Meeting NSC age and transit time

1. Present again the idea: the intention, the purpose, the knowns and the unknowns
2. Have a little debate about the Idea and find what would work and what would not
3. Define clear ways to express our ideas into the paper

The Idea

This is an opinion paper, based on theoretical appreciations, our current understanding of NSC dynamics and some colected evidence that we have up to now. It aims to present a metric to valuate the metabolic state of a tree which can, in theory (this is the novelty of the idea) to evaluate the risk or relative vulnerability of a tree to future stressful conditions.

The metric consist in the ratio between the NSC age (age of the stored NSC) and the NSC transit time.

The asumptions are:

1. Trees store NSC for some periods of time to support metabolism in the future
2. Trees use NSC reserves when they are in a negative carbon balance
3. There is a constant mixing of NSC between organs and compartments (there is not switch on or switch off)
4. NSC ages in trees are not evenly distributed
5. There is a top dow allocatin of carbon in trees where carbn gets fixed in te leages and transported to other organs
6. The amount of NSC stored it is not important, what really matters is the turnovertime. (flux/pool\_size)

Modelled quantities

NSC ages/NSC transit times

At steady state

Trees are not in steady state and their response to stress causes a transient change in NSC age composition.

Changes in turnover time result in an alternative NSC age and NSC transit time relationship.

Measured qantities:

Response to boaz comments

There are at least two points that undermines the MSM approach.

1. Stressed trees use NSC reserves. We see in girdled trees and after hurricane that trees use older NSC to grow and respire. (I wonder if older respired CO2 in tree stems simply reflects reduction in growth respiration around the cambium that consumes fresh NSC, and greater proportion of maintenance respiration from older xylem.) But we still don't have 14C evidence for metabolic switching in less catastrophic and more common physiological states (I can only think of D'andrea et al. 2019 who showed remobilization of old NSC after late frost). In fact, Peltier et al. 2023 found that 10 years of drought halved NSC ages in tree stems. There is also no clear evidence of NSC reduction in stressed trees. Piper et al ([https://link.springer.com/article/10.1007/s40725-019-00109-z](https://nam12.safelinks.protection.outlook.com/?url=https%3A%2F%2Flink.springer.com%2Farticle%2F10.1007%2Fs40725-019-00109-z&data=05%7C02%7Cdavid.herreraramirez%40yale.edu%7C07b81e2b253c41b1053608dc8b7d16a1%7Cdd8cbebb21394df8b4114e3e87abeb5c%7C0%7C0%7C638538616595301658%7CUnknown%7CTWFpbGZsb3d8eyJWIjoiMC4wLjAwMDAiLCJQIjoiV2luMzIiLCJBTiI6Ik1haWwiLCJXVCI6Mn0%3D%7C0%7C%7C%7C&sdata=58L2Idm%2BDPlpikcQWuv1WCsxlBx72Z4PUGsAnq8GVHY%3D&reserved=0)) and Adams et al. ([https://www.nature.com/articles/s41559-017-0248-x](https://nam12.safelinks.protection.outlook.com/?url=https%3A%2F%2Fwww.nature.com%2Farticles%2Fs41559-017-0248-x&data=05%7C02%7Cdavid.herreraramirez%40yale.edu%7C07b81e2b253c41b1053608dc8b7d16a1%7Cdd8cbebb21394df8b4114e3e87abeb5c%7C0%7C0%7C638538616595312335%7CUnknown%7CTWFpbGZsb3d8eyJWIjoiMC4wLjAwMDAiLCJQIjoiV2luMzIiLCJBTiI6Ik1haWwiLCJXVCI6Mn0%3D%7C0%7C%7C%7C&sdata=ykqyPnR%2FTyG3CgahsDJ4CunSIIvvIZToK9C6%2Ba34yw4%3D&reserved=0)) didn't find a universal NSC decrease during stresses. Only Pinaceae trees show such universal reductions. Hence, because species differ in their NSC strategies, different MSM does not necessarily indicate stress.

2. Last in, first out, or any selectivity that causes to older metabolized NSC with stress. Also here the evidence is limited.

In summary, because we still don't know to tightly link between 14C ages and metabolic state of trees, the paper feels very theoretic. To keep it in similar shape, I will shorten it, and highlight the knowns and unknowns. Maybe you can combine the paper with your results from  Brazil, so you will have more evidence to base on? Tell me what you think.