TREE CARBOHYDRATE BUDGET . METHODS FOR SUSTAINABLE MANAGEMENT OF ALMONDS UNDER CHANGING CENTRAL VALLEY CLIMATIC CONDITIONS

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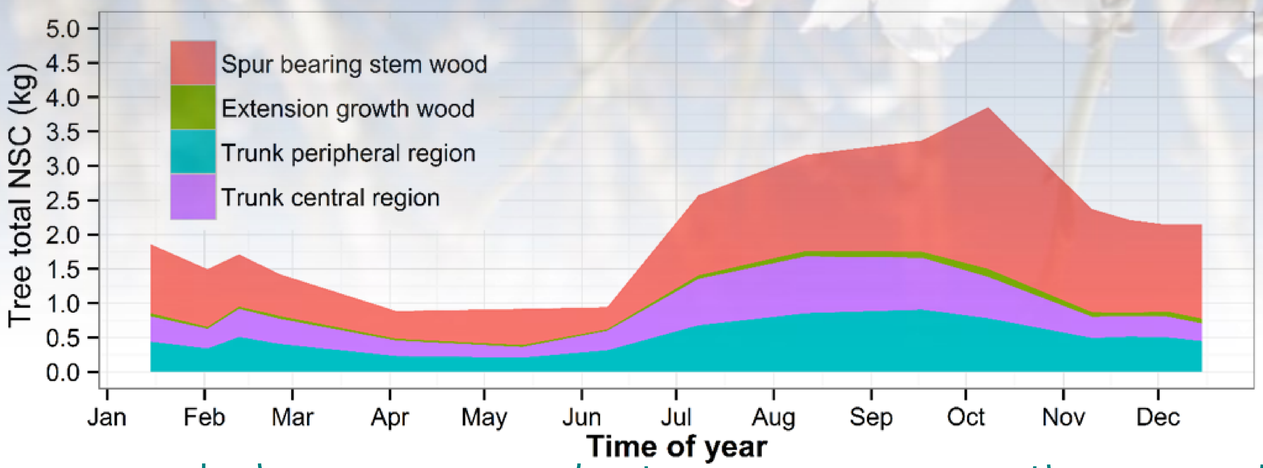
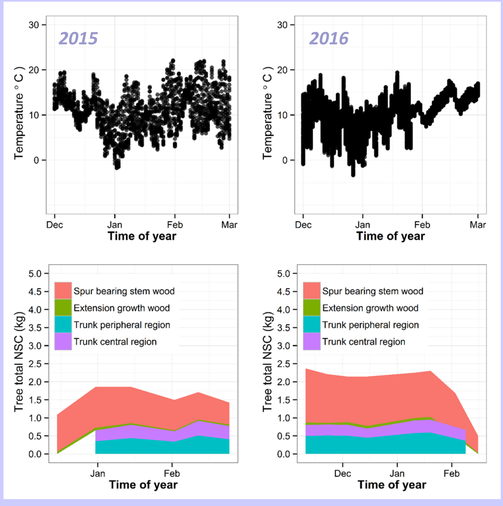


BLOOM **NUT FILL** **NSC STORAGE FILL** **DORMANCY**

***Nonstructural carbohydrates (NSC)**, mainly soluble sugars and starch, provide energy resources for almond trees. Their concentration dynamics, transport, and seasonal utilization patterns are under tight biological and environmental control that is correlated with tree phenology. The availability of NSCs ultimately control tree productivity through **growth, yield**, and **survival**. NSCs provide perennial plants with energy reserves required to survive **DORMANCY** periods and spring **BLOOM** and leaf growth prior to achieving photosynthetic independence. Breaking of dormancy is characterized by a specific pattern of NSC redistribution in the branches and the local availability of sugars significantly influences bloom, thus yield performance. Once leaves are developed, almond trees use the NSC produced by photosynthesis for **NUT FILL.** After harvest, the **REFILL of NSC STORAGE POOL** is fundamental for winter dormancy survival and performant bloom.*

SPUR BEARING STEMS AND TRUNK ARE THE MAIN STORAGE SOURCE FOR DORMANCY ….



Mobilization of NSC in winter is associated with mean air temperature and temperature variability.

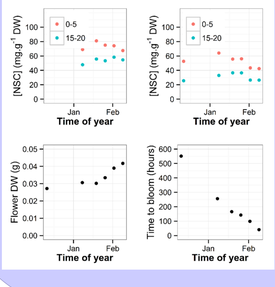
Lower temperatures in winter 2016 was associated with less NSC consumption in almond trees.

The low temperature variability and sharp increase during spring induced full mobilization of NSC during blooming in February.

Most of the mobilization of NSC during Bloom 2016 occurred in the Spur bearing stem.

Trunk peripheral NSC mobilization coincide with leafing and spring growth. Later in the season after fruit drop, NSC storage are restored for next winter.

… BUT LOCAL NSC AVAILABILITY IN EXTENSION GROWTH STEMS CONTROL FLOWER SYNCHRONISM AND QUALITY

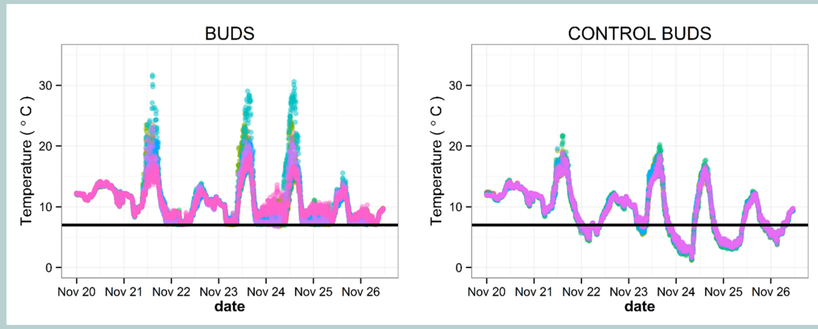


NSC are being accumulated towards buds during winter. During January and February, the local NSC accessibility for bud development increase. This increase in availability allows for a quicker flower development, higher flower biomass and synchronism.

MECHANISTIC UNDERSTANDING OF CHILLING HOURS ACCUMULATION

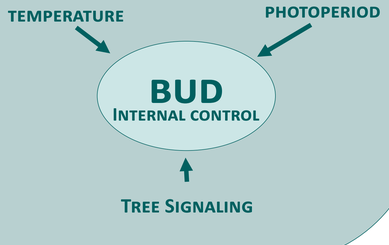
BUD TEMPERATURE TREATMENTS

Temperature treatments. Imposing different temperature scenario to buds from the same almond trees allow to understand the control of flowering time. Warming buds after chilling induced early bloom. We test different scenario like preventing chill accumulation or increasing forcing temperature after chilling accumulation. With local heating we also test the independence of the bud from the tree internal clock.



FROM GENE CONTROL TO WHOLE TREE SIGNALLING

The use of holistic approach allow to understand chilling processes in almond. We investigate the control of dormancy duration and flowering using genes expressions analysis, NSC measurements, flower quality and energetic balance.

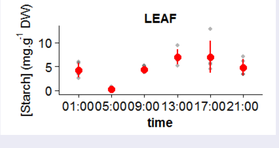


DYNAMIC OF NSC TRANSPORT AND REDISTRIBUTION

TRACKING OF THE NEWLY PRODUCED NSC WITH ISOTOPES

13 C labelling of photosynthate. We labelled the NSC photosynthesized during a day of a branch and tracked their movements and partitioning within the whole almond tree.

When evaporation is low during night time , the NSC are being redistributed. The temporary storage of NSC are being used for respiration.



Autonomy of a branch. The proportion of NSC redistributed to the whole canopy is informative for the understanding of tree architecture, nuts distribution within the tree and pruning practices.

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