

Incorporating roots into PlantFATE, a dynamic eco-evolution trait-based vegetation model

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Key Features of PlantFATE

Plant Functional Acclimation and Trait Evolution (PlantFATE) model

- 1. Eco-evolutionary Optimal Physiology
- 2. Trait-based Functional Diversity
- 3. Size-structured Demographics
- 4. Trait Evolution via Eco-evolutionary Dynamics

Current advantages

> Good predictability in new sites

Collaboration gradient

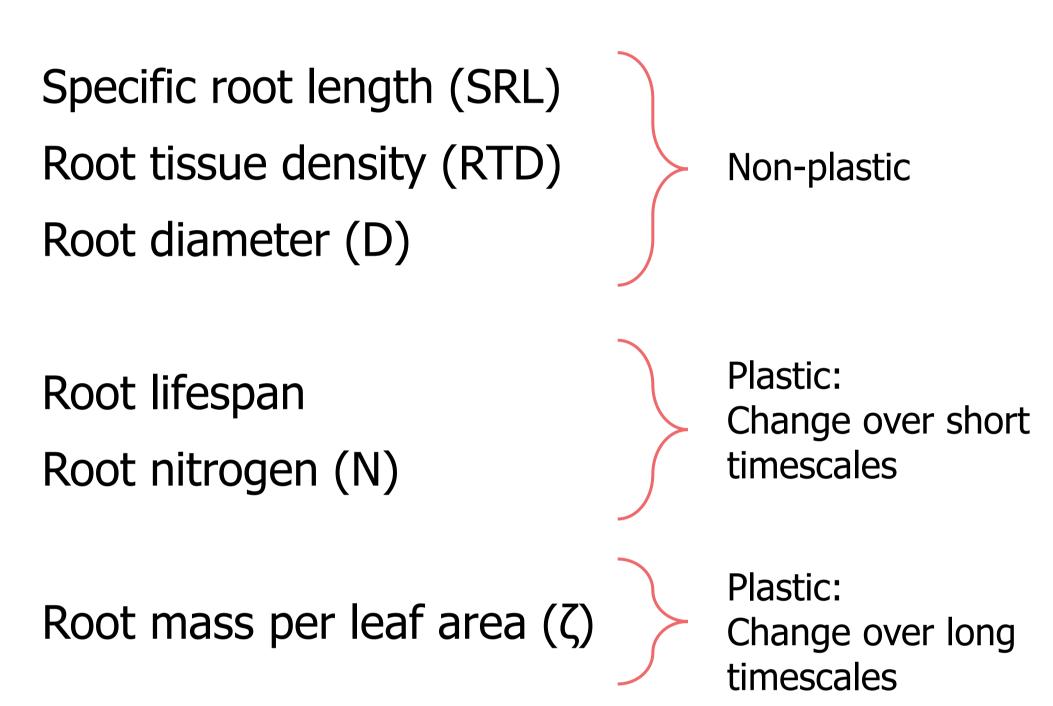
Conservation gradient

- > Can predict species adapted to future climate
- > Physiology well represented with new P-hydro model

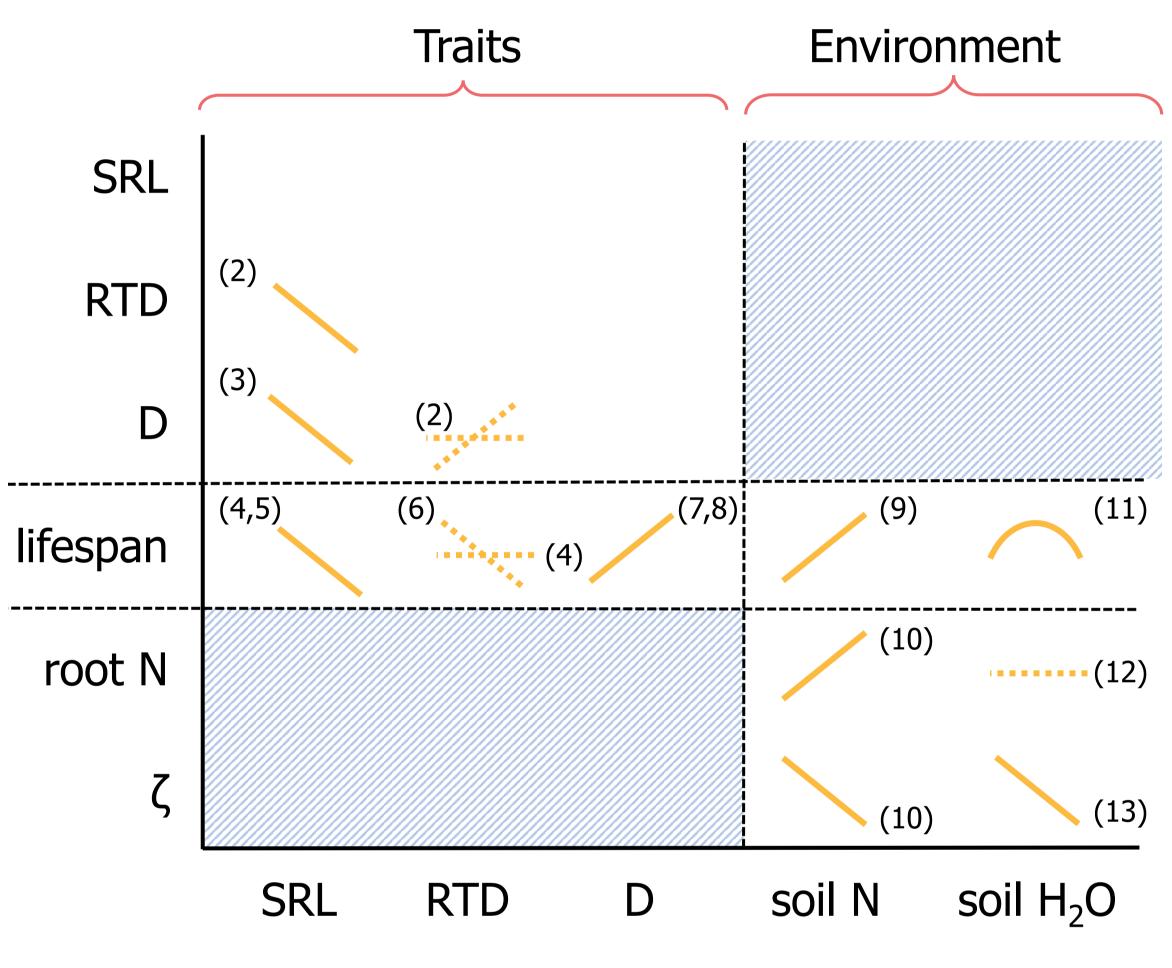
Next step: improved representation of roots

> Coupled with water basin model HS10.9 | Orals | Elisa Stefaniak et al. Fri, 19 Apr, 15:00-15:10 Room 2.15

Traits



Tradeoffs



BG3.38 | Orals | Jaideep Joshi et al.

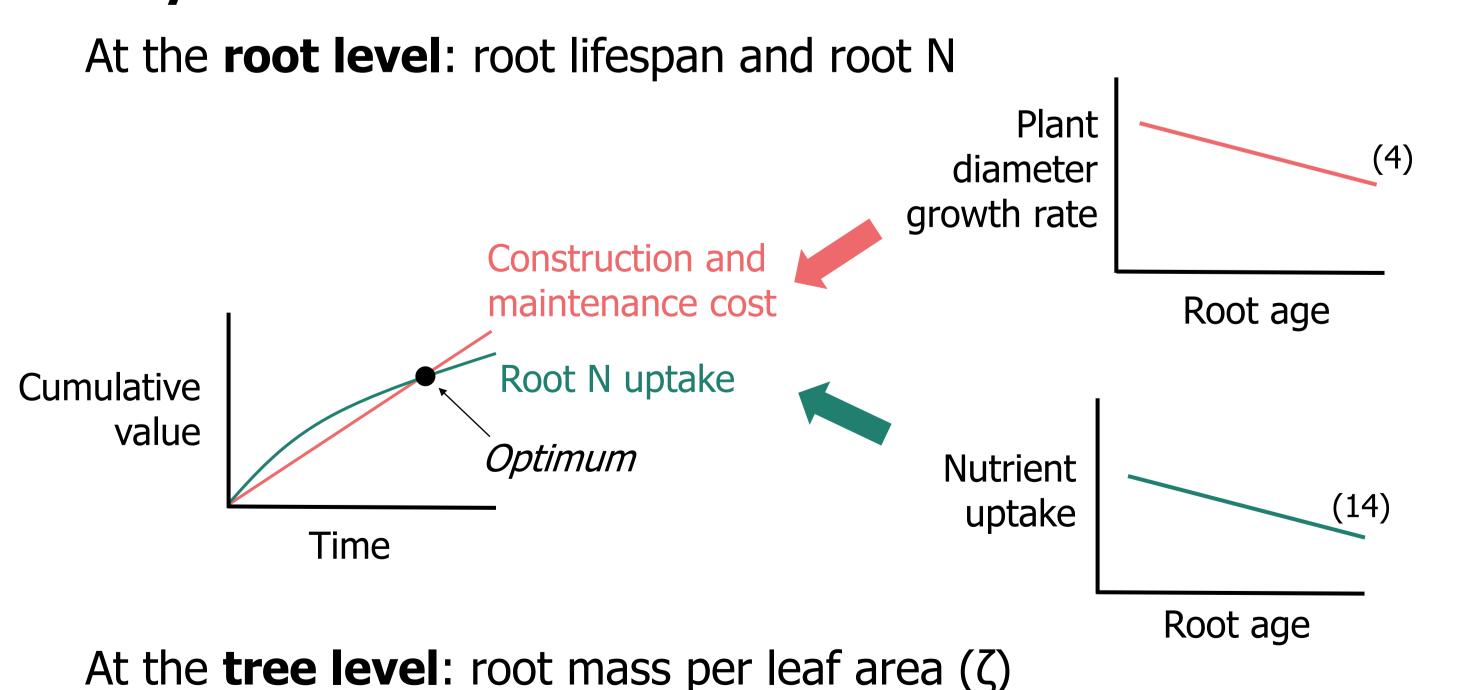
Fri, 19 Apr, 16:55-17:05 Room 2.95

We want your input!

Modelling Principles

1. **Geometric**: relationship between SRL and -D² (3)

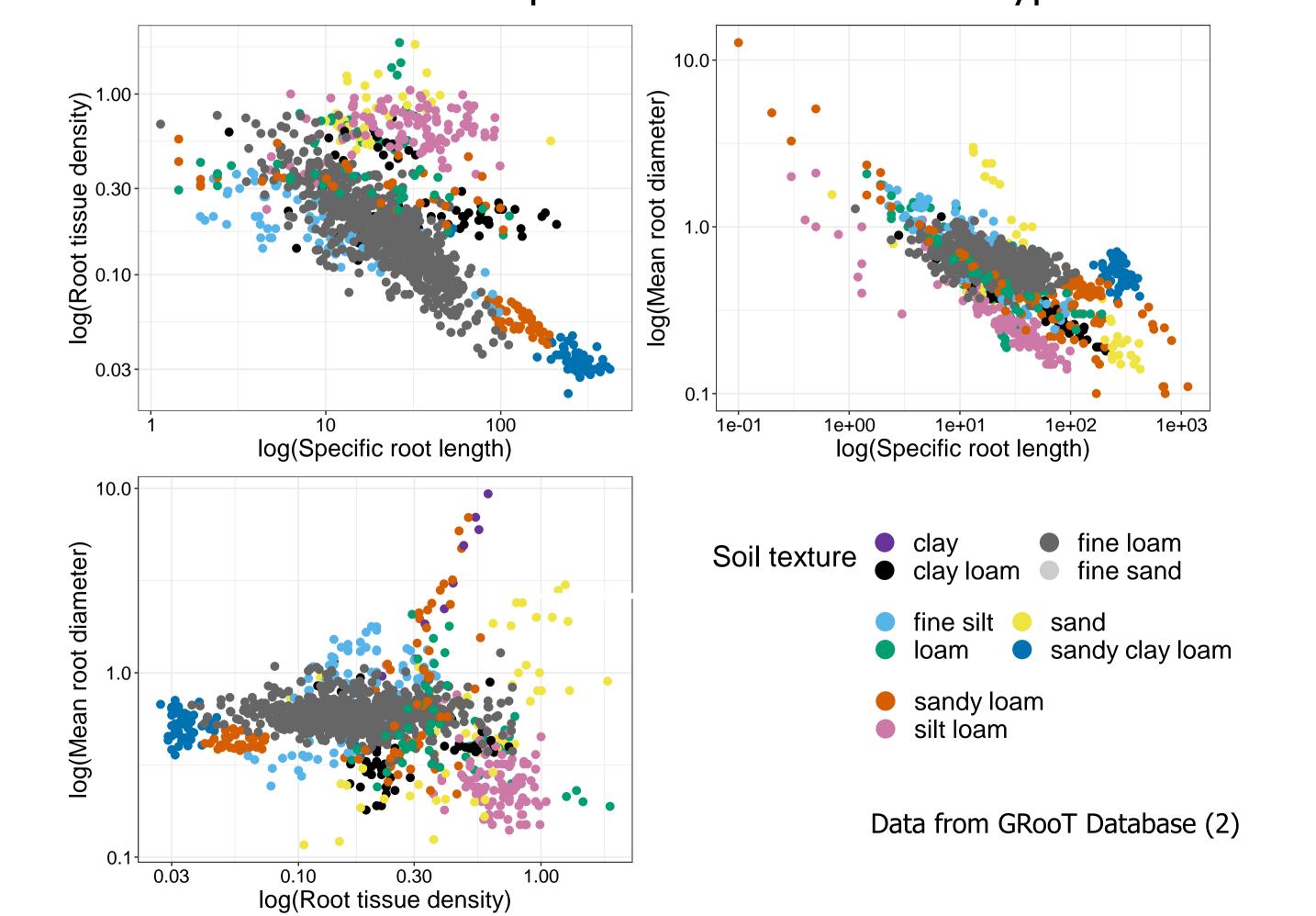
2. **Optimality**:



Data

"Do-it-yourself"

Correlation between RTD and SRL \rightarrow the 2-D collaboration-conservation gradient collapses to a 1D root economics spectrum within each soil type



"Outsourcing"

Fig. adapted from

Bergmann et al. 2020 (1)



Paper describing PlantFATE Joshi et al. 2023, BioRxiv



Add your thoughts to the page below:

- A. What determines root lifespan?
- B. Why do root traits behave differently in different soil types?

References: 1. Bergmann et al. 2020, Science Advances | 2. GRooT: Guerrero-Ramirez et al. 2021, Global Ecol & Biogeo | 3. Ostonen et al. 2007, Plant Biosys | 4. McCormack et al. 2012, New Phyt | 5. Weemstra et al. 2016, New Phyt | 6. Withington et al. 2006, Ecol Monographs | 7. Adams et al. 2013, Tree Physio | 8. Wang et al. 2021, Chin J Plant Ecol | 9. Burton et al. 2000, Oecologia | 10. Li et al. 2015, SBB | 11. McCormack & Guo 2014, Front Plant Sci | 12. Zhang et al. 2022, J Plant Growth Reg | 13. Brunner et al. 2015, Front Plant Sci | 14. Wells & Eissenstat 2003, J Plant Growth Reg

3. **Evolution**: D or SRL, in response to environmental conditions in the long term