

OSPREE

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

It feels like we have started to hone in on one model (see Fig. ??), which could relate to one data manuscript from OSPREE. In starting to think on this manuscript and discuss it with some people, it occurred to me that we will want to release much of the OSPREE database at that time. That means we'll also want to have done most of what we're really excited about *before* releasing the database.

This means to me that one thing we should answer soon is: given these 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 with the 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

Below updated at December 2018 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: Cat, Dan, Deirdre and Nacho
 - 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
 - (c) Provenance models (goes with latitude models?) (Dan)
 - (d) Elevation models? (Cat)
 - (e) Effects of coast models? (Cat)

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

- (f) Get trait data (and correlate cues with trait data)² Darwin, Deirdre working on this, Cat also willing to help.
 - i. wood anatomy
 - ii. leaf vein anatomy (Sack papers?)
 - iii. Leaf Economic Spectrum: SLA and LDMC and C:N
 - iv. trichome density: higher density correlates with earlier leafout cues
 - v. hysteranthly
 - vi. seed dormancy characteristics
 - vii. shade tolerance
 - viii. height
 - ix. cold/thermal tolerance
 - x. growth rate and longevity, could use pioneer ... see Laube *et al.* 2012 (faster growth rate, should have cues to vs. earlier active)
 - xi. discussion item: root traits, probably important, hard to get
 - xii. Traits we don't think we want:
 - xiii. Traits we're not sure whether we want or not: seed mass
 - i. Step 1: Identify traits of interest
 - ii. Step 2: Select species
 - iii. Step 3: Find traits
 - iv. Step 4: Settle on hypotheses to test once we know the dat
- (g) Calculate forcing and chilling sensitivities from PEP725 data for OSPREE species (open option)
- (h) Calculate delays in advances in OSPREE species from PEP725 data (Ben is working on something similar)
- (i) Get phylogeny for our species, add it to basic BB model (Nacho, in BRMS, also do phylogenetic signal)
- 2. 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) ~~BB models with chilling examined:~~ Not enough data to look at experimental versus forced.
 - (c) ~~Revisit non-linear BB models:~~ No sign of non-linearities in our data, but Ailene checking a couple species (see issue #190)

²For 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.

- (d) BB models: Does temperature treatment covary with photoperiod? ... still sort of working on (Cat, but not much data.. issues #220 and #235 at least)
- (e) BB model interpretation: Apply 1 C of warming (across year, in certain seasons)

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 niche 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 (?) 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?