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OSPREE
Notes on what we want to do before moving on...

This file started with the following setup: given the OSPREE data what would you want to know? Or, phrased differently, what do you expect others would immediately do with these data and of that list which items would we have wished we had done?

We (Ailene, Cat, Dan, Nacho, Lizzie) discussed this in August 2018 and came up a following list of projects/tasks. Most of these tasks could fit into one or more paper (see further below; note how one project may show up in multiple paper conceptions), but step 1 seems to be to decide which ones we want to do and get them started. So here's the overall list of what we'd need to do to tackle *everything* that we came up with.[1]

Stuff we should do ...

Below updated at July 2019 retreat:

1. Bigger tasks (to divvy up)
    (a) % budburst model (Ailene expressed interest; Dan is working on similar modeling approaches)
        i. Step 1: Find out if we have fake data (if not, make fake data)
        ii. Side note: Data should be pretty clean, % BB is not thrown out until step 6 in BB cleaning.
    (b) Range questions: Everyone!
        i. Calculate exact geographical position within (or beyond) range of each species in each study
        ii. Calculate climatic position within (or beyond) range of each species in each study
        iii. Provenance questions: Do cues vary across provenance? Ideally in some way (northern or coastal or up a mountain etc.) but barring that do they vary? Or even how much does provenance explain days to budburst or such?
            A. Elevation models? (Cat)
            B. Effects of coast models? (Cat)

[1] Note that we probably don't want or need to do everything.

C. Get trait data (and correlate cues with trait data)[2] Darwin, Deirdre working on this.

A. wood anatomy

B. leaf vein anatomy (Sack papers?)

C. Leaf Economic Spectrum: SLA and LDMC and C:N

D. trichome density: higher density correlates with earlier leafout cues

E. hysteranthy

F. seed dormany characteristics

G. shade tolerance

H. height

I. cold/thermal tolerance

J. growth rate and longevity, could use pioneer ... see Laube *et al.* 2012 (faster growth rate, should have cues to vs. earlier active)

K. discussion item: root traits, probably important, hard to get

L. Traits we don't think we want:

M. Traits we're not sure whether we want or not: seed mass

A. Step 1: Identify traits of interest

B. Step 2: Select species

C. Step 3: Find traits

D. Step 4: Settle on hypotheses to test once we know the dat

iv. Calculate forcing and chilling sensitivities from PEP725 data for OSPREE species (open option)

v. Calculate delays in advances in OSPREE species from PEP725 data (Ben is working on something simiilar)

vi. Get phylogeny for our species, add it to basic BB model (Nacho, in BRMS, also do phylogenetic signal)

2. Do we want to analyze the performance data?

3. Look at crops versus non-crops ... (run models we have with crops and compare crops versus non-crops)

4. More comparisons of growth chamber studies being applied to natural systems ... (short communication on how to gather growth chamber or field data differently to make each type of data better inform the other)

5. Roadmap of future experiments should tackle gaps ... maybe include examples of where current approaches fail and show how you would have gotten a different answers.

[2]For here and for all our questions, we'll want to think carefully about not running so MANY models that we are sure to find something, AKA sure to find something possibly spurious.

Stuff we said we wanted to do and did!

Updated July 2019

1. Tasks related to BB model (probably do not need to divvy up right now, as we will get these done methinks)
   (a) BB models with Weinberger
   (b) Revisit non-linear BB models: No sign of non-linearities in our data much, at least for chilling.
   (c) BB models: Does temperature treatment covary with photoperiod? ... see issues #220 and #235 at least. Also, countinxns code does this now!
   (d) BB model interpretation: Apply 1 C of warming (across year, in certain seasons) ... so very done!
2. Other stuff ... ?

Lizzie's notes from way back when ...

Directions I can think of that we could take these budburst data:

1. % budburst models (Question: Do we need non-linear β models for this? Or does link in β models cover this nonlinearity?)
2. Examination of what can predict variation in cues (pro: lots of people will ask about this so we'll have an answer; con: need to set it up so it is not a fishing expedition):
   (a) Range size
   (b) Climatic niche and phenological response? Any predictions? (Size of nice relates to variance in responses; bigger niche more flexible response)
   (c) Range related questions: I think range size and cue variation is interesting, relatedly (perhaps I am influence by having just looked at Picea abies), it would be interesting to see if there are differences between studies within normal range provenances and outside of them.
   (d) Latitude and provenance questions (e.g., our current latitude model, also, for studies with just provenance we could fit $BB\ provenance + error$)
   (e) Some climatic attribute of range
   (f) How far outside their range the cutting was taken + some climatic attribute of range
   (g) Traits (would need to collect these data ourselves and then see if we trust them)
   (h) Other cues (do cues trade-off or correlate across species)?

(i) Phylogeny

(j) None of the above, it's about study design or such ... see below (below text also moved to budburst.tex)

3. Understanding our results (cue estimates) in relation as to when species may delay or do weird things (pro: it's an obvious and important question, and one we have a lot of expertise to answer; cons: we know that real phenological models are more complex, so what can we really offer?)

   (a) How similar are our estimates from sensitivities you could estimate from long-term data (I think we can do this for chilling and forcing using PEP725 data).

   (b) Use species from (Fu et al., 2015) to illustrate what 1°C would mean if:

      i. Evenly applied across year

      ii. Applied to only certain seasons ...

   (c) We could see if we can predict the delay seen in PEP725 data?

4. Look into two major areas that could cause variation we see given the data we have ... (pros: we have the data to do this; cons: may be too similar to limiting cues MS). There are two (three) big sources of reasons for the variation:

   (a) Methodology

      i. Imputation model

      ii. Weinberger method!

      iii. Model with experimental versus field chilling... (do similar to Weinberger? We could code each study as one of three types of chill: all field chill, all experimental chill, field+exp, or what about fitting a model with studies with no field chilling? Or look at studies that calculated their own units?)

      iv. Non-linear model?

      v. How to do photoperiod (i.e., does temperature co-vary with photoperiod)?

   (b) Species, population-level etc.

      i. Latitude model

      ii. Provenance model

      iii. Trade-offs and correlations in cues among species

      iv. Coastal versus non-coastal

      v. Continent of origin?

   (c) Also, sort of climate (i.e., the same tree planted in Finland and southern low-elevation Germany will leaf out first at the German site) ... but we sort of deal with that via the study design, no?

References

Fu, Y. S. H., Zhao, H. F., Piao, S. L., Peaucelle, M., Peng, S. S., Zhou, G. Y., Ciais, P., Huang, M. T., Menzel, A., Uelas, J. P., Song, Y., Vitasse, Y., Zeng, Z. Z., and Janssens, I. A. (2015). Declining global warming effects on the phenology of spring leaf unfolding. *Nature*, 526(7571):104–107.