Cat's thoughts on phenology and growth

- Really depends on what you mean when you say these things!
  - What do you mean by ***phenology*** or ***growth*** because it turns out these definitions matter

- After our months of investigating do I feel confident to say that longer growing seasons results in increased tree-ring width? Absolutely not.

- But! I do feel convinced that budset impacts tree/shrub height and root:shoot ratios, with earlier budset leading to shorter trees

- TAKEAWAYS:
  - How we define growing season length really matters and maybe we should think more about budset
  - How we define growth also matters! Would we see more relationships between phenology and tree-ring width if we used budset instead of leaf senescence? Maybe.
  - Do I think something else is going on? Yes! I have a hunch by just looking at growing season length, we're missing really key events like false springs, droughts, and herbivory that are affecting growth

- None of the 3 studies were integrative in the way I (we?) would have liked
- One of the papers I read (Buermann et al 2018) didn't really address the GSL X growth question, but it brought up an interesting point about lagged effects of earlier season on growth later in the season, i.e., warmer spring temps lead to more greenness in the spring but have mixed regional effects on summer and autumn greenness (Fig 1)
- This wasn't in the papers I read but overshooting in favorable times/years could be good to think about
- And just a thing I noticed about GSL versus start of season/end of season: there seems to be many more papers that look at start of season only, rather than GSL and its impact on growth

Last week...


AT GR11A P3
ALNINC SH1 P2
HF9 AT P2
ALNINC GR1B P3
ALNINC WM5A P1b
ALNINC HF3 P1b
AI GR8B P5
ALNINC GR 11 P1
ALNINC SH1 P2

And, the Tree Spotters!

- Check out: What's Going On in This Graph? Tree Rings and Climate

Lizzie's mid-table entry thoughts …

- People are getting into endogenous limits lately I think, it's hot.
- Put down your covariates folks!
  - Good data + photoperiod as a covariate = bad paper IMHO.
  - What's wrong with GSL x growth as a test?
- Wood phenology people do not know leaf phenology lit, methinks.
- Seems more studies find GSL x growth across latitude/elevation than within sites (within individuals)
  - Which makes me wonder how big the GSL variation is there

Some important points

- The assumption that warming alone should lead to earlier phenology and a longer growing season and therefore greater growth is logical, all else being equal. But all else is not always equal, and the ecological field needs to better understand the surprisingly complicated links between different aspects of climate throughout the season, the seasonal phenological events (e.g. budburst, leaf fall) that drive the beginning and end of the growing season for trees, and what determines allocation to woody growth in trees. Each field has its own cool contributions / types of data, but also its own blind spots.
- Some low hanging fruit:
  - ✓ Core trees in existing provenance trials where phenology has already been measured. Or at phenocam sites?
  - ✓ Measure phenology (leaf level, growth level) in climate change experiments (greenhouse, field)
  - ✓ Assess where carbon goes (don't just measure uptake) in trees, and what is lost, relative to phenology

The majority of studies:

- SOS ~ MAT (phenology studies)
- Growth ~ MAT (tree ring, expts)
- Phenology/Growth ~ Genotype (common garden, provenance expt)
- Carbon (uptake, sequestration) ~ Climate (eddy – covariance)