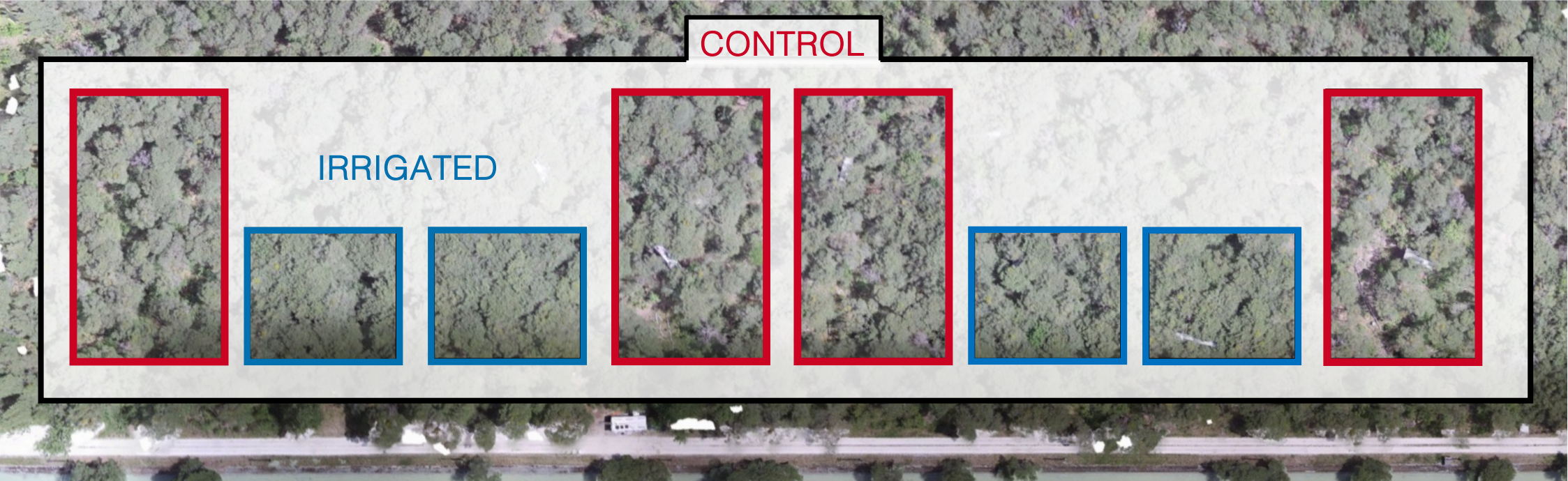


Twenty years of irrigation acclimation is driven by denser canopies and not by plasticity in twig- and needle-level hydraulics in a *Pinus sylvestris* forest

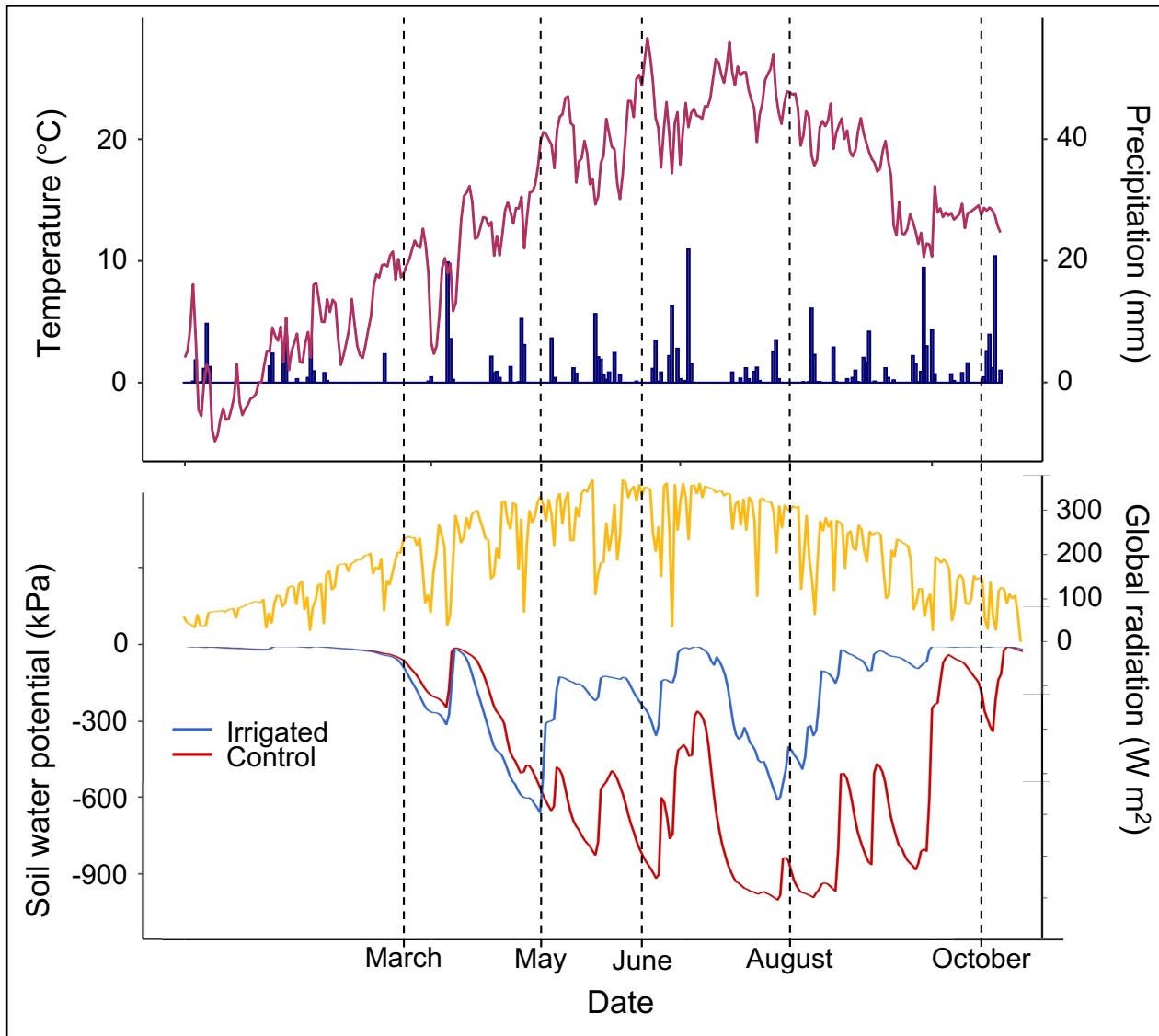
Alice Gauthey, Christoph Bachofen, Alana Chin, Hervé Cochard, Jonas Gisler, Eugénie Mas, Katrin Meusburger, Richard L. Peters, Marcus Schaub, Alex Tunas, Roman Zweifel and Charlotte Grossiord



Context: the Pfywald forest experiment



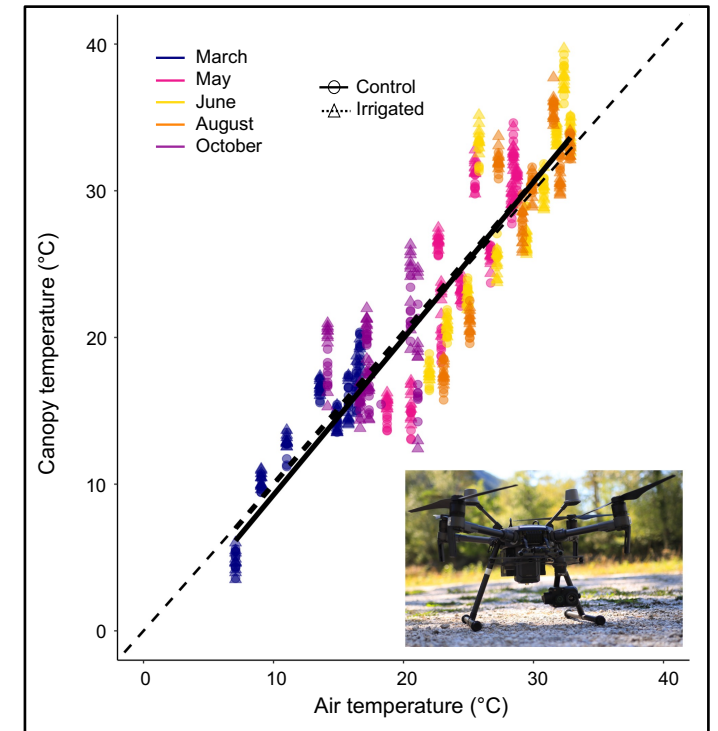
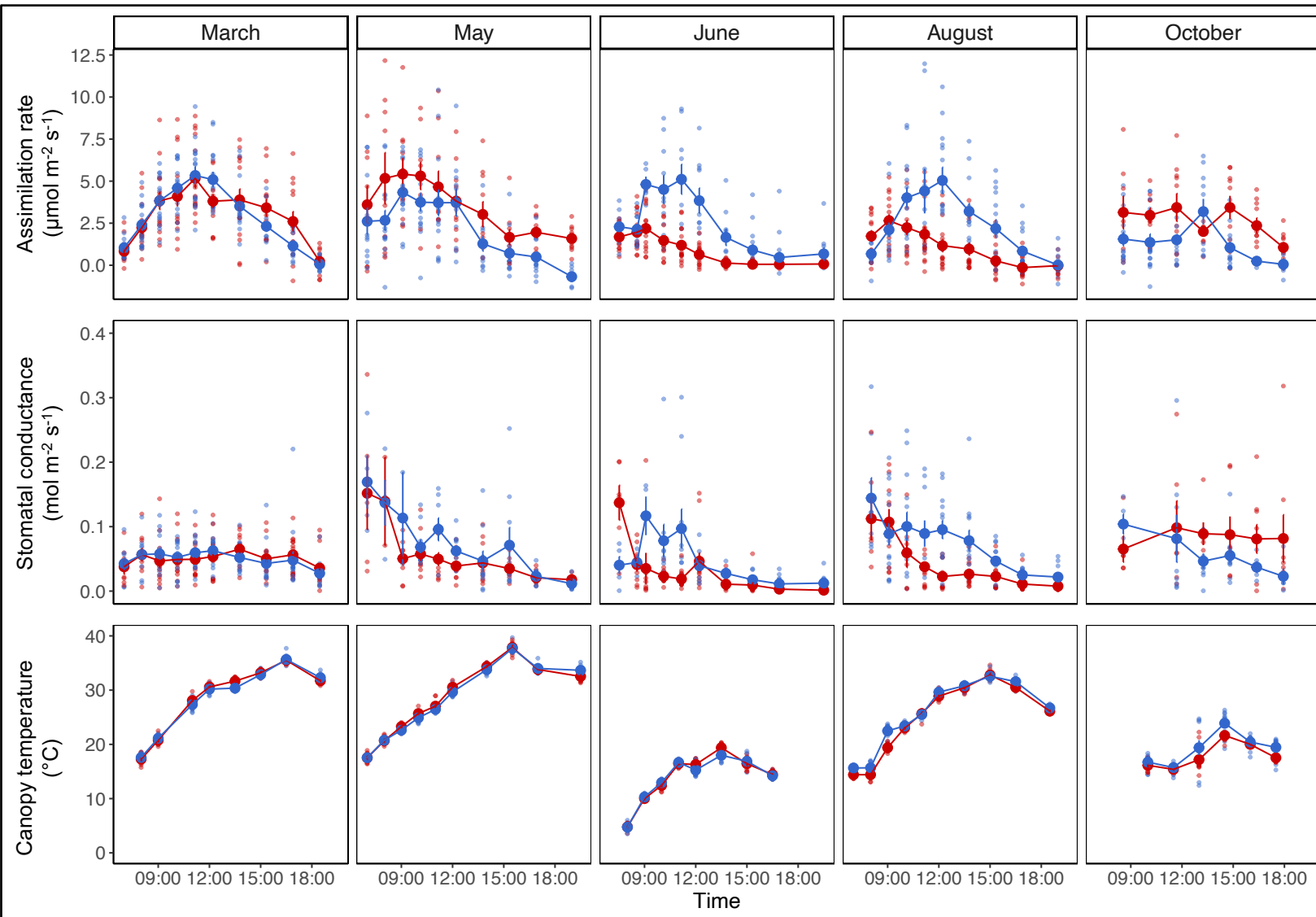
A quick reminder of previous findings



1. Effect of soil moisture on the seasonal and diurnal dynamics of net photosynthesis (A), stomatal conductance (g_s), and canopy temperature (T_{can}), and the thermal plasticity of photosynthesis (T_{crit} , T_{opt} , and A_{opt}), over the course of one year

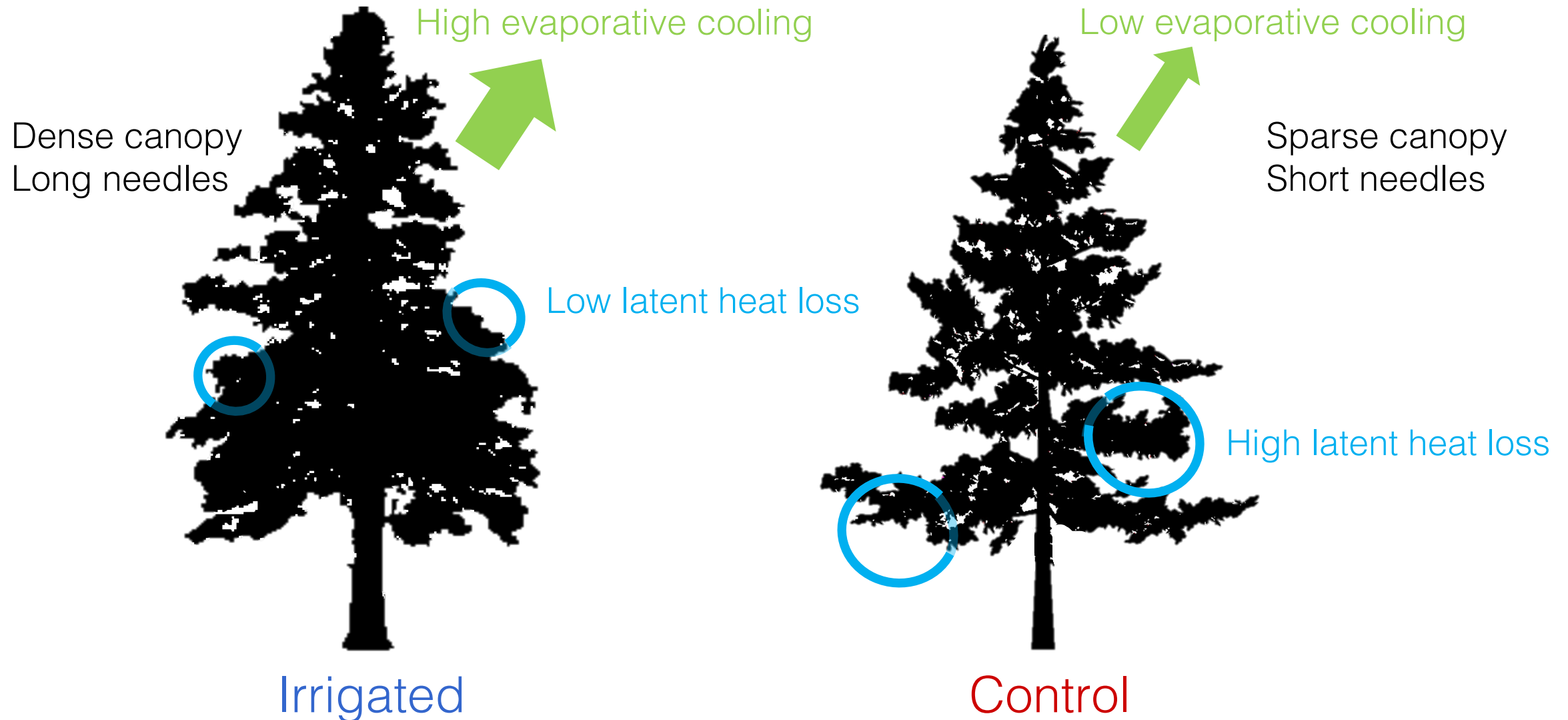
Gauthey et al., 2023, NPH

A quick reminder of previous findings

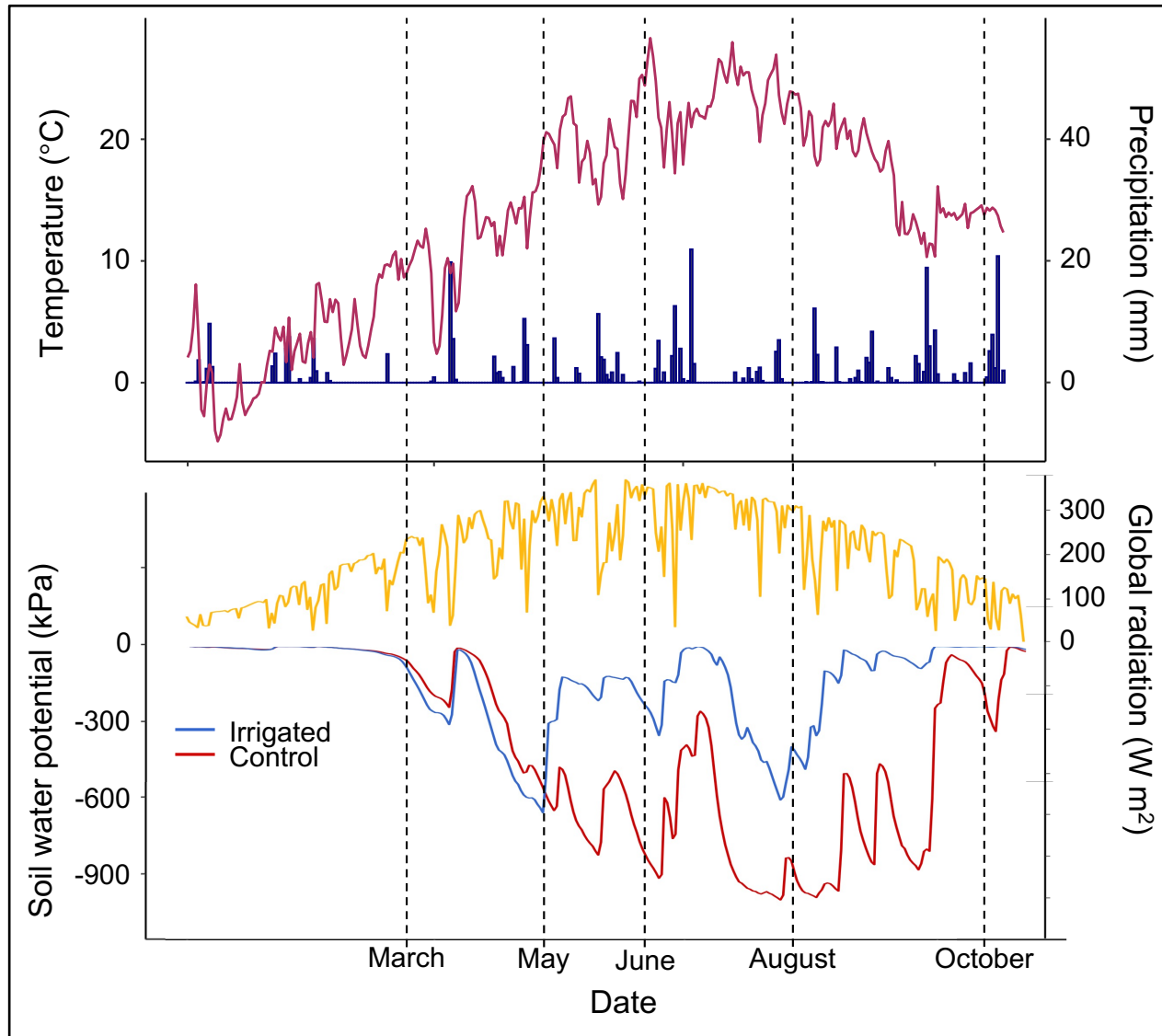


Irrigation resulted in higher needle-level A , g_s , T_{opt} , and A_{opt} compared to naturally drought-exposed trees. No daily or seasonal differences in T_{can} were observed between treatments.

A quick reminder of previous findings



A quick reminder of previous findings



Gauthey et al., 2023

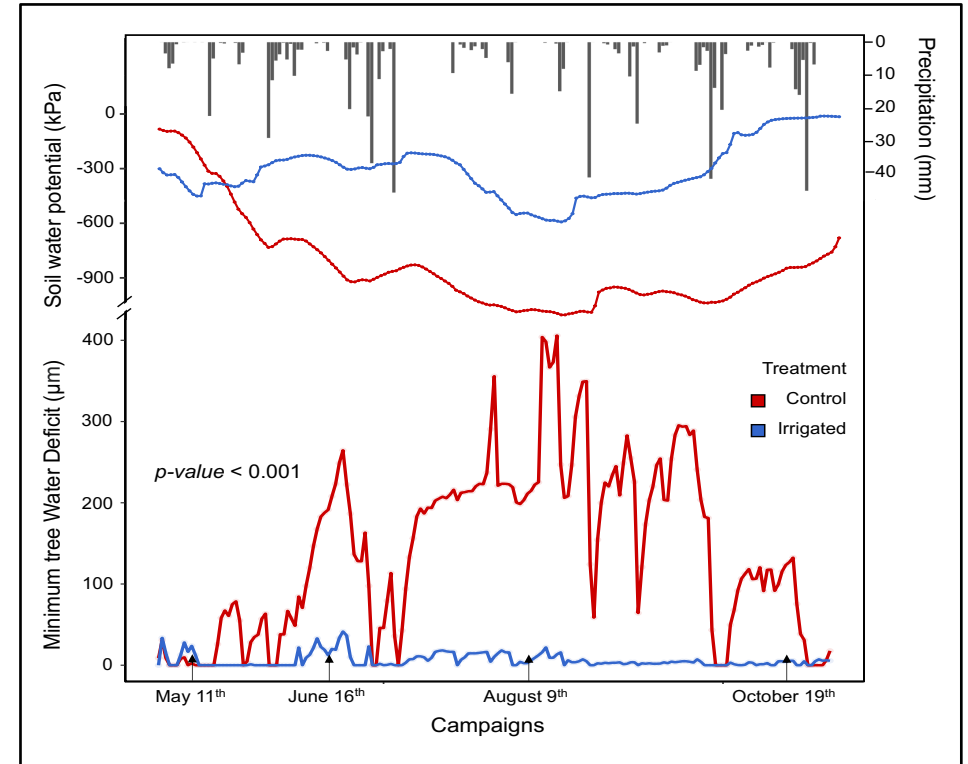
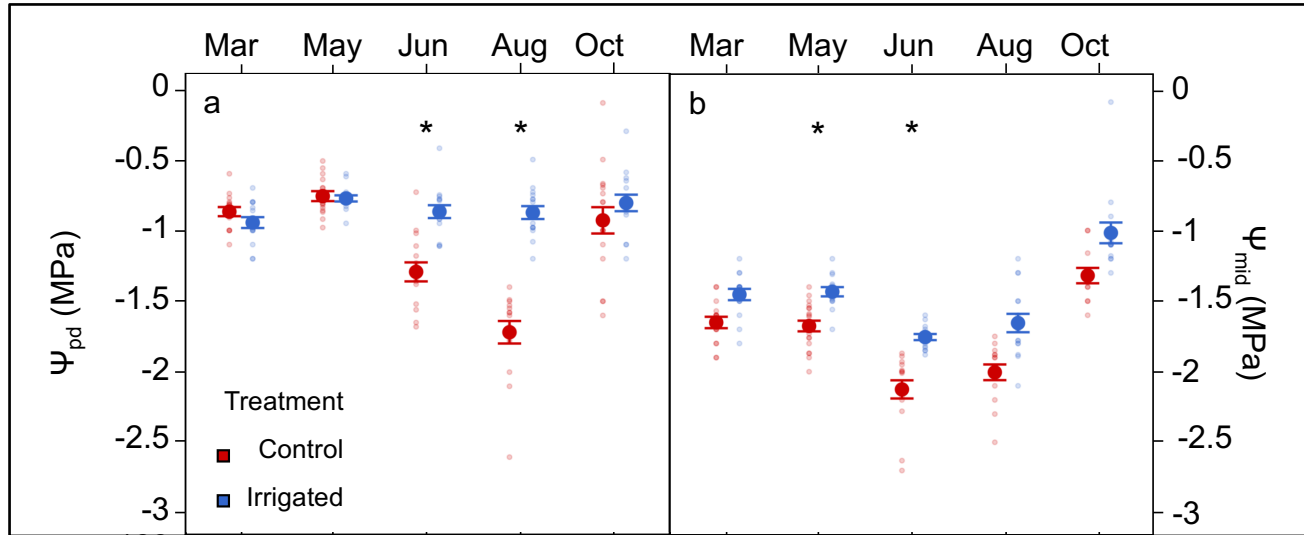
1. Effect of soil moisture on the seasonal and diurnal dynamics of net photosynthesis (A), stomatal conductance (g_s), and canopy temperature (T_{can}), and the thermal plasticity of photosynthesis (T_{crit} , T_{opt} , and A_{opt}), over the course of one year

Gauthey et al., 2023, NPH

2. Acclimation of *Pinus sylvestris*' morpho-anatomical traits (stomatal anatomy and crown density) and hydraulic traits (leaf water potential, vulnerability to cavitation (Ψ_{50}), specific hydraulic conductivity (K_s), and tree water deficit) to prolonged changes in soil moisture

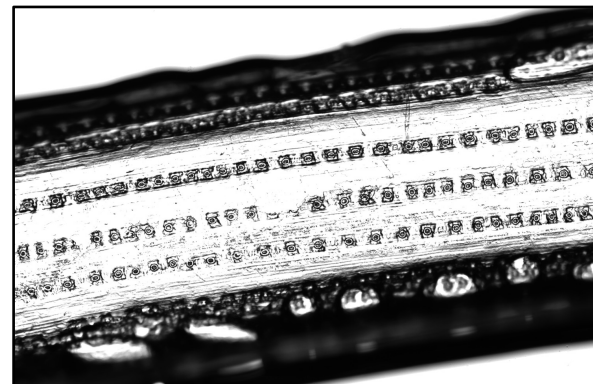
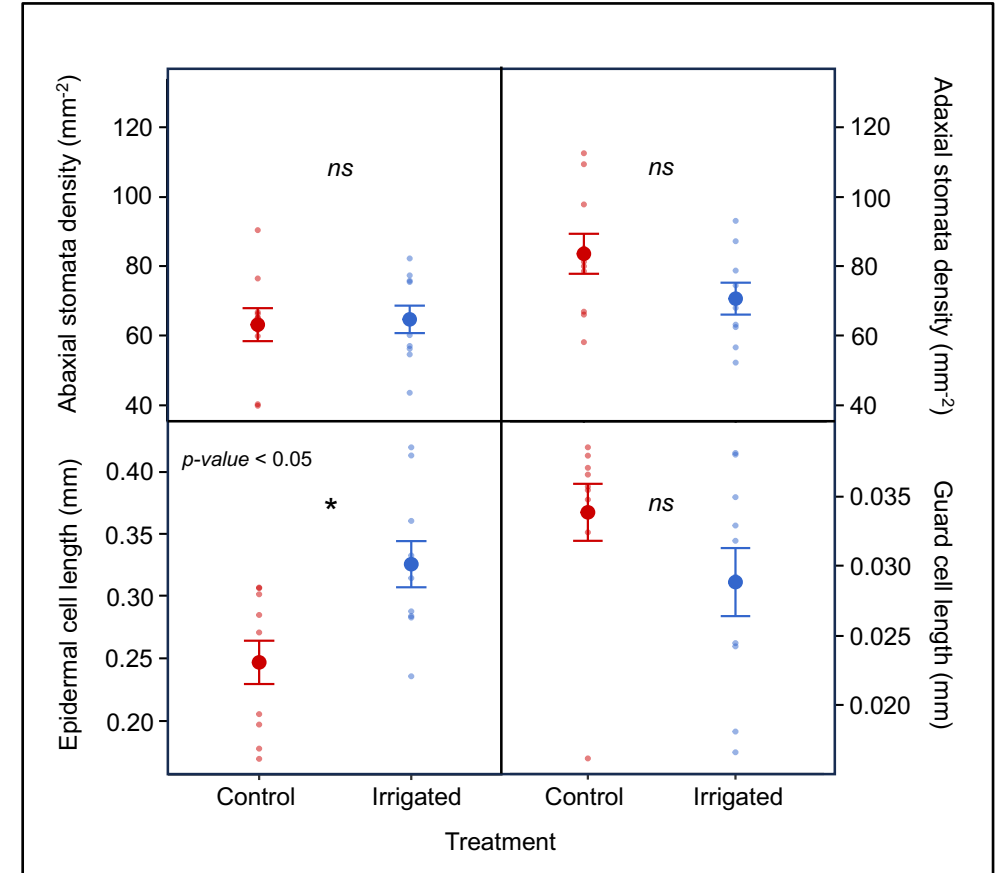
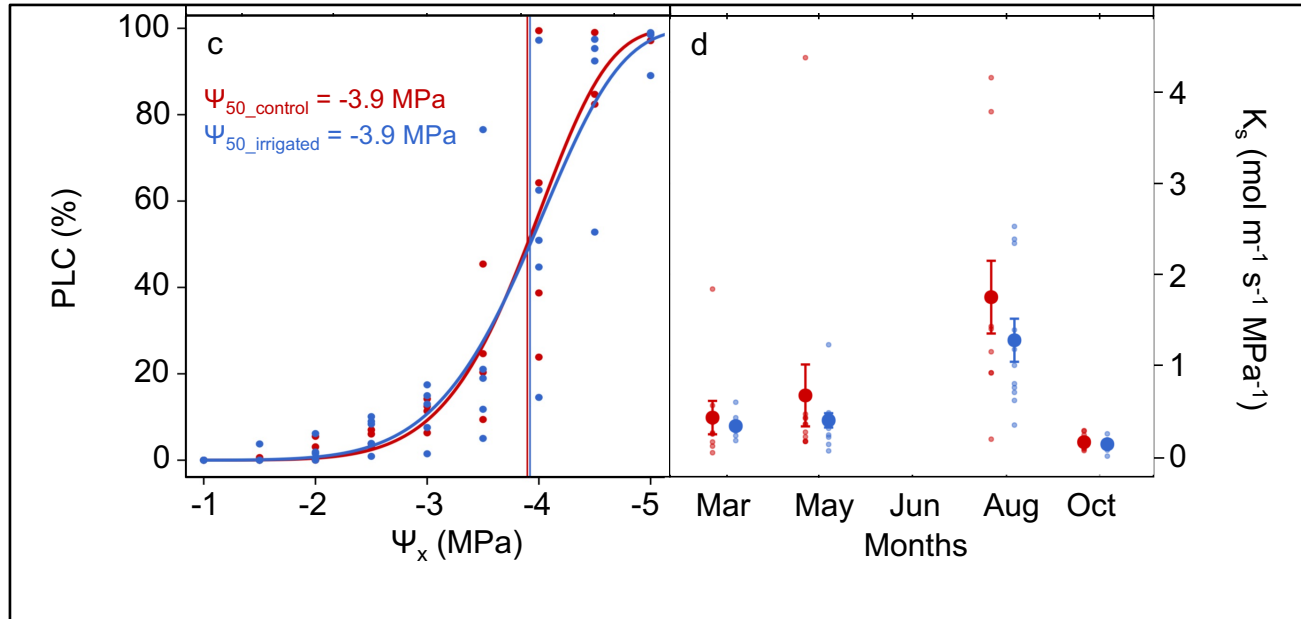
Gauthey et al., 2024, JXBot

Water stress during growing season



We found that low water availability reduced twig water potential and increased tree water deficit during the growing season.

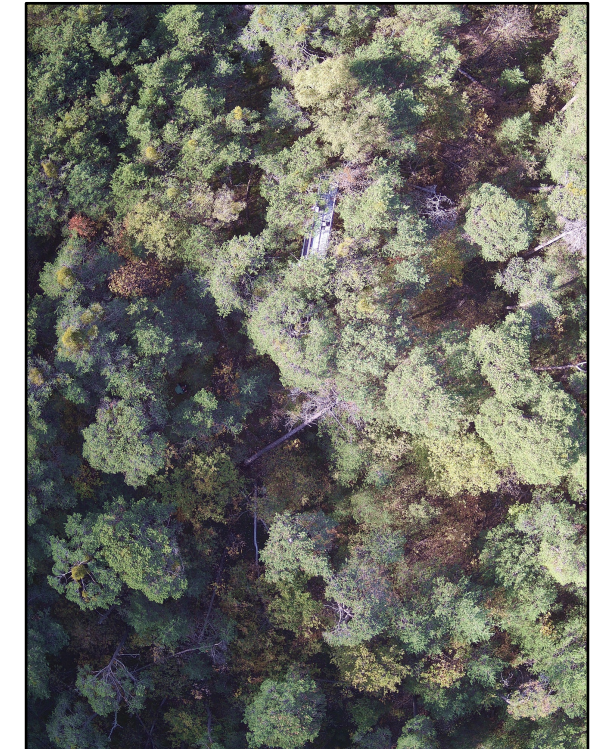
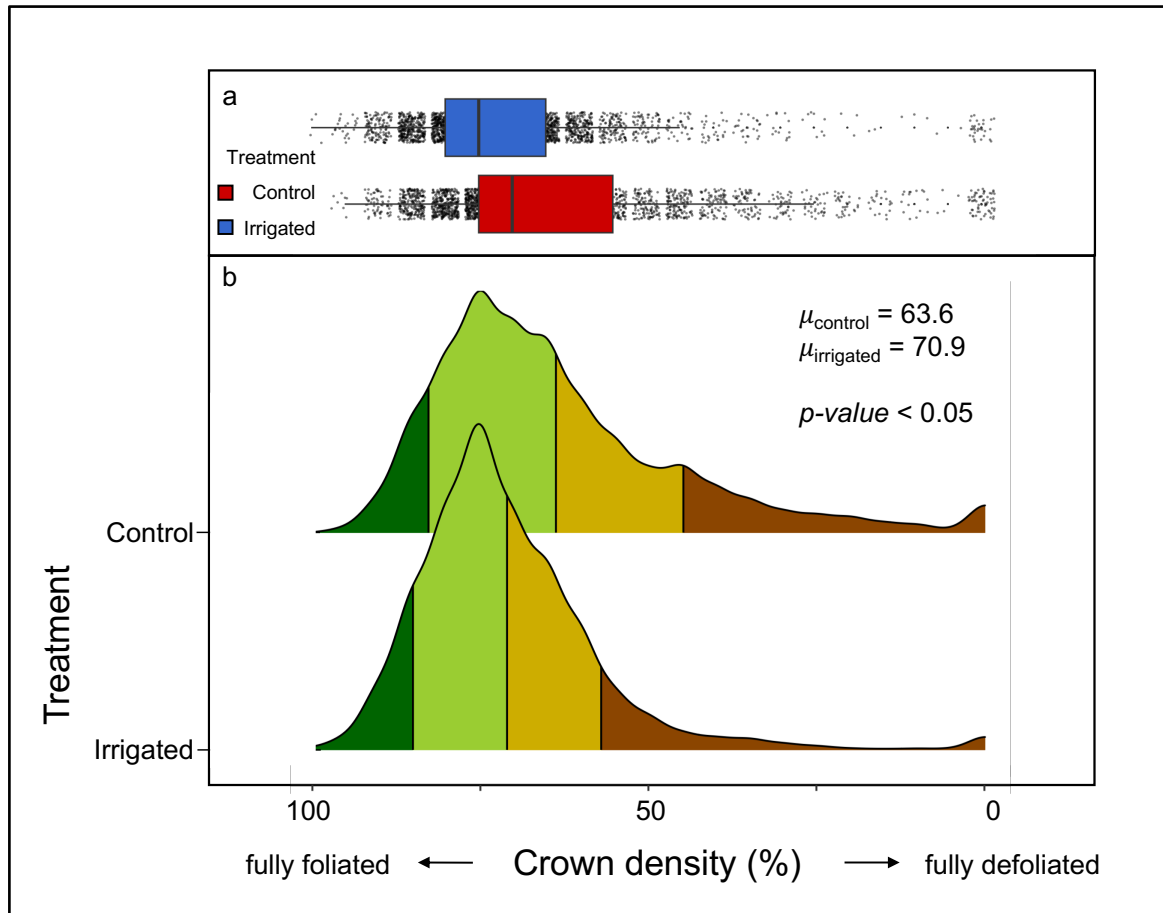
Absence of morphological adjustments



Still, the trees showed limited adjustments in most branch-level hydraulic traits (Ψ_{50} and K_s) and needle anatomy.

Leaf area index as a proxy for crown density

In contrast, trees acclimated to prolonged irrigation by increasing their crown density and hence the canopy water demand.



Twenty years of irrigation acclimation is driven by denser canopies

High evaporative cooling



Dense canopy



Low latent heat loss

Irrigated

Same canopy temperature
Same hydraulic vulnerability and conductivity
Same stomatal morphology

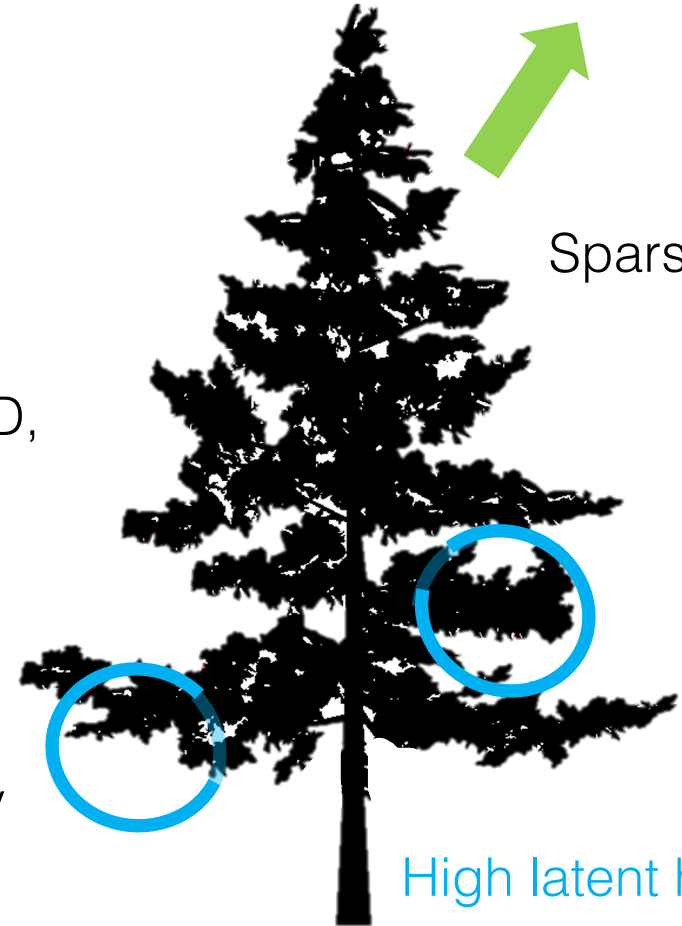
Strong response of A , g_s , TWD, water potential to changes in soil moisture/VPD

Acclimation of canopy density

Low evaporative cooling



Sparse canopy



High latent heat loss

Control

Twenty years of irrigation acclimation is driven by denser canopies



Thank you for listening!

Questions?