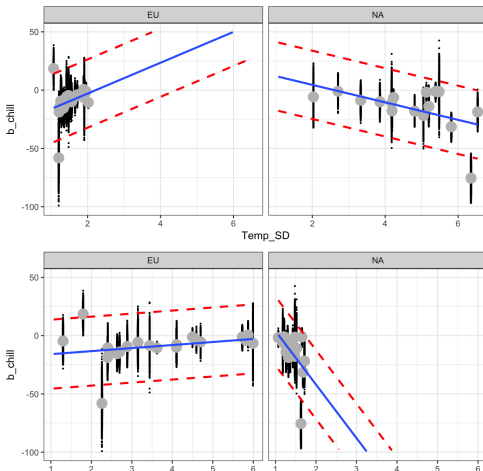


Figure: Influence of temporal and geographic variation in growing degrees to last frost on β_{chill} . Model is pooling on iterations. Blue line is mean and red lines 95% credible intervals

Hypothesis 3

Standard deviation of mean winter temperatures (STV) should correlate with higher (more negative) chill sensitivity

This hypothesis was supported by Zohner's work. However, we think it might be an artifact of not explicitly including phenology into our models. Its also not supper supported in our data



Hypothesis 4

Range margins drive chill or photoperiod sensitivity

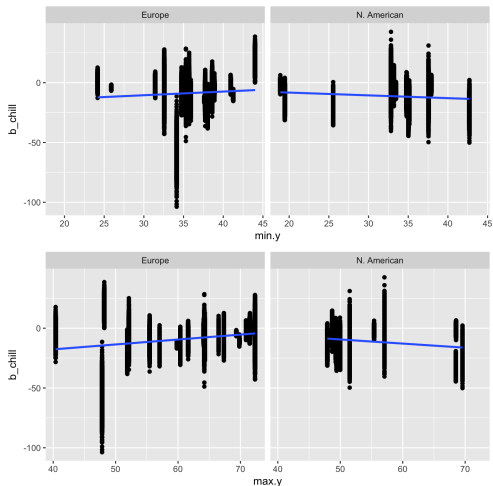


Figure: Influence of max. and min latitude. on β_{chill} . No hierarchy, simple linear model for now.

Alternative hypotheses

In the future we will ...

We don't see a lot of support for our hypothesis. Here are some other ideas we are thinking of testing.

1. Intra-specific variation in cue use is high.
2. How much overlap there is in species' ranges drive cue use difference

Intra-specific?

We don't see a lot of support for ths hypothesis.

Inter-specific:

`sd(force.z): 7.17`

`sd(photo.z): 2.76`

Intra-specific:

`sd(force.z): 1.65`

`sd(photo.z): 0.62`

New steps for the scientific community ...

To robustly deal with this ...

1. Paleo-climate
2. Better-data— Phylogeny
3. Community assembly—since we can't separate leafout date from cue we should