Investigation into dormancy breaking agents and dynamic chill portions model in CA cherries via carbohydrates and solar radiation

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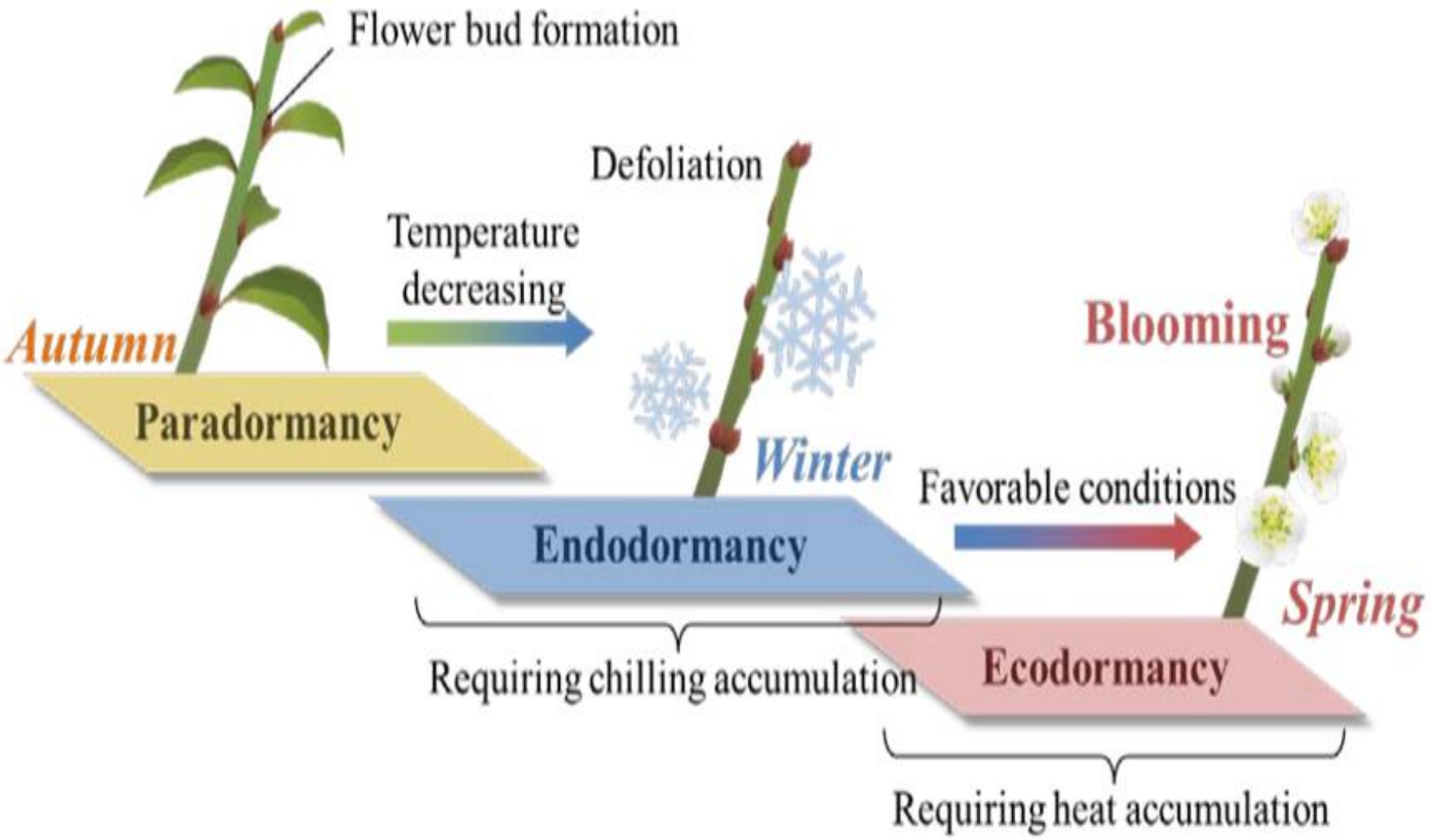
Final Report 2021/2024

California Cherry Board

Introduction: winter chill accumulation



Introduction: climate change

Impacts of insufficient winter chill

- inadequate, delayed, uneven bloom
- limited cross-pollination
- reduced fruit set
- variable fruit sizes and maturity stages
- reduced yield and grower returns

Dormancy Breaking Agents

Dormancy Breaking Agents can partially mitigate the effects of insufficient **chilling if applied at the right time**

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Chill Accumulation Models

All these models have **shown discrepancy among locations and years, with inconsistency being amplified by climate change** (Luedeling et al. 2009).

Hypothesis

Two primary causes for the **unreliability** of the current models:

1) their dependence on a single climatic variable, air temperature

2) they are all empirically derived rather than based on a functional understanding of the dormancy process.

Objectives

1) Meteorological objective:

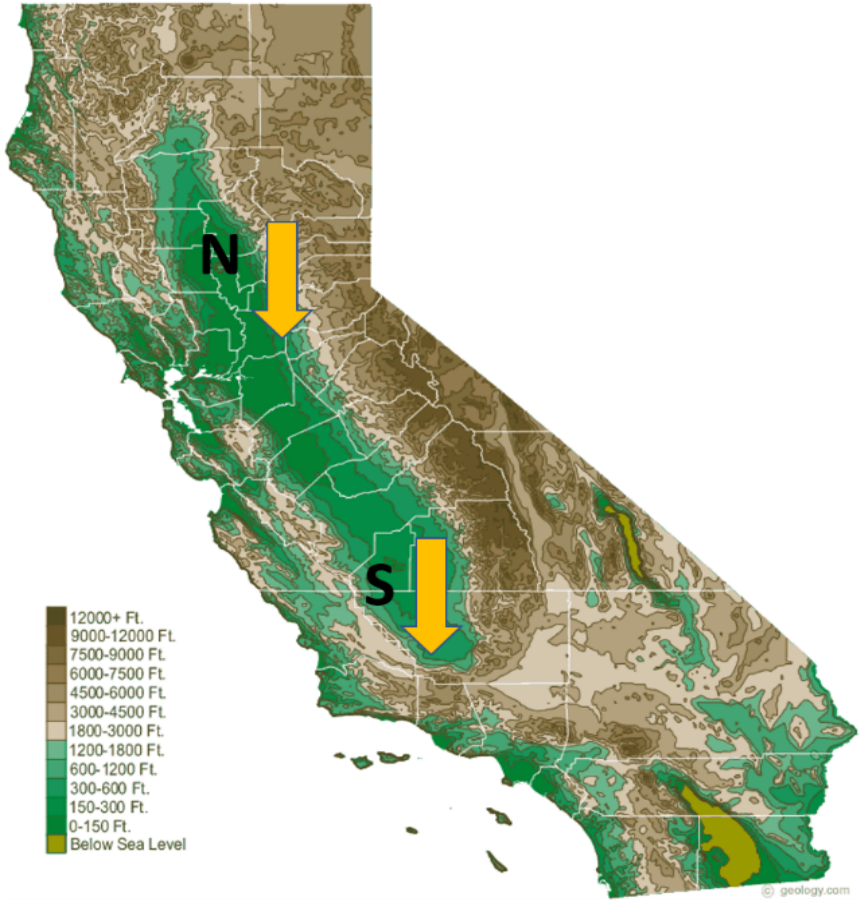
Create a model to predict tree temperature in cherry based on several environmental factors

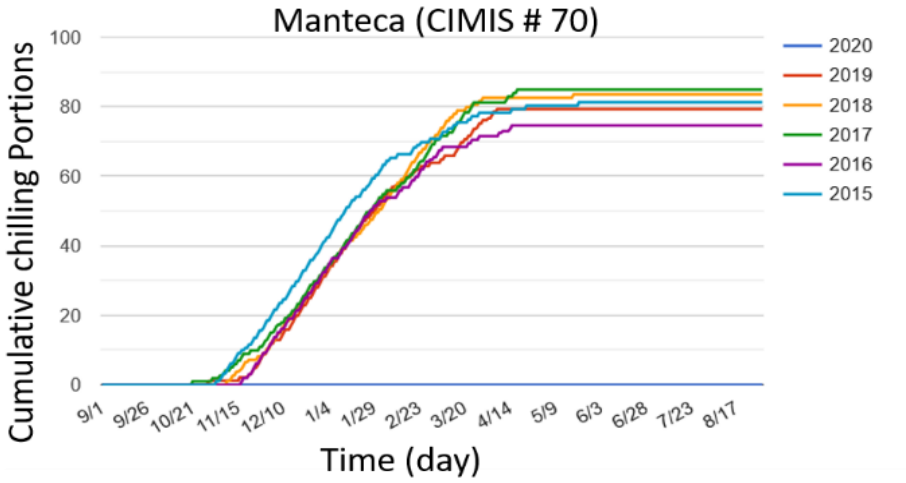
2) Physiological objective:

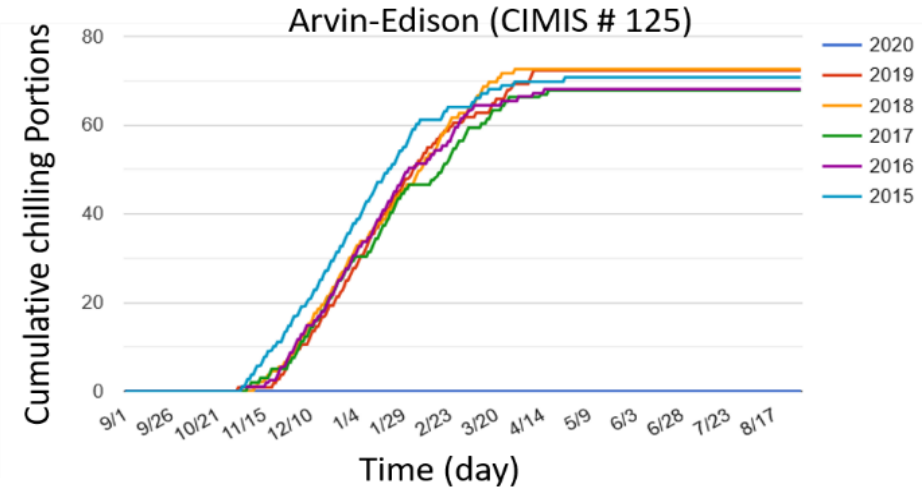
Develop a biomarkers of chill accumulation (carbohydrate dynamics)

Optimal dormancy breaking agents spray time

Experimental design: site selection







5 orchards, 3 cultivars, two environments, very variable managements

Data collection

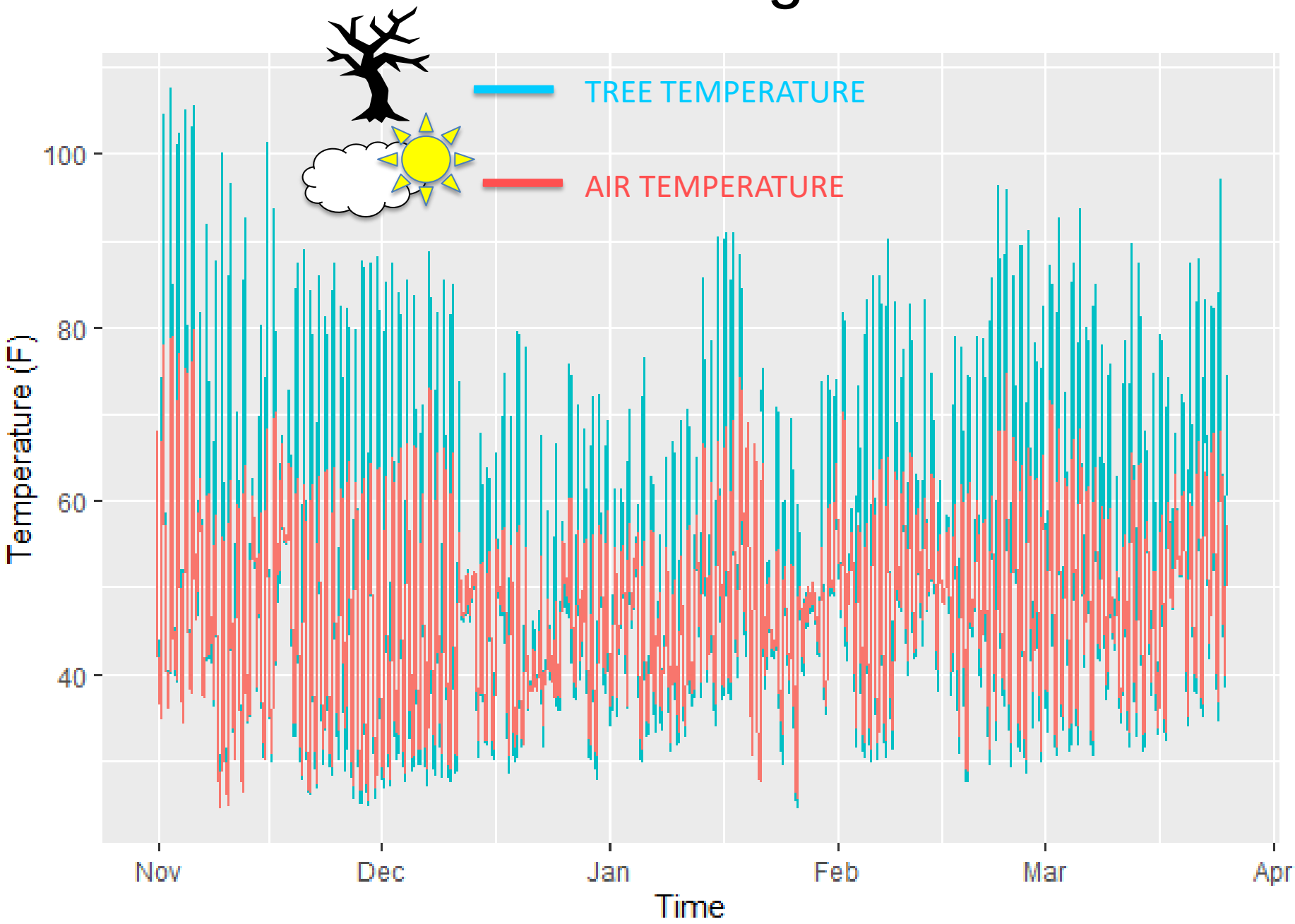
NSC Sampling

Tree bark temperature

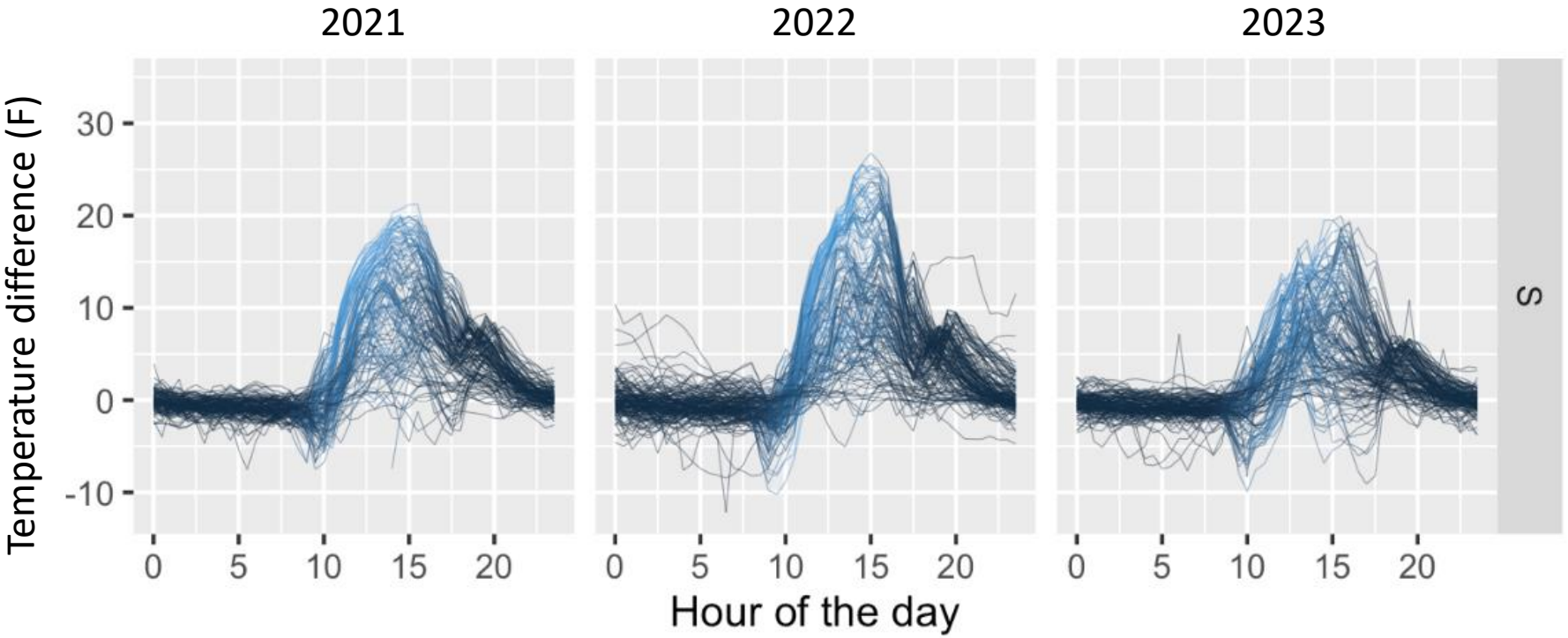
Meteorological station

Phenology

OBJECTIVE 1: Meteorological

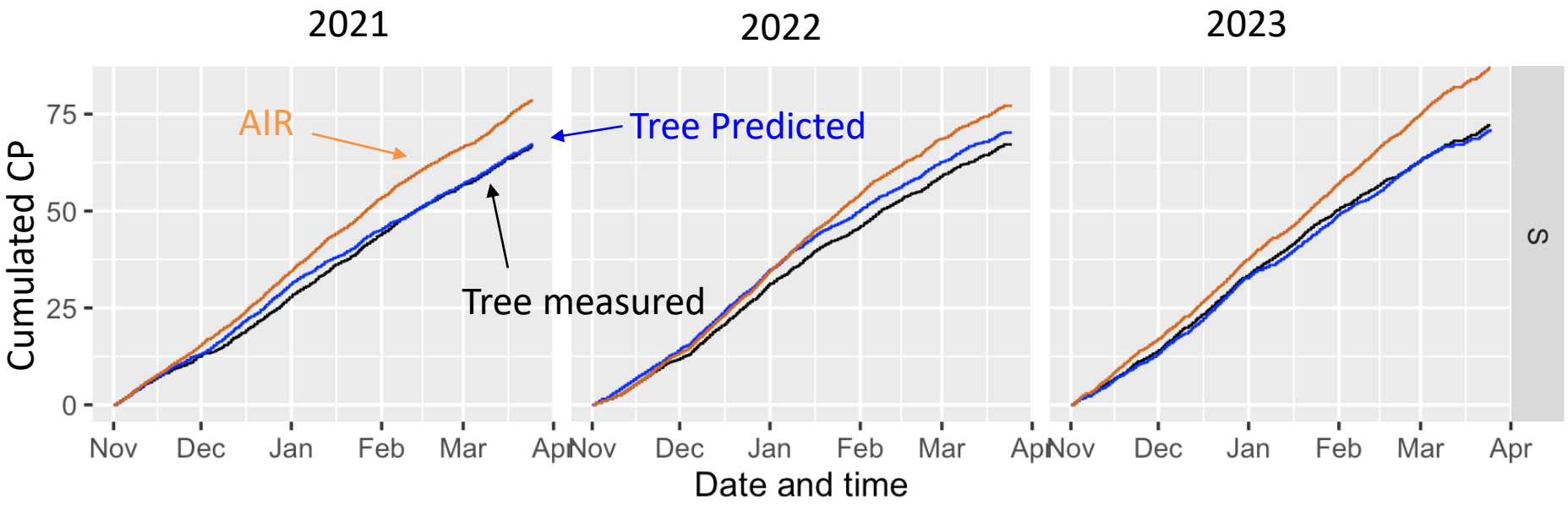


Difference between TREE and AIR temperature



- T_tress is on the average **10° F higher than T Air**
- on sunnier periods this difference is **20-25 ° F**
- is the S exposed in Bakersfield it was up to **40 ° F**

Difference between TREE_CHILL and AIR_CHILL

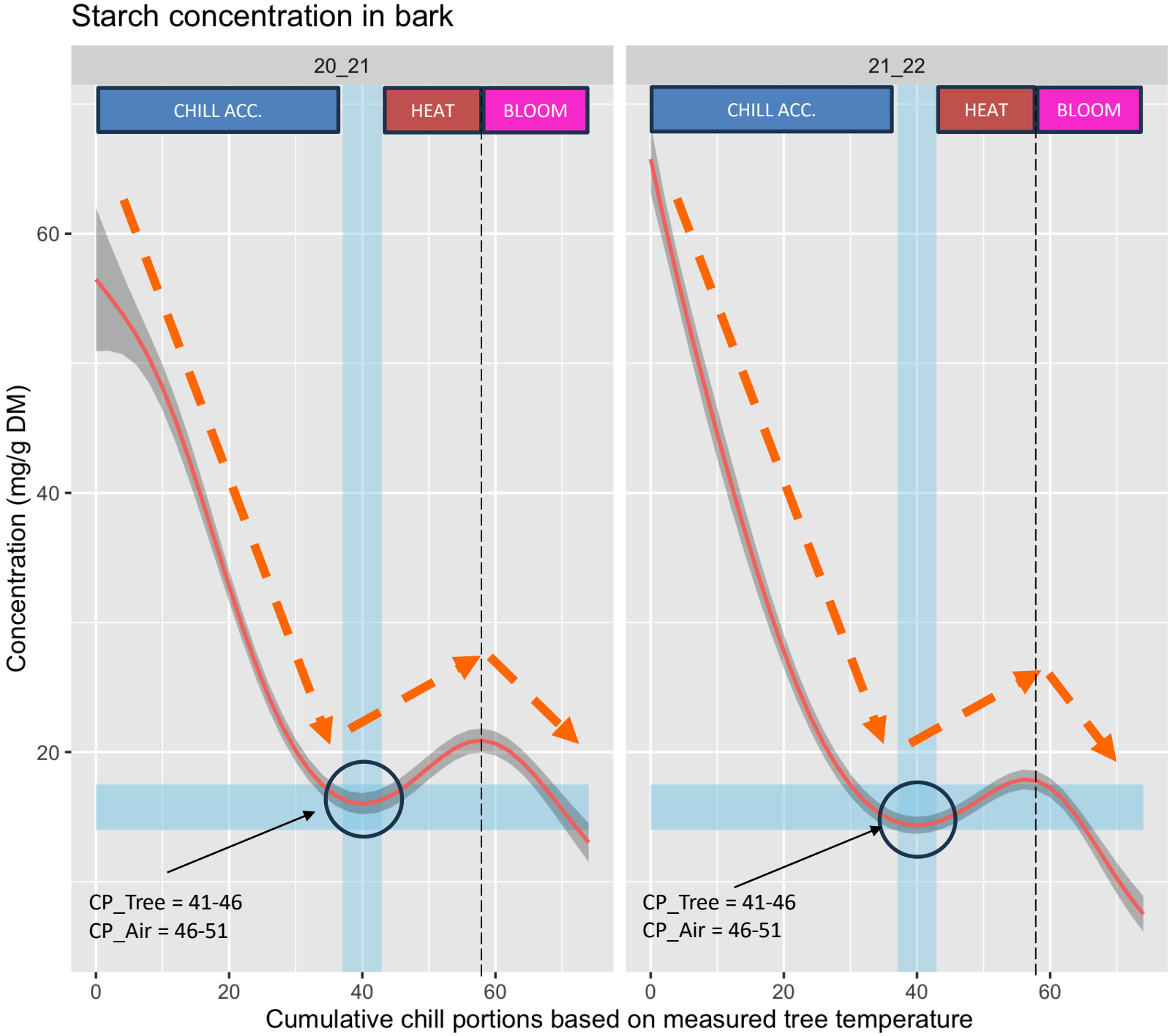


The Chill_tree **is 12-15 CP lower** than the Chill_Air

Goodness of the Tree_Chill Model

method	chill_portions
Measured_Ttree	50
Predicted_Ttree	50
Orchard_Tair	57
Cimis Tair	56

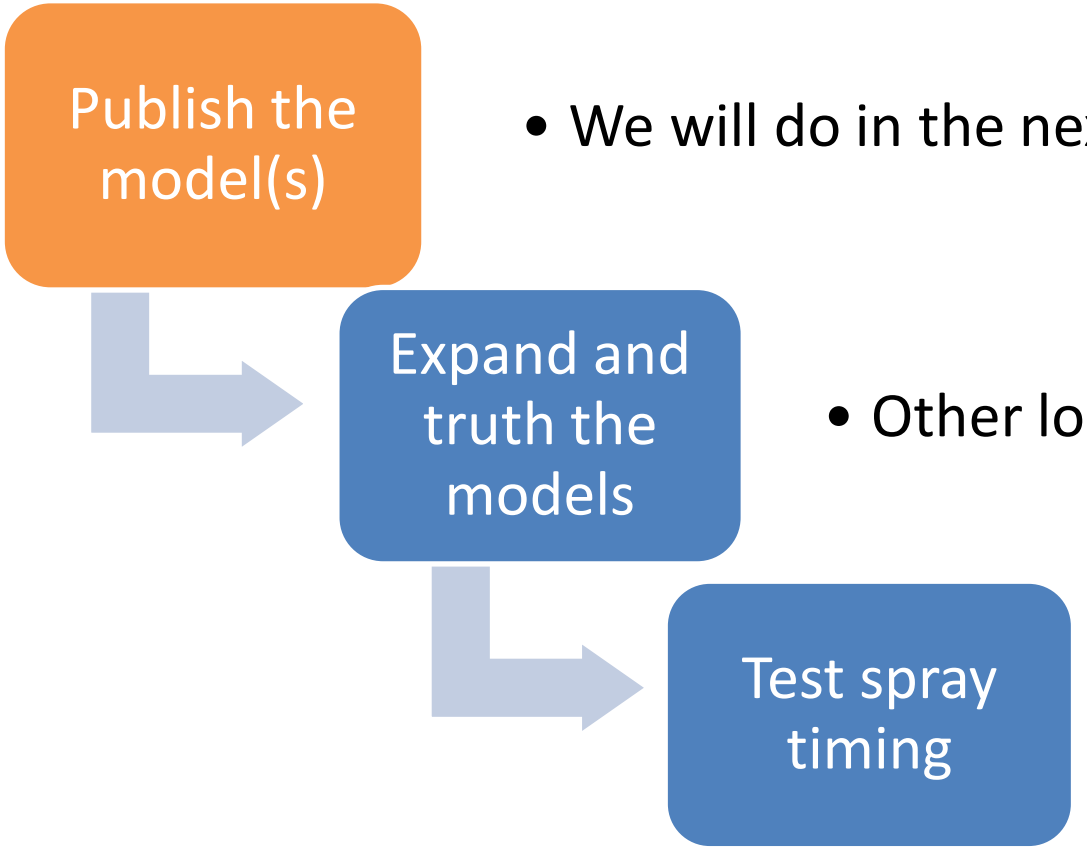
OBJECTIVE 2: Physiological



Application

- Better understanding of the physiology af chill
- Better characterization of cultivar chill requirement – less dependent from climatic shifts
- Better time dormancy breaking agents spray
- Pest modeling and management
- To implement other chill management practices such as evaporative cooling etc
- Adapted to other crops

Next steps



- We will do in the next year(s)
- Other location and years
- based on Tree_CHILL and predicted NSC changes

We **applied to several grants**, including the CCB, a Multistate CDFA (with Washington State University), a USDA (with Washington and Oregon State University)

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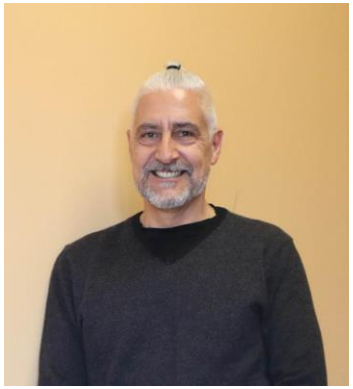

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CALIFORNIA CHERRIES

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