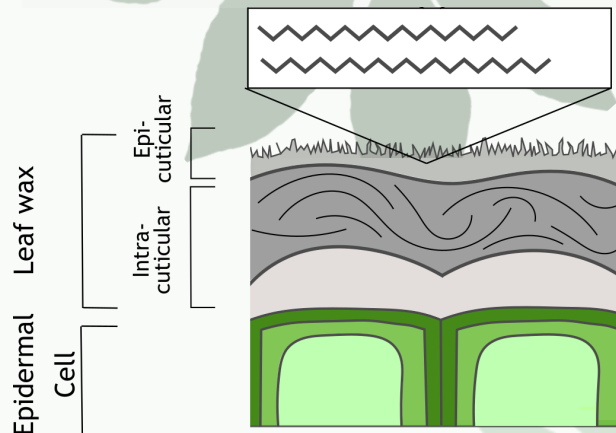




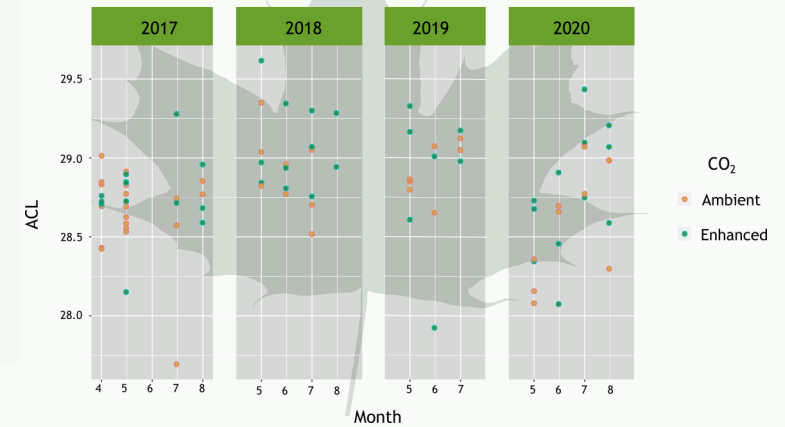
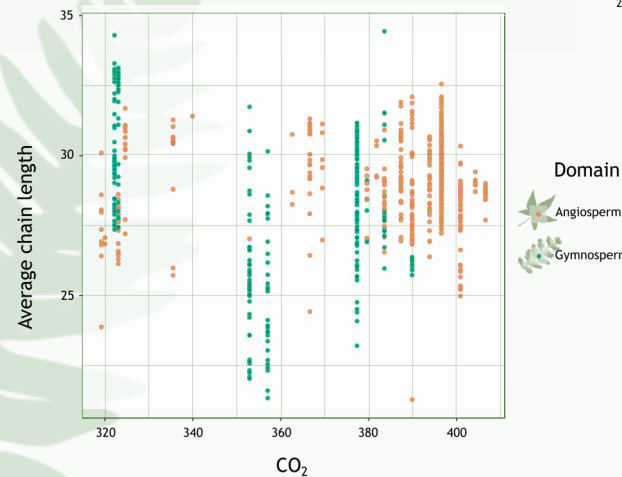
What are leaf wax *n*-alkanes?

- ◆ Long-chained components of leaves' protective wax layer: hydrophobic, so prevent water loss
- ◆ Longer *n*-alkane chains: prevent more cuticular water loss
- ◆ Resistant to decay; preserved in sediments on geologic timescales
- ◆ Widely used in reconstruction of past environmental states in the geologic record
- ◆ Key parameter: Average chain length; ACL: average no. of carbons in any chain in an *n*-alkane sample



Results: BIFoR

- ◆ Extracted waxes from sycamore from BIFoR 2017-2020
- ◆ No change in ACL observed between ambient, enhanced arrays
- ◆ No change in ACL observed with seasonal-scale changes in temperature, rainfall
- ◆ Conclusion: Wax ACL is not plastic on short timescales. No evidence for covariance with CO₂ detected.



Results: literature

- ◆ Published *n*-alkane ACL data dates from 1960-2020: a 320-415 ppmv CO₂ range
- ◆ Data covers angiosperm and gymnosperm trees
- ◆ Extremely large spread of data hampers interpretation: data collected from many different locations and difficult to deconvolve impacts of temperature, aridity, phylogeny
- ◆ Future work: re-collection of specimens from 1960's collection sites and species, wax extraction from herbarium specimens

ACL and CO₂: mechanisms

- ◆ Longer *n*-alkane chain lengths: more costly to produce but preserve more water—ACL correlates with aridity, temperature on continental scales
- ◆ Under elevated CO₂, plants don't need as much investment in water saving chemicals—including *n*-alkanes—ACL expected to decrease
- ◆ However: Just because plants could benefit from a decrease in ACL, doesn't mean they will
- ◆ Timescales of response: can ACL alter with CO₂ on human timescales?

Conclusions:

- ◆ No impact of elevated CO₂ on leaf wax *n*-alkane average chain length on yearly-decadal timescales
- ◆ Suggests ACL interpretations in the geologic record are robust; existing links to temperature and aridity explain trends
- ◆ Further work: comparison of ACL to geologic-scale proxy CO₂ reconstruction: does ACL change with CO₂ on evolutionary timescales?