



THE 1<sup>ST</sup> INTERNATIONAL SUMMER SCHOOL ON ADVANCED SOIL PHYSICS

**MODELING WATER FLUXES IN THE SOIL-PLANT SYSTEM**

# MODELLING WATER FLUXES IN ROOT SYSTEMS - MARSHAL

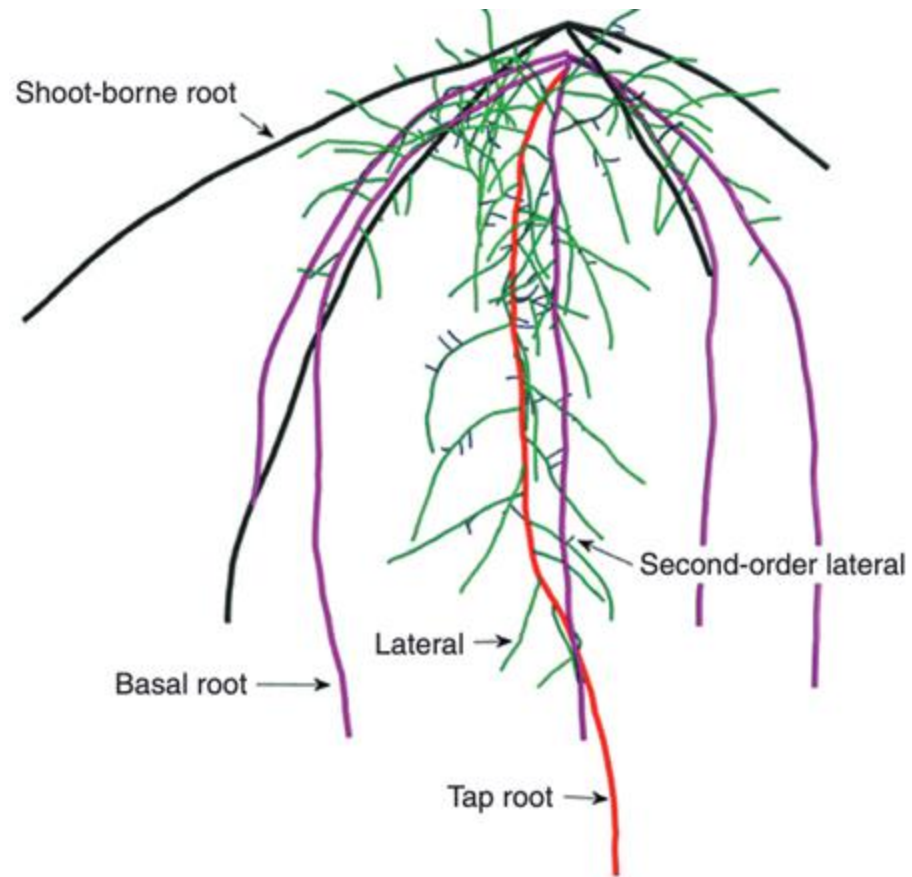
Félicien Meunier

 **UCLouvain**

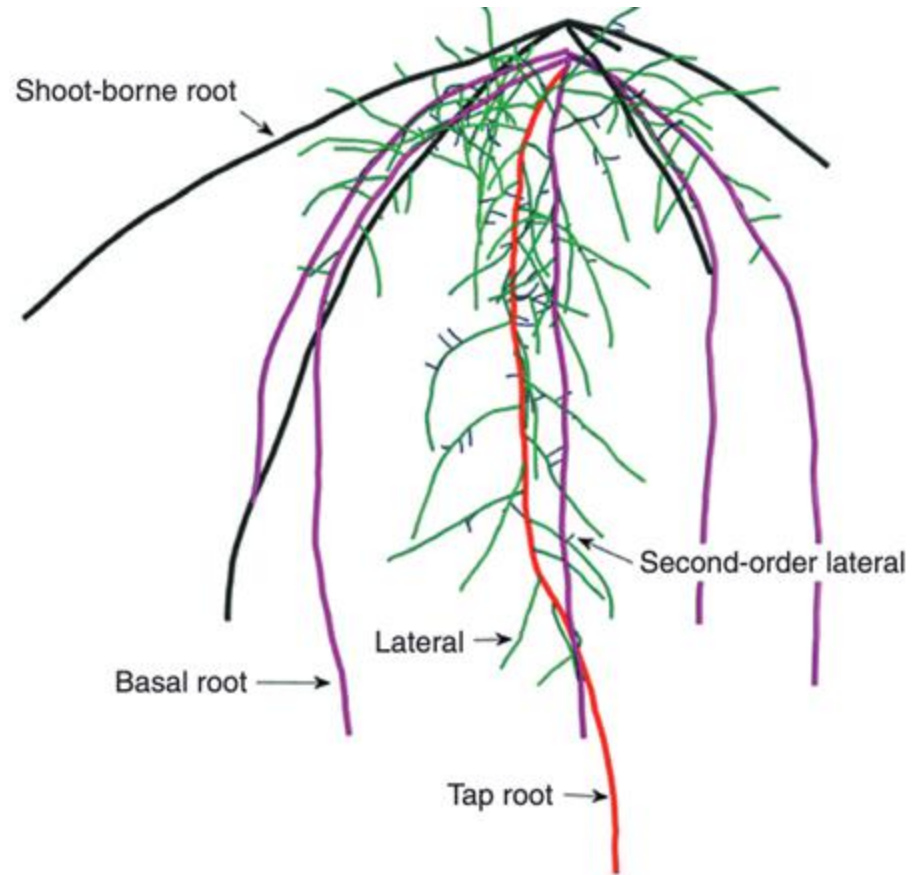


**ENVITAM**

## Root system architecture

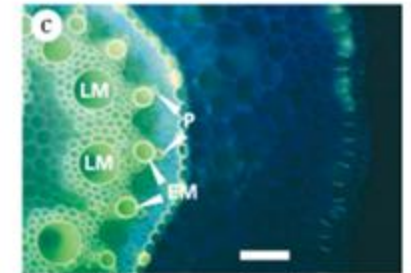
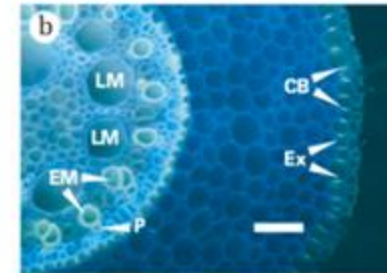
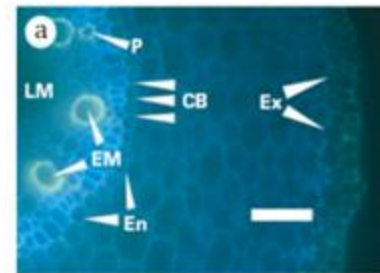
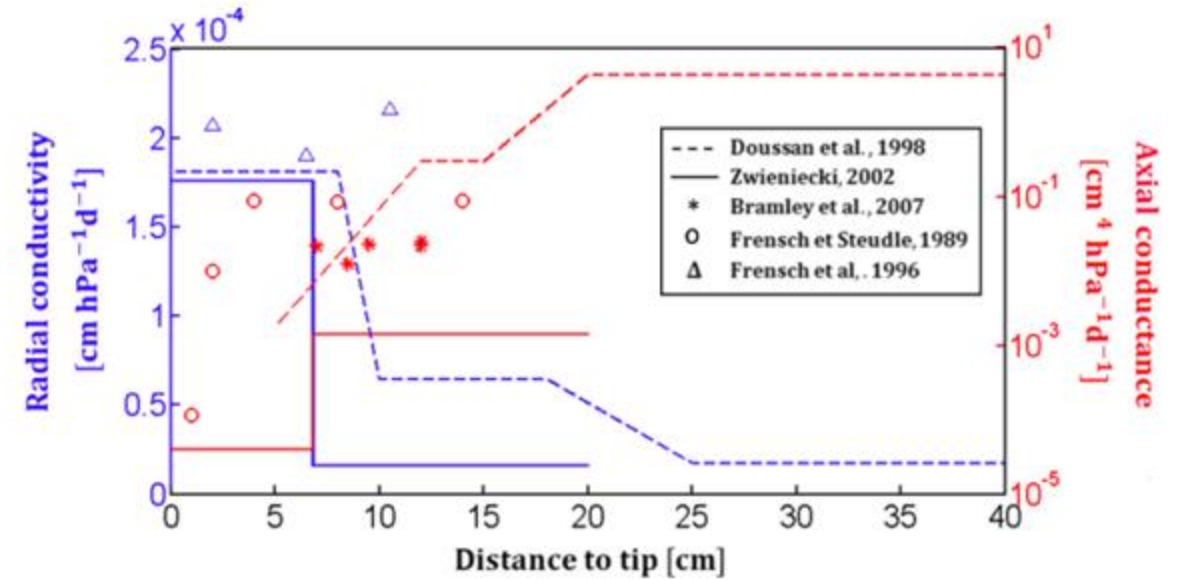


## Root system architecture



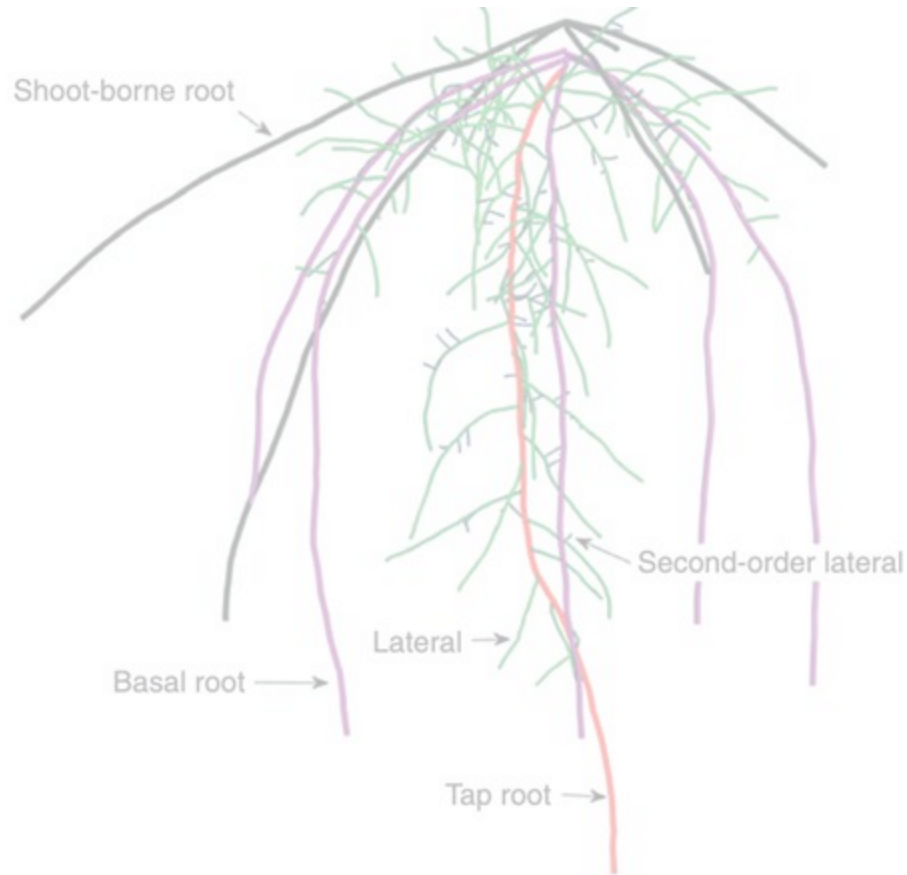
X

## Root hydraulics



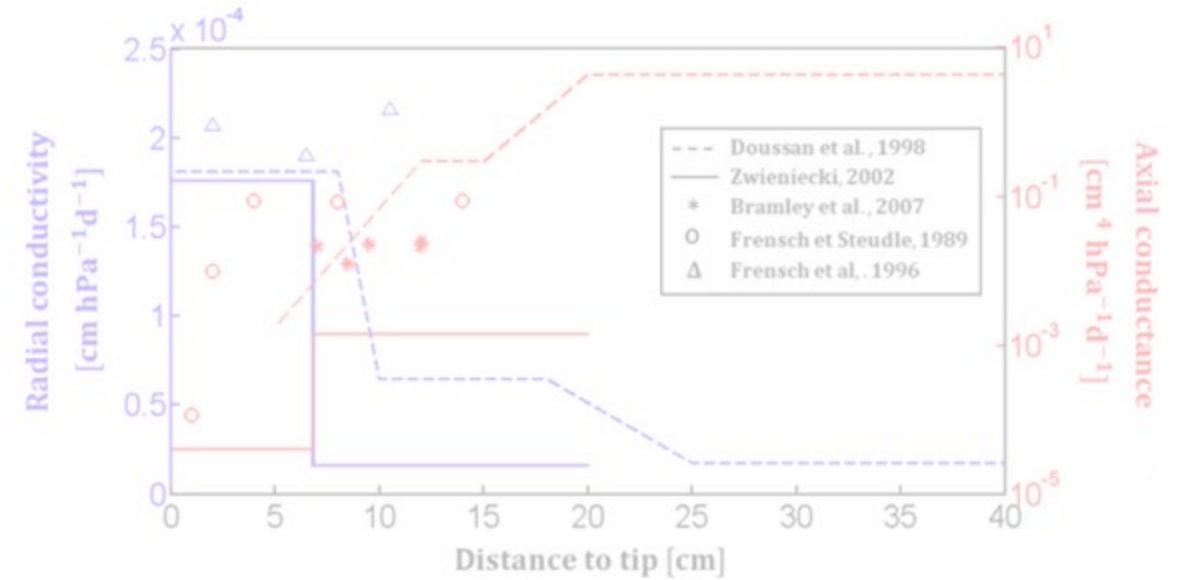


## Root system architecture

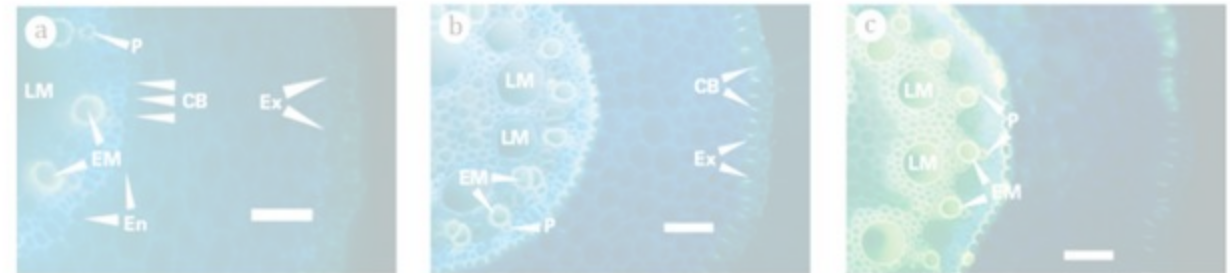


- Root system architecture  
e.g. from CPlantBox
- Root growth parameters  
e.g. for CPlantBox

## Root hydraulics



X

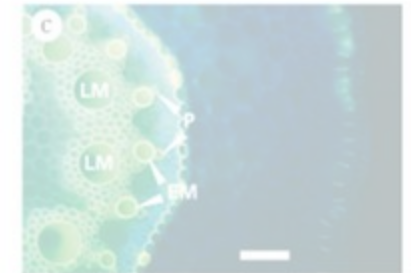
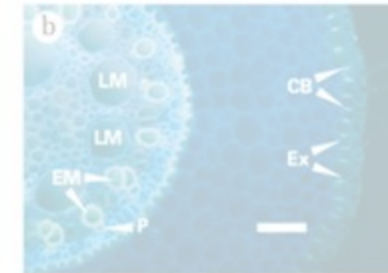
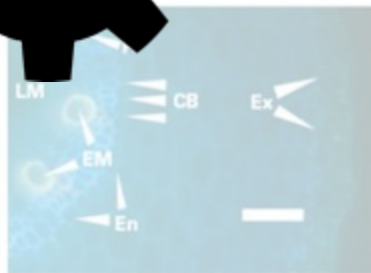
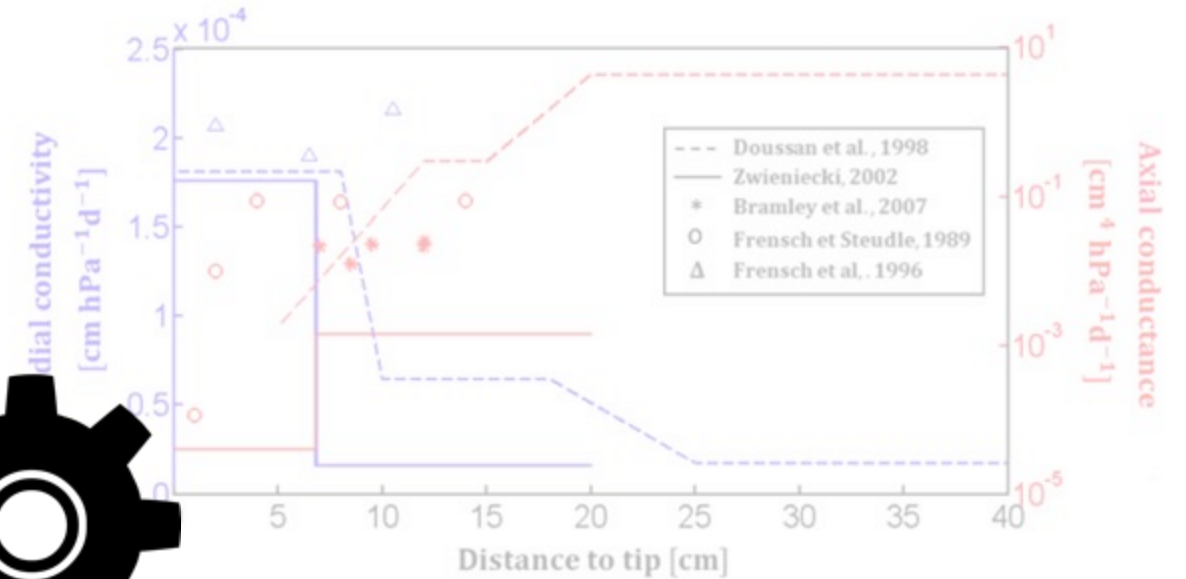
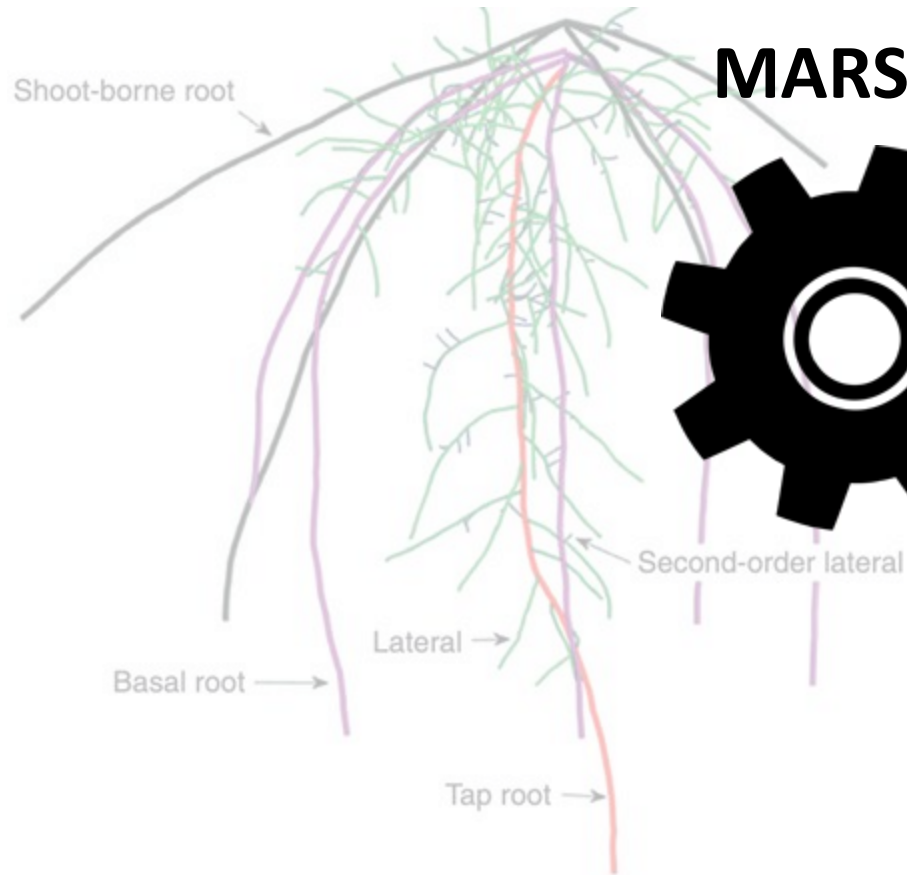


- Radial conductivity =  $f(\text{age, type})$
- Axial conductivity =  $f(\text{age, type})$

## Root system architecture

## Root hydraulics

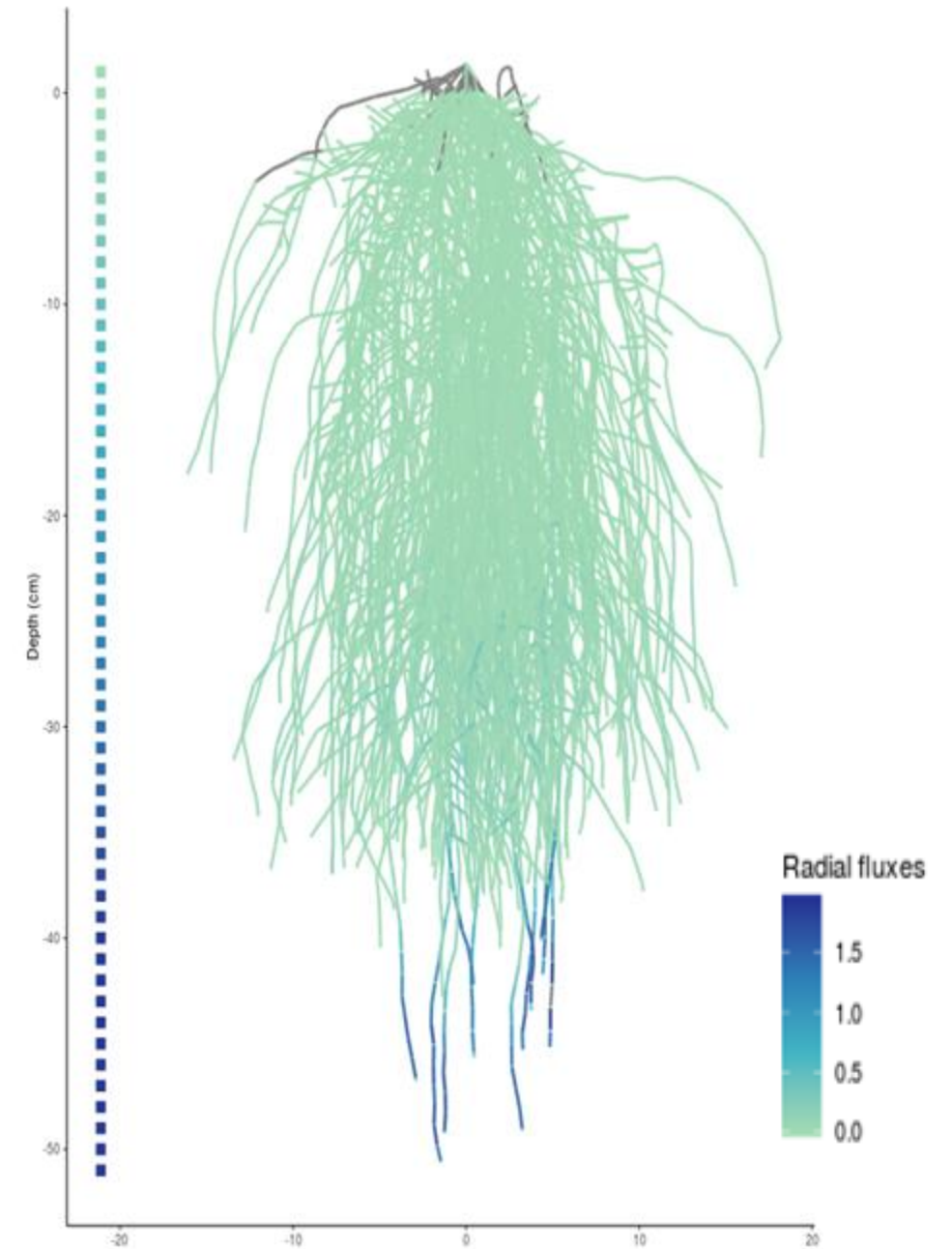
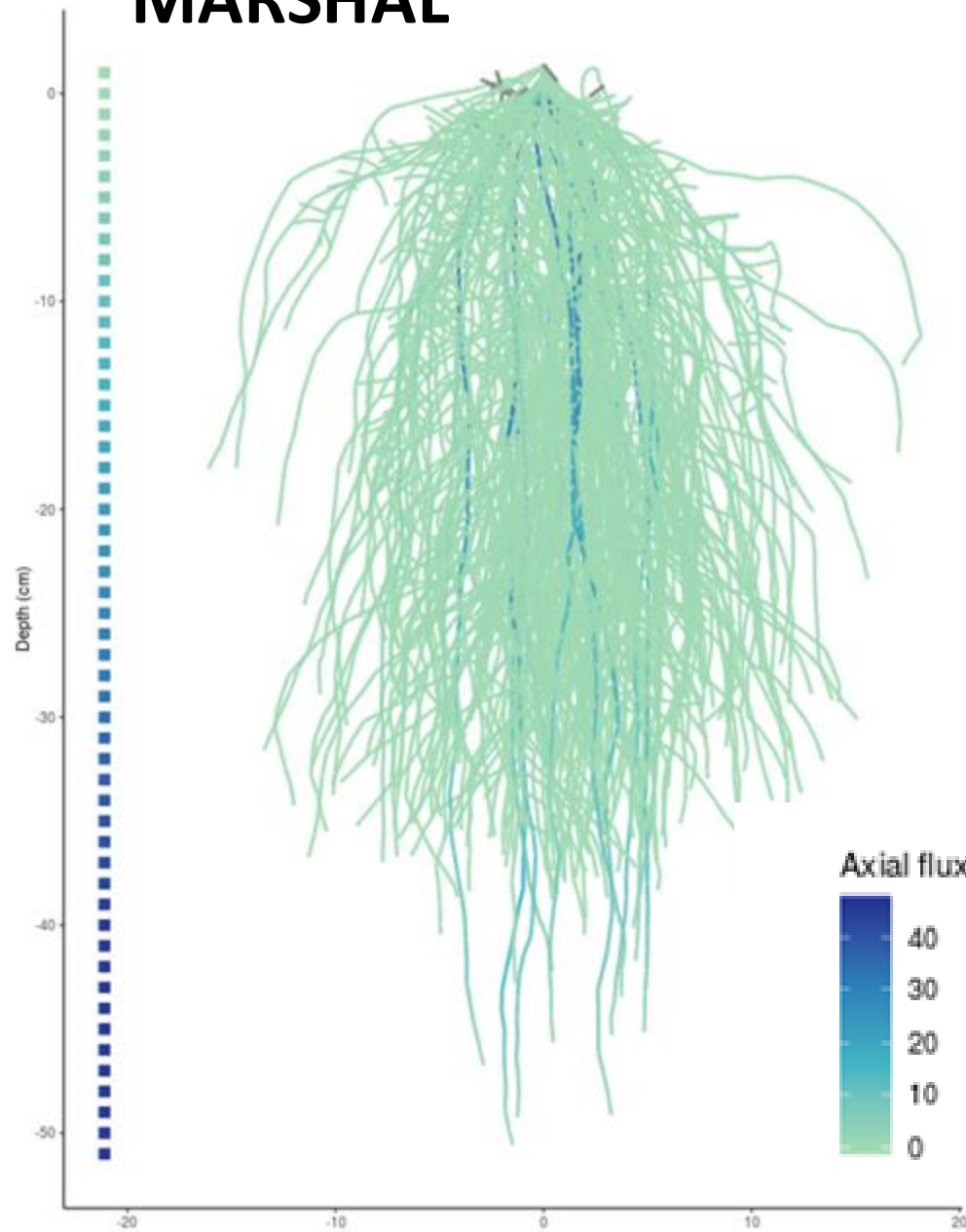
# MARSHAL



- Root system architecture (xml)  
e.g. from CPlantBox
- Root growth parameters  
e.g. for CPlantBox

- Radial conductivity =  $f(\text{age, type})$
- Axial conductivity =  $f(\text{age, type})$

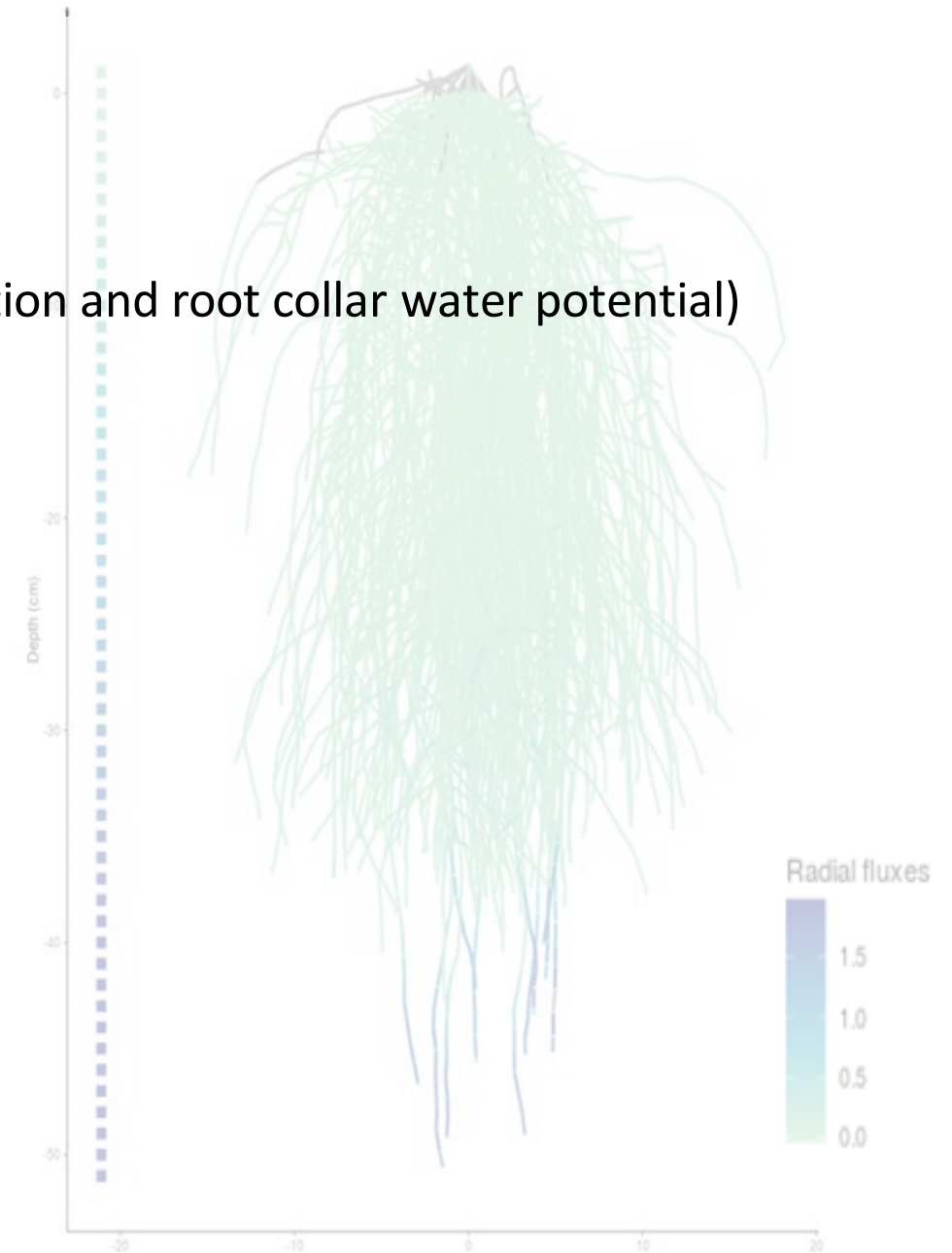
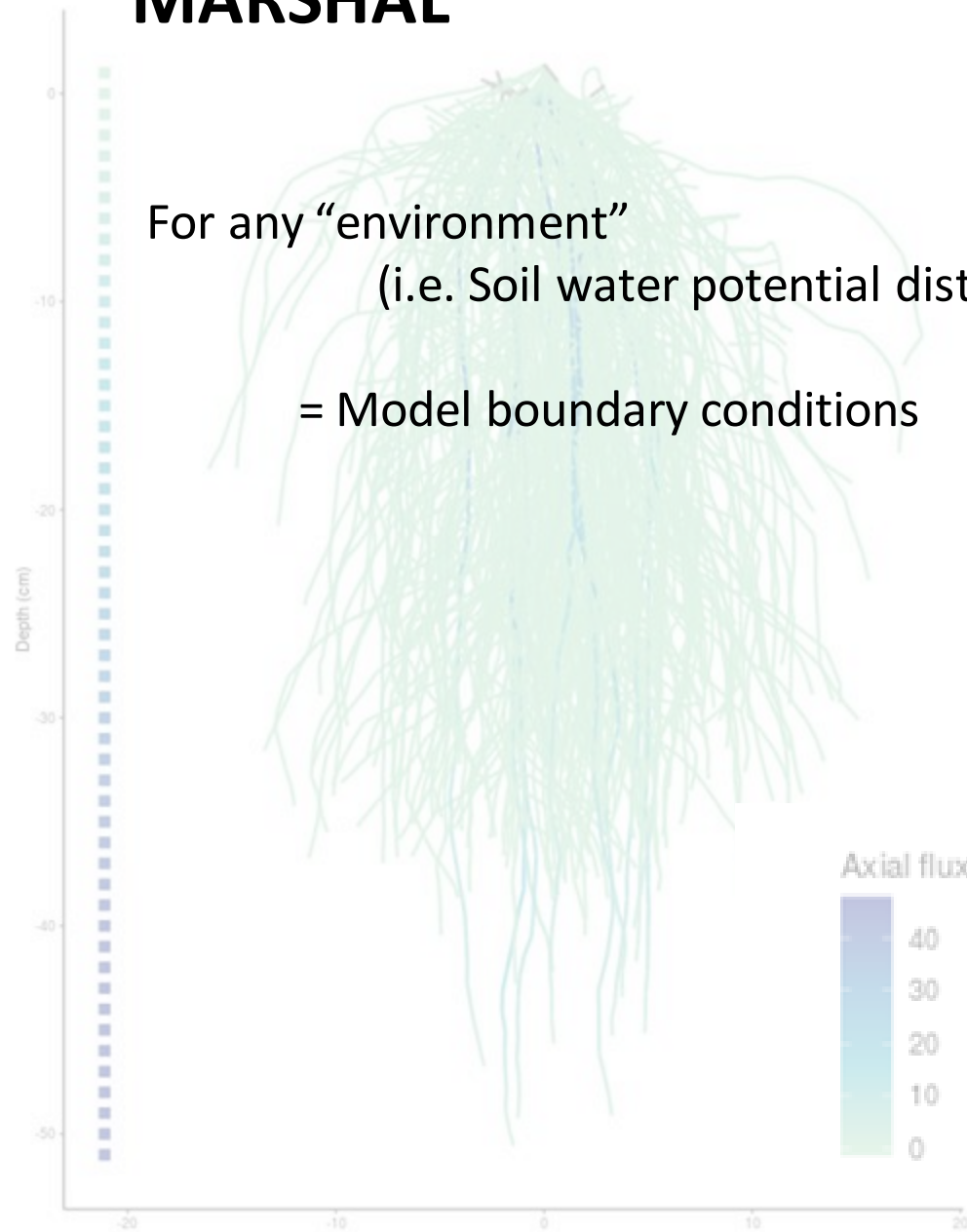
# MARSHAL



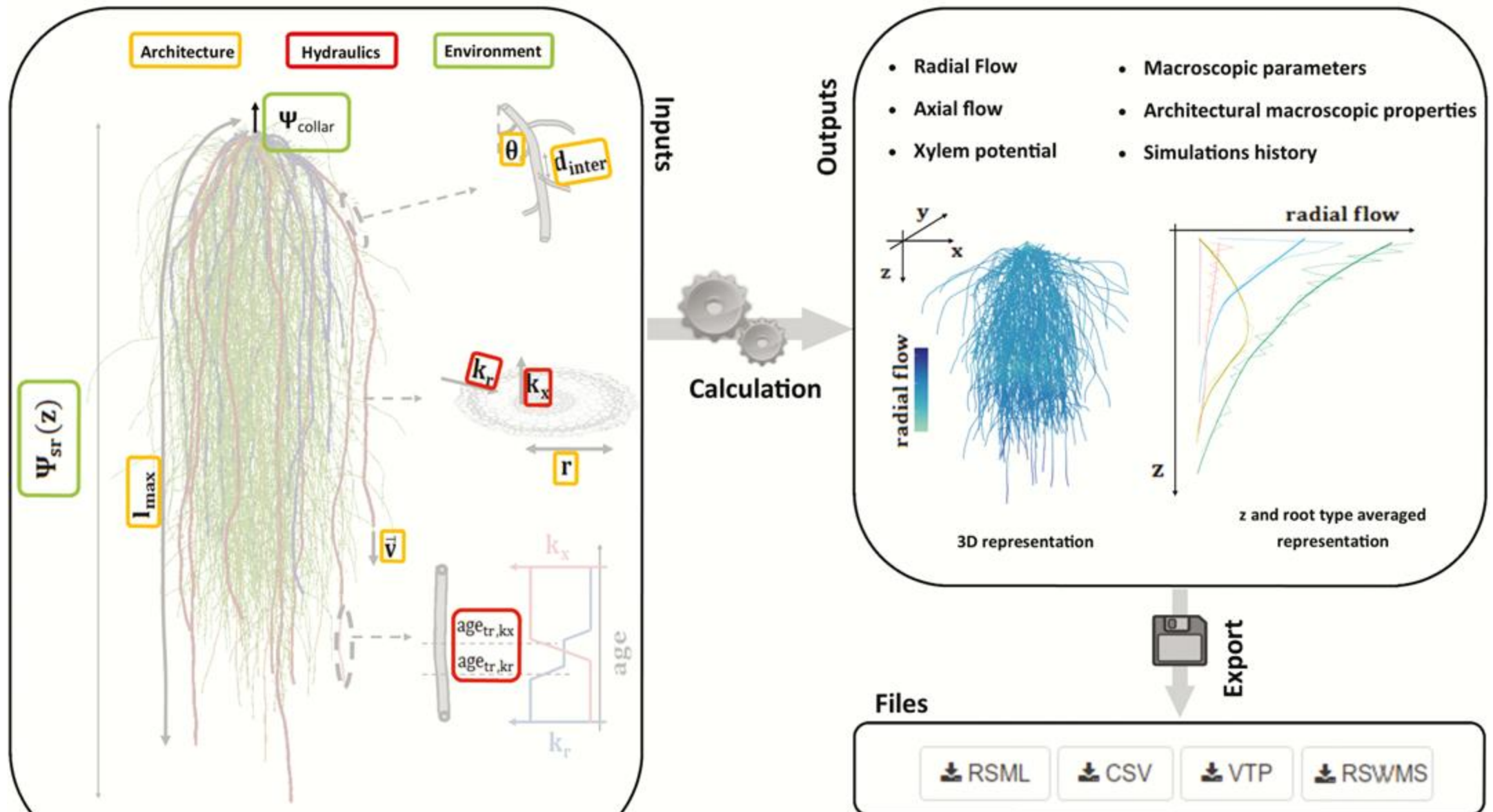


# MARSHAL

For any “environment”  
(i.e. Soil water potential distribution and root collar water potential)  
= Model boundary conditions

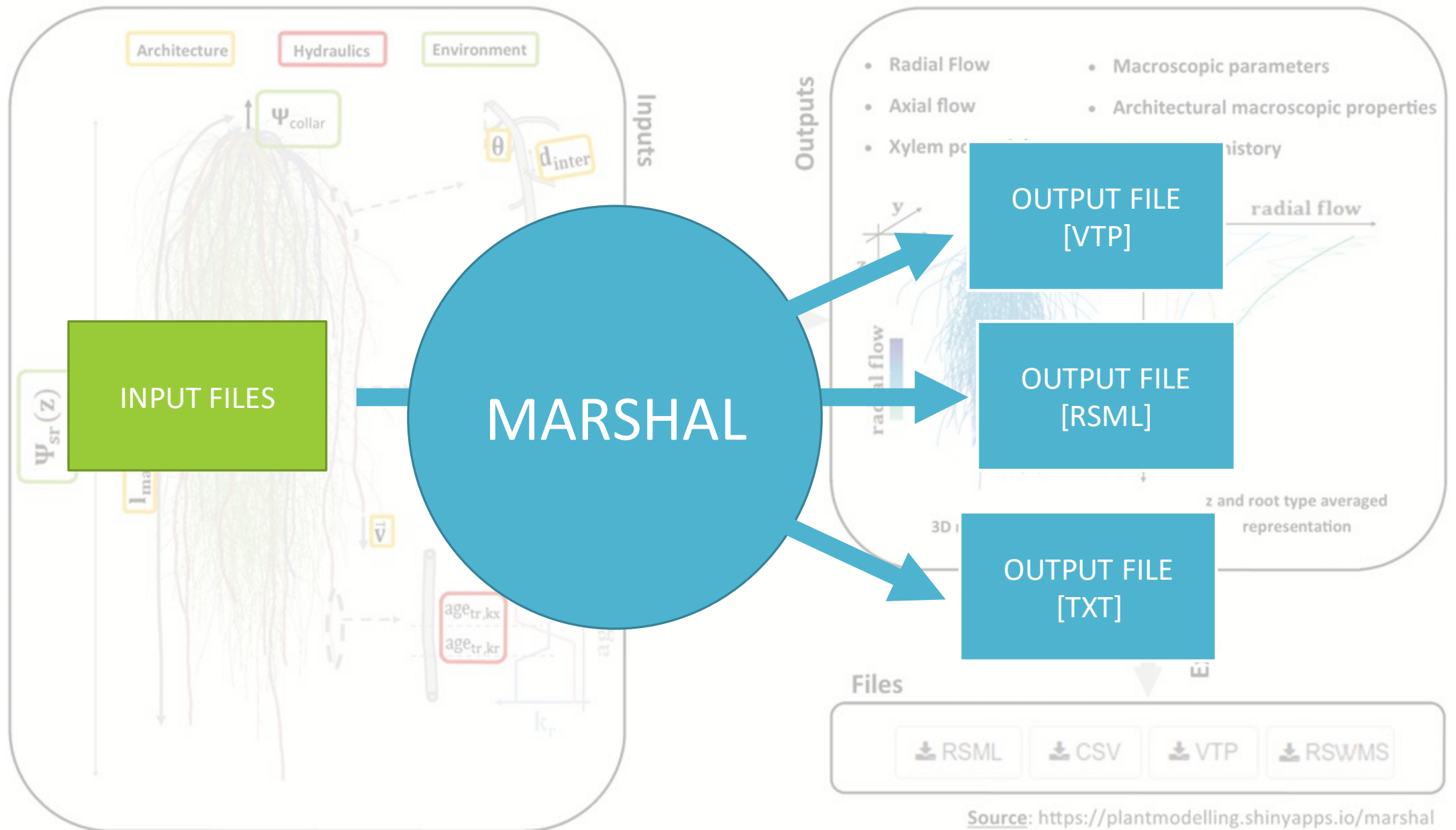


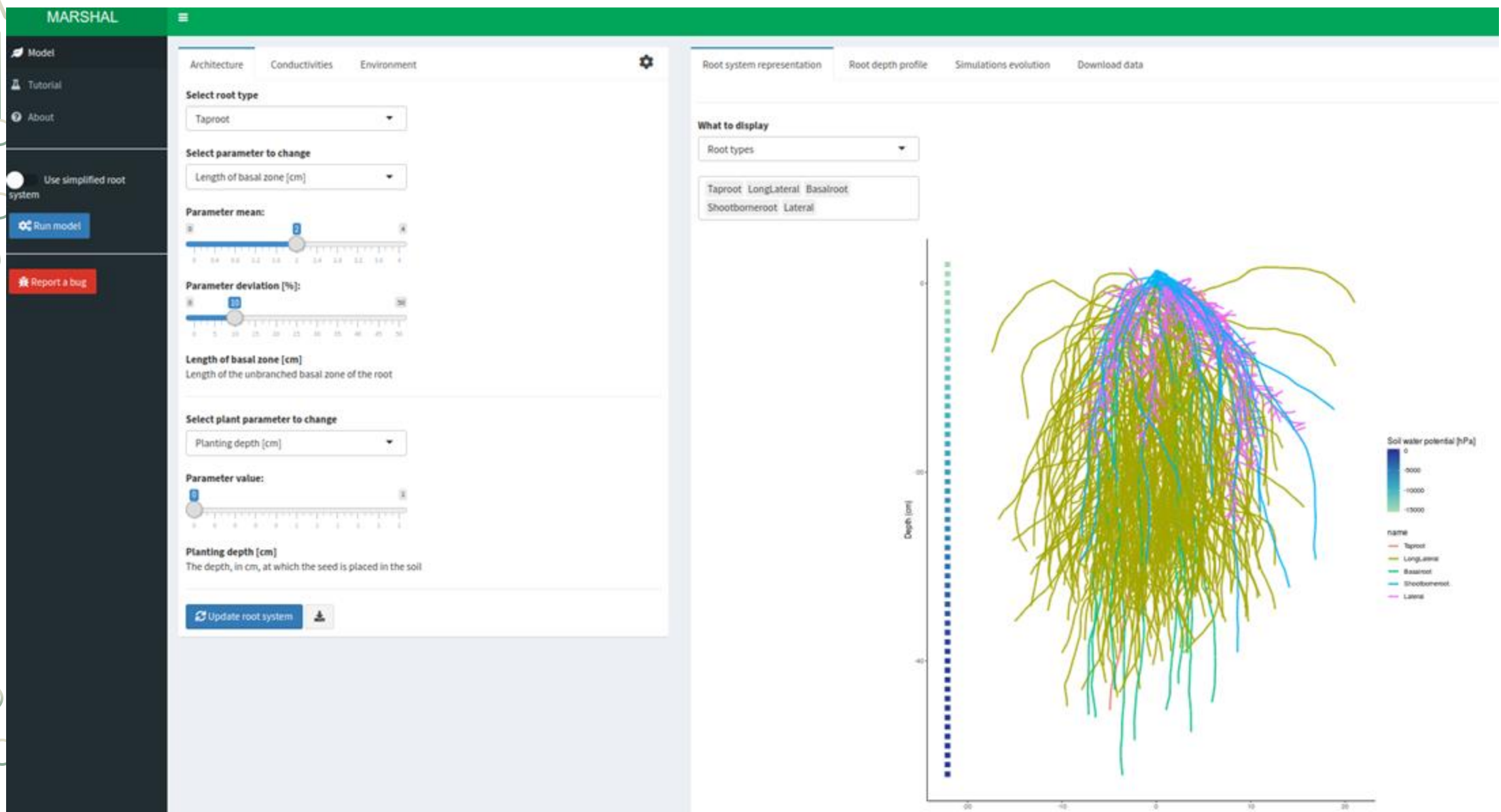
# MARSHAL



Source: <https://plantmodelling.shinyapps.io/marshall>







# EXERCISE

<https://github.com/water-fluxes/day-3-plant-scale-marshall>

<https://plantmodelling.shinyapps.io/marshall>

- Try to web interface to play with the parameters
- Run the jupyter notebook in binder
- Try plotting the model inputs/outputs
- Try modifying the parameters directly in the input files
- Generate one specific root system hydraulic architecture for every group (see printed documents), and its extract macroscopic parameters