

High-resolution Thermal Imagery Reveals How Interactions Between Crown Structure and Genetics Shape Plant Temperature

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Remote Sensing in Ecology and Conservation

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High-resolution thermal imagery reveals how interactions between crown structure and genetics shape plant temperature

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Climate Scientists Warn of a 'Global Wildfire Crisis'

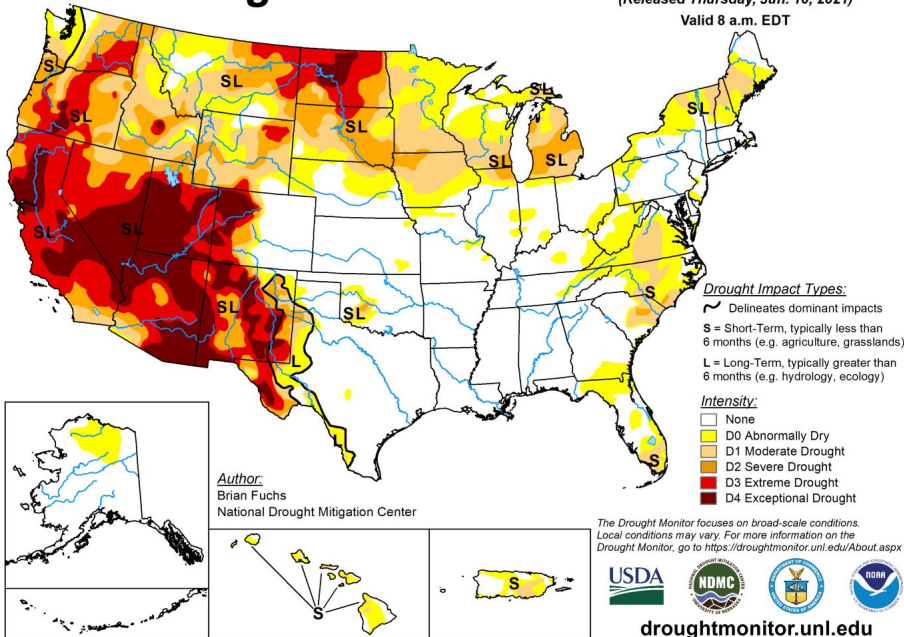
Worsening heat and dryness could lead to a 50 percent increase in wildfires, according to a United Nations report.



Source: Bob Nichols, USDA

U.S. Drought Monitor

June 8, 2021
(Released Thursday, Jun. 10, 2021)
Valid 8 a.m. EDT



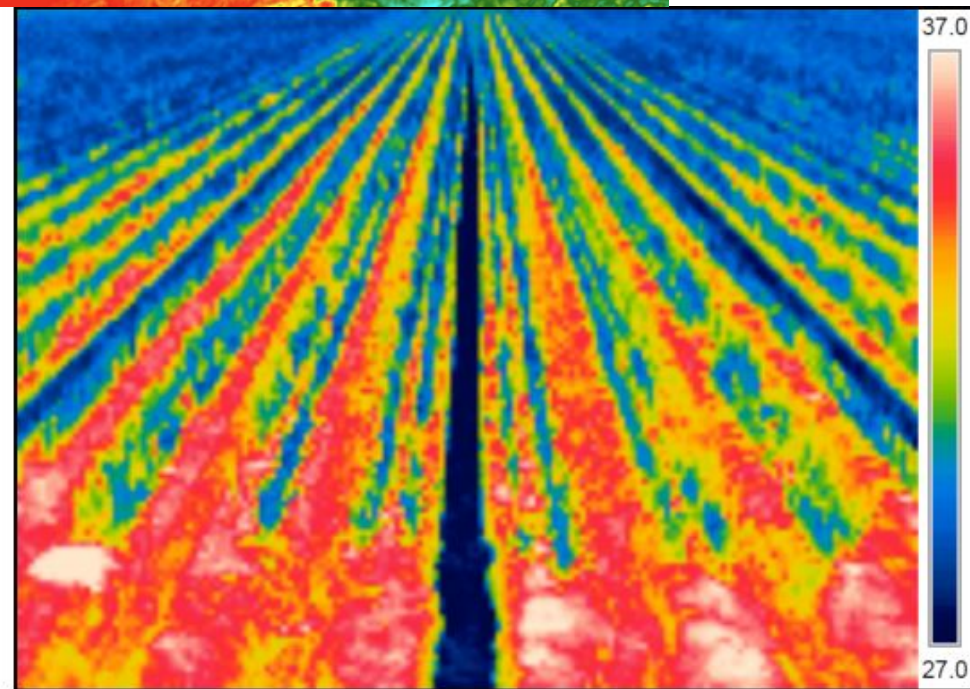
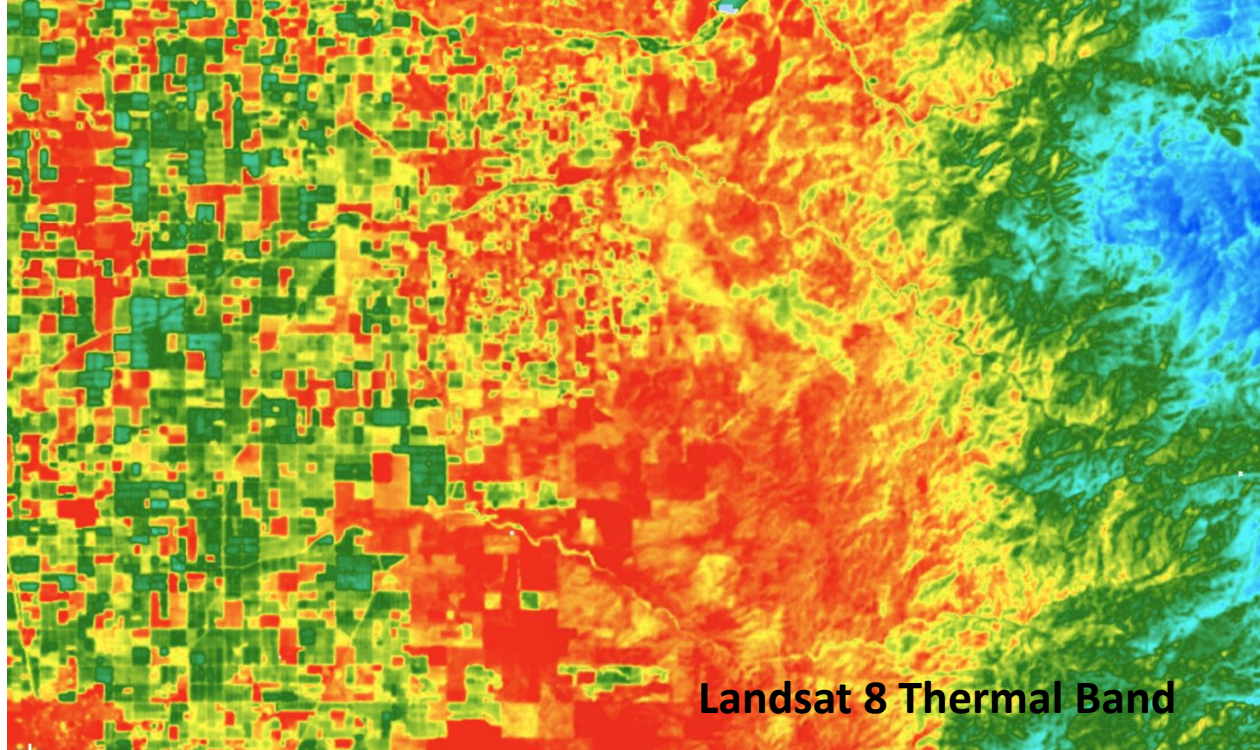
ENVIRONMENT

The drought in the western U.S. could last until 2030

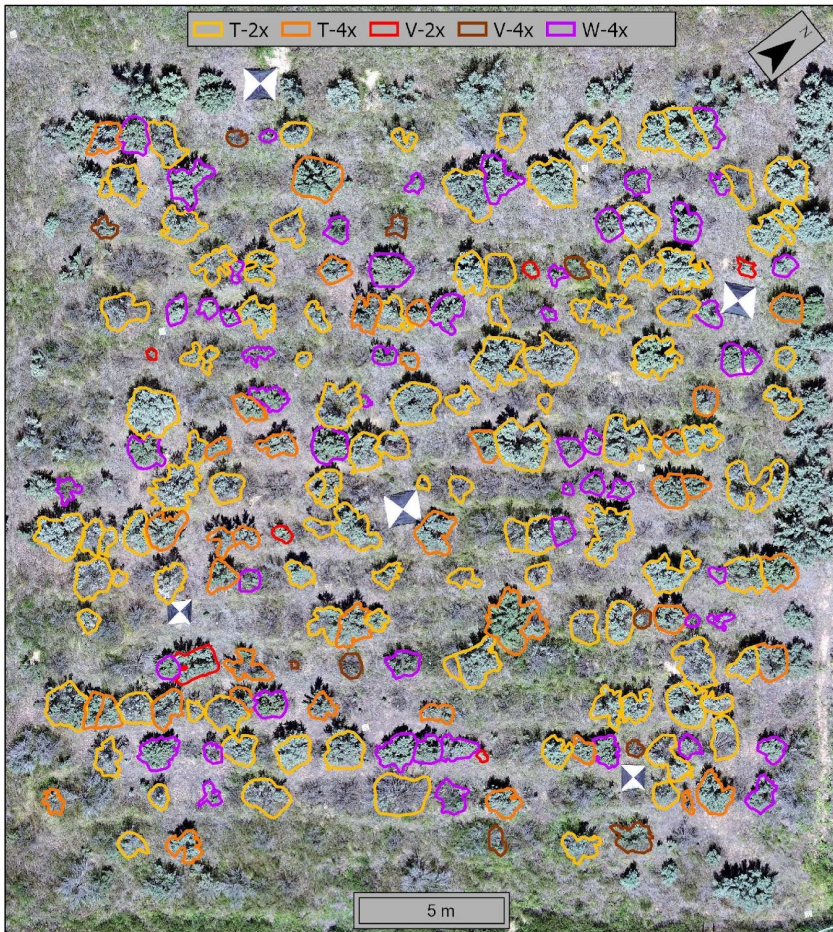
After a brutally hot and dry 2021, the region is now in the worst "megadrought" in 1,200 years. Climate change is to blame.

BY ALEJANDRA BORUNDA





Orchard



Bryce Richardson

Lazarus, Germino, Richardson 2019;
American Journal of Botany

Objectives

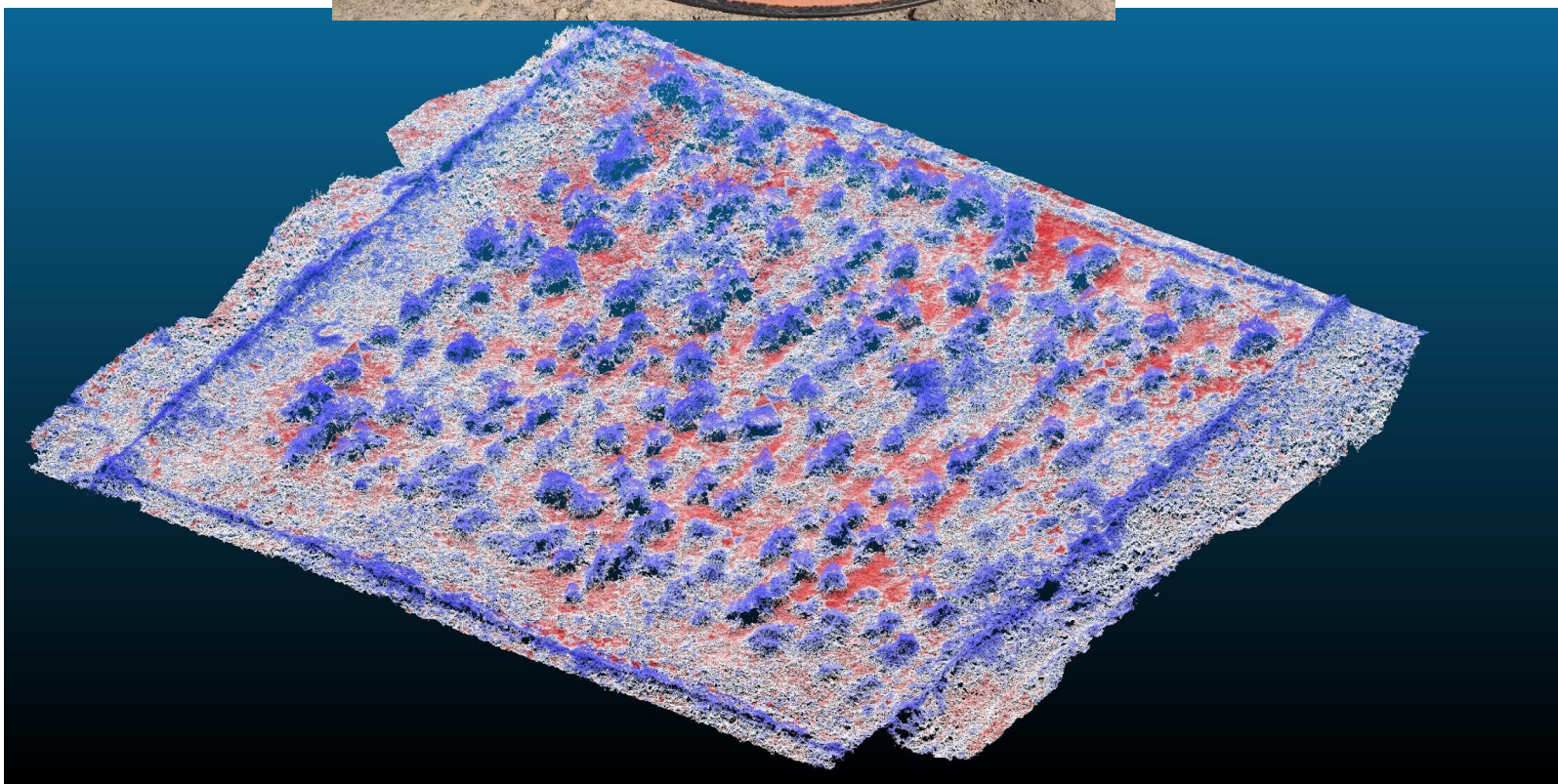
1. Compare field-based stomatal conductance with UAS-derived canopy temperature
2. Quantify genetically underpinned variation in whole plant and leaf temperature with thermal UAS
3. Compare the effects of plant structure, solar radiation, and genetics on leaf-level temperature

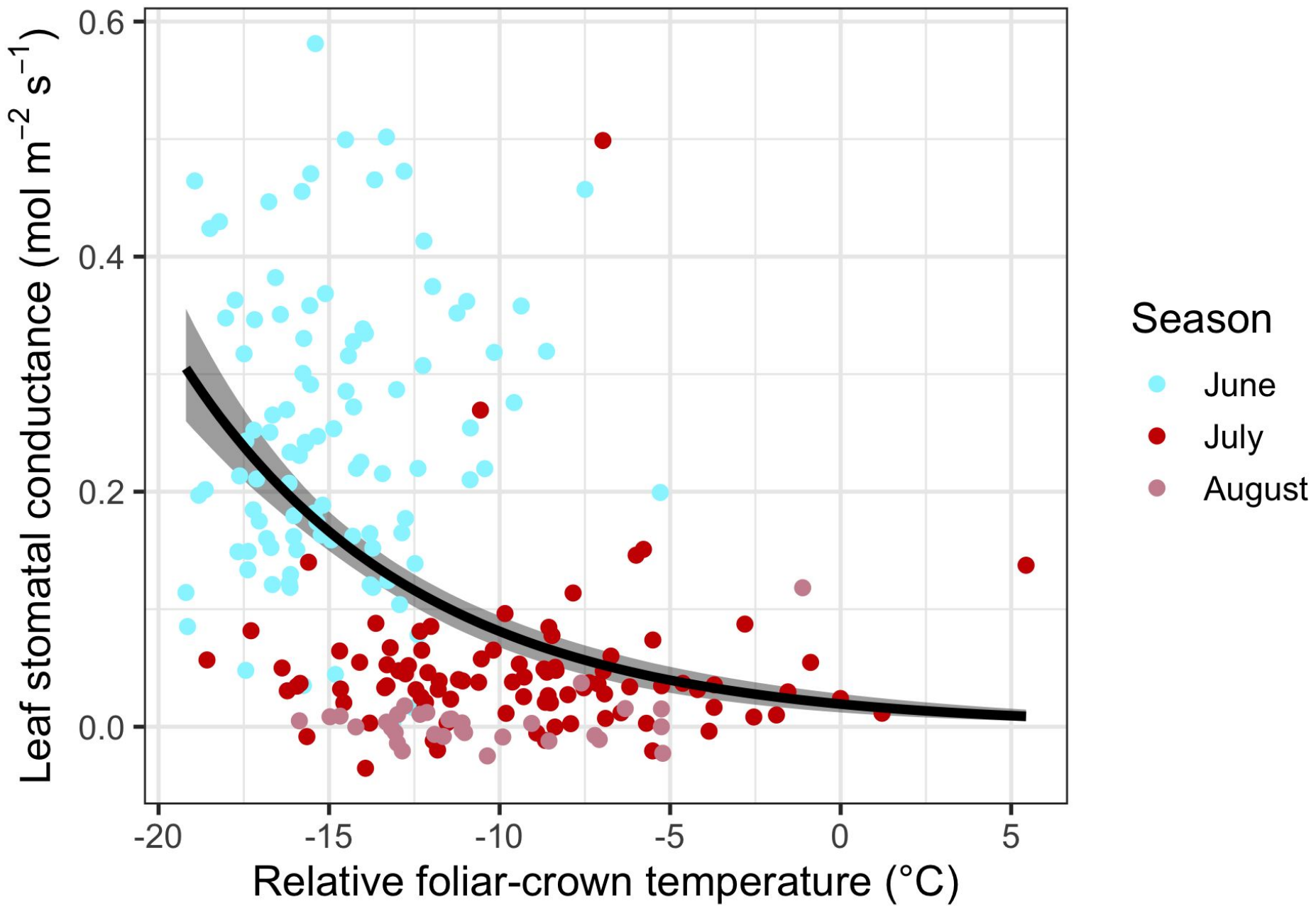


Donna Delparte

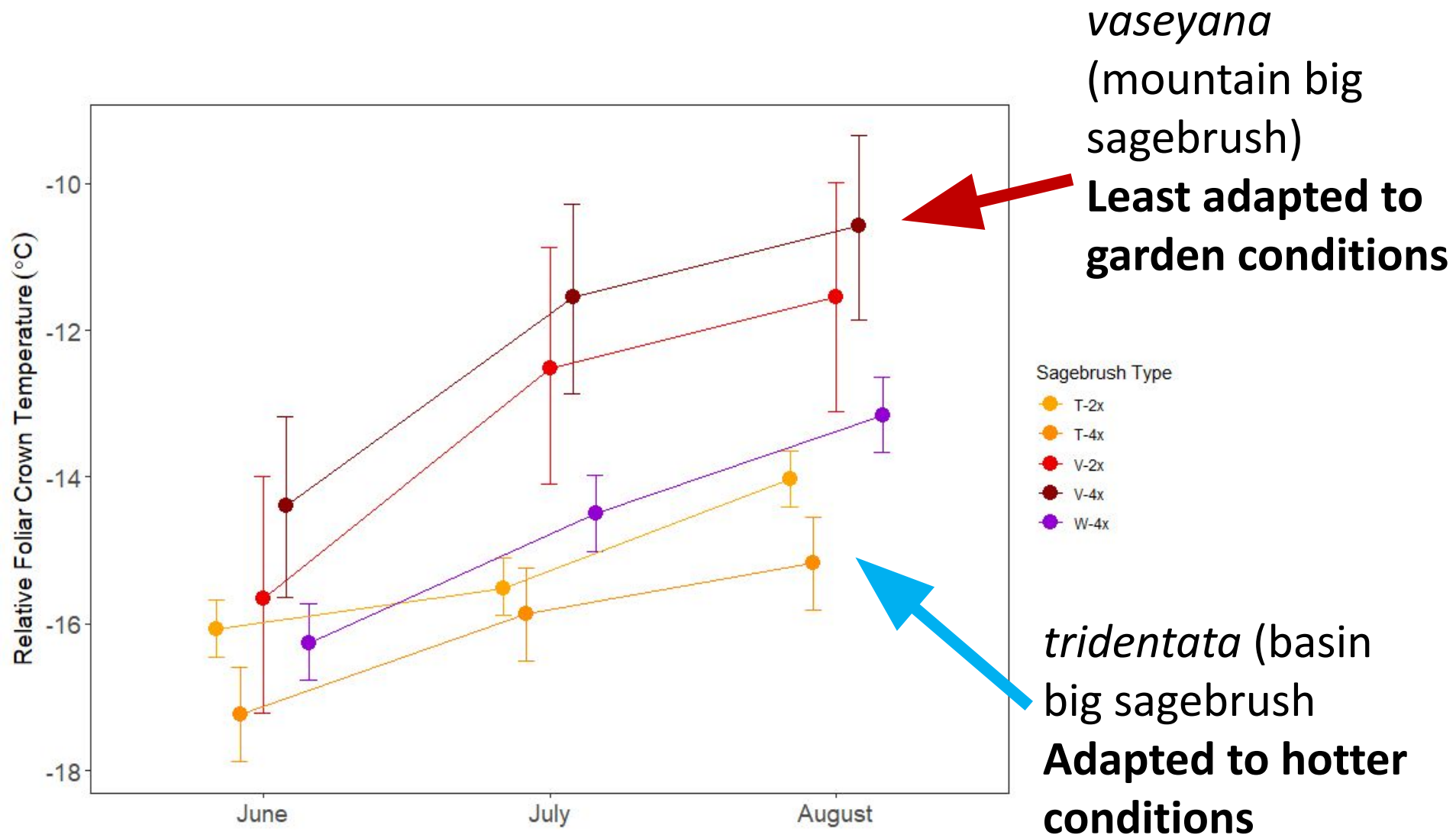


Trevor Caughlin

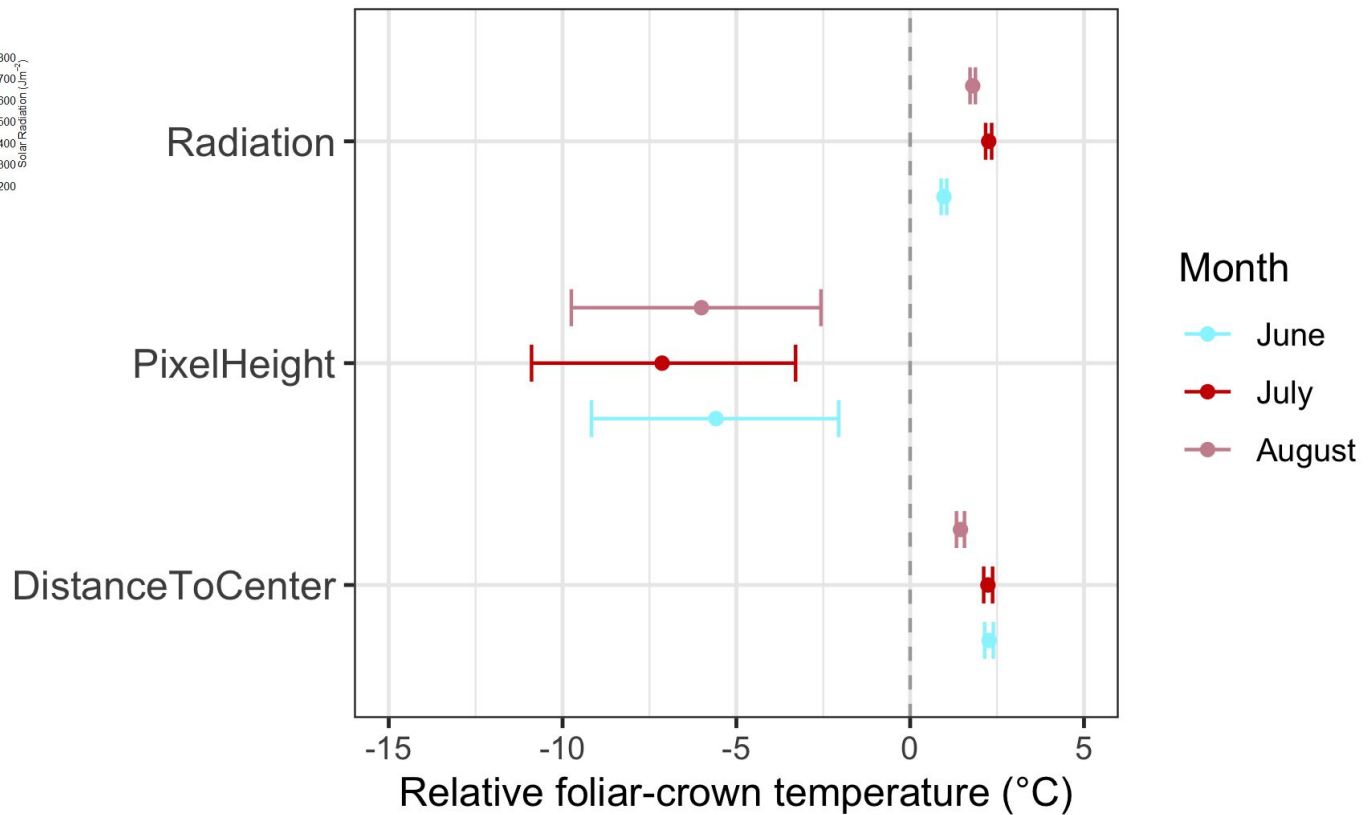
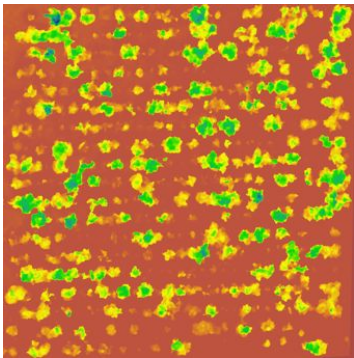
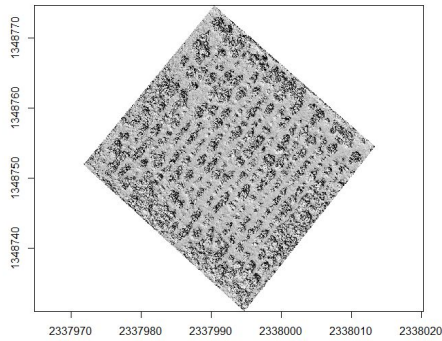




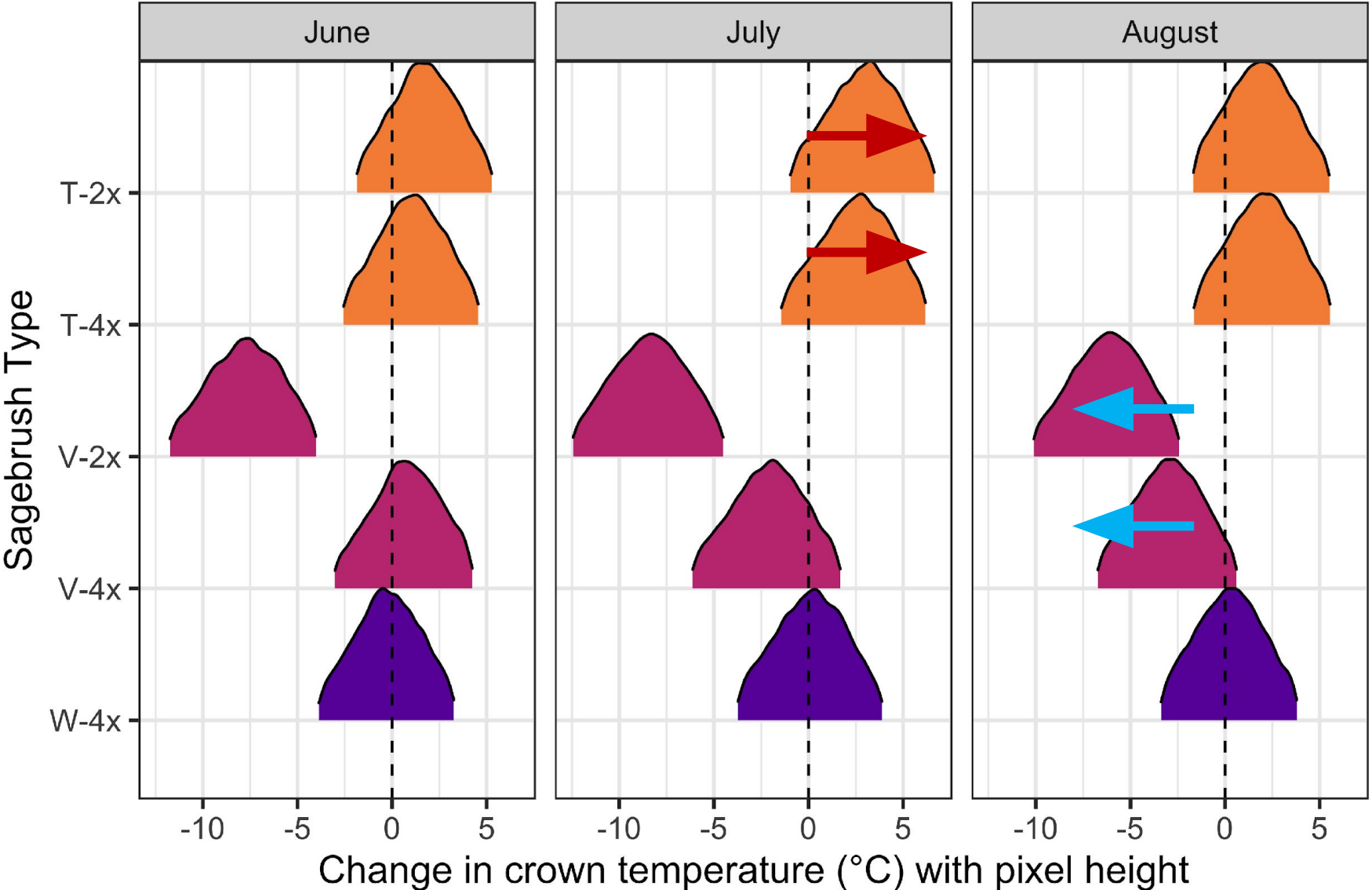
Subspecies differ in whole plant canopy temperature



Pixel height drives leaf-level temperature



Genetic Signal Flips at Leaf Scale

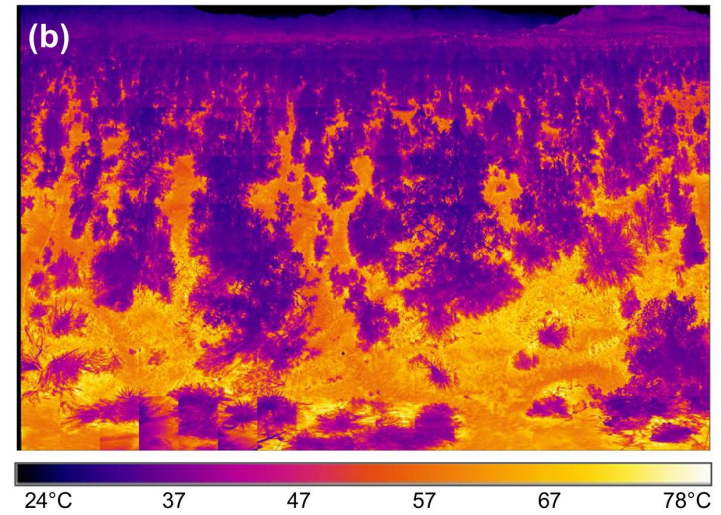
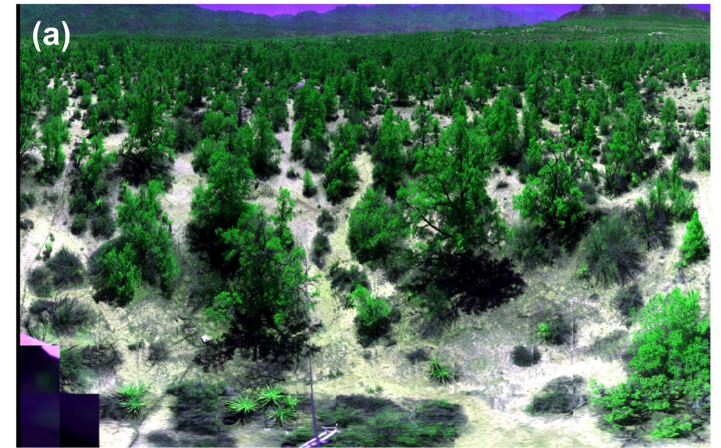


Conclusions

- Thermal UAS captured leaf-level differences in temperature that relate to genotypes across season
- Aggregated to the plant level, well adapted plants were cooler
 - This difference was explained at the leaf level by pixel height and solar radiation
 - At any given height, the less well-adapted subspecies (*vaseyana*) had cooler leaves

Next Steps

- Natural environments
- Newer sensor (MicaSense Altum)
- External calibration of the thermal sensor
- Temperature sensors across the landscape, at different heights above the ground



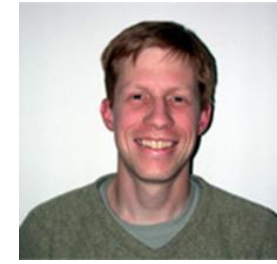
Still et al. 2019

Acknowledgments

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Megan Cattau



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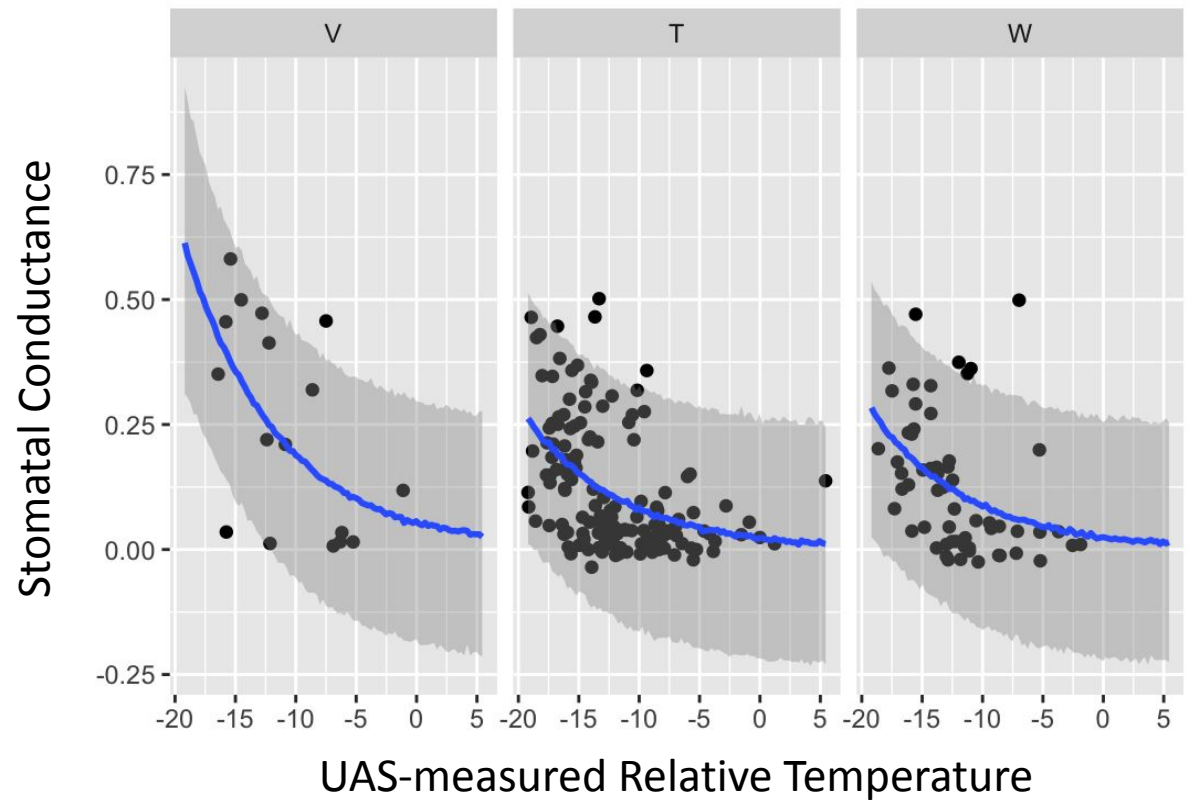


Spencer Roop



Keith Reinhardt

Questions?

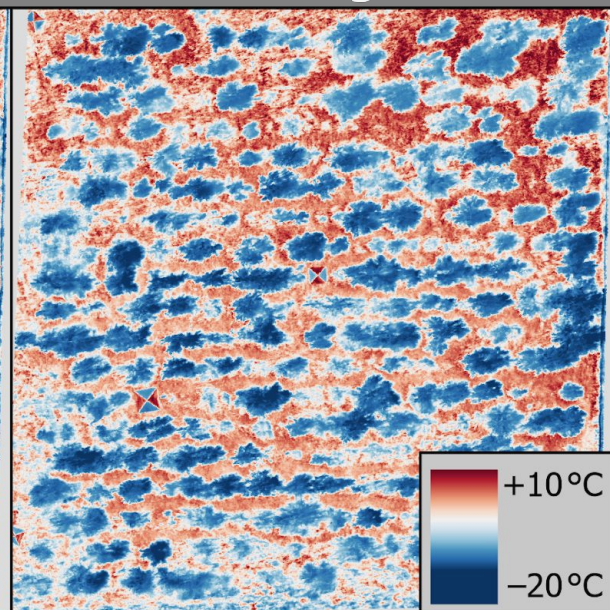
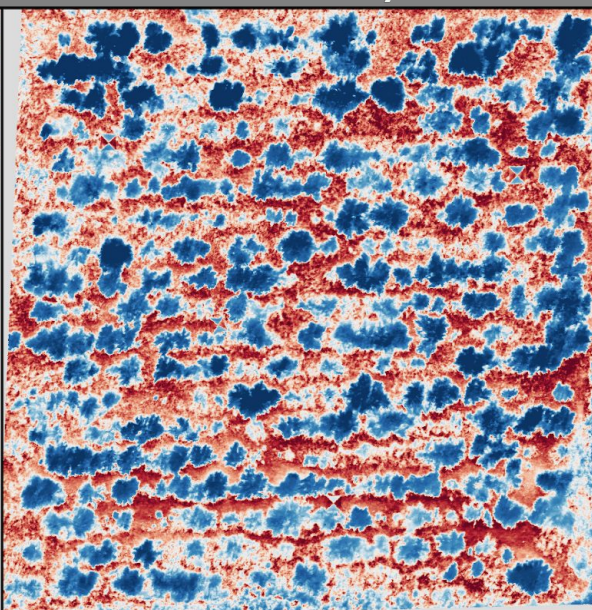
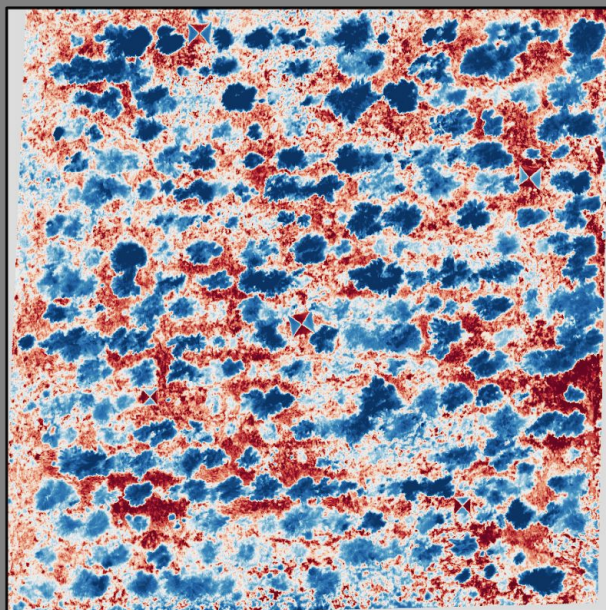


5 June

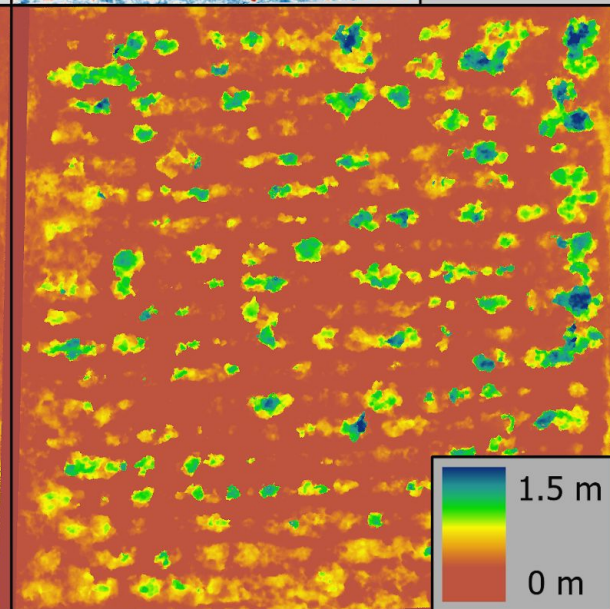
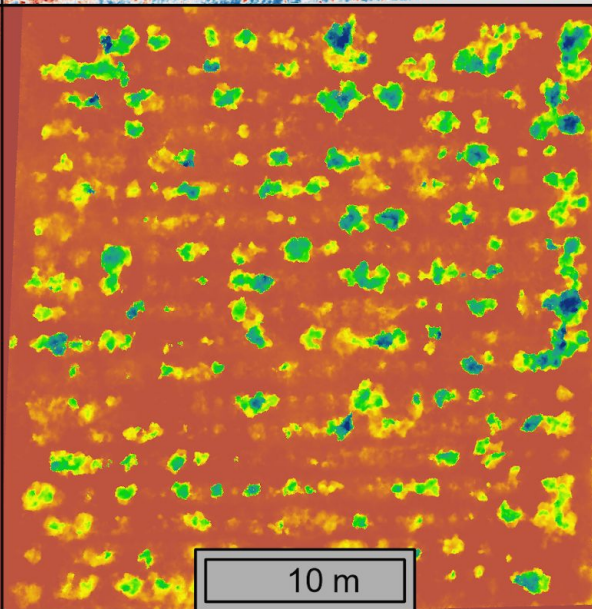
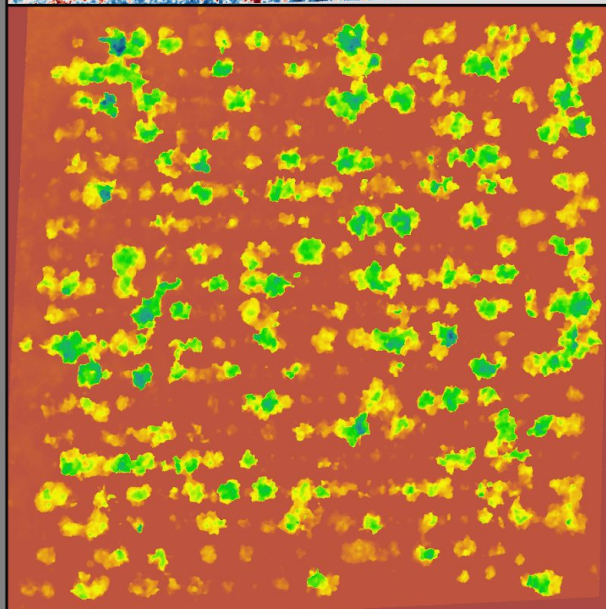
11 July

28 August

Relative Temperature



Canopy Height



10 m

