

# How Plant Roots Take Up Soil from Water

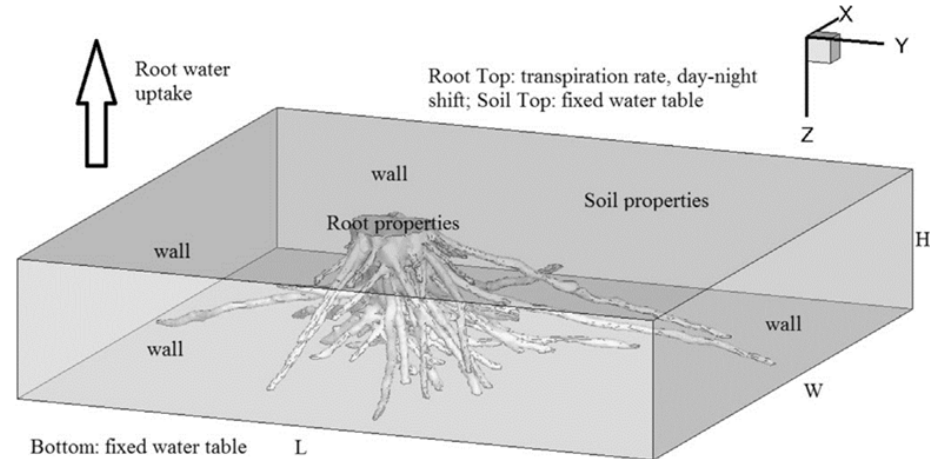
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## Objective

- Overcome the enduring challenge of imaging and modeling root water systems in the rhizosphere, a vital realm of plant-atmosphere interaction.
- Demonstrate a new coupled imaging-modeling approach that simulates realistic flow and transport scenarios in the rhizosphere.

## New Science

- Combines X-ray Computed Tomography for scanning the root specimen with three newly integrated tools: outside software (CT Pro CD), open-source software (RooTrak), and PNNL-developed code.
- Creates a utilitarian and realistic pore-scale model by modifying the Navier-Stokes equation.



The computational domain (0.03 m x 0.03 m x 0.0063 m) and the simulation setup. The three-dimensional root structure, with the same imaging resolution, is in the middle, surrounded by soils.

## Significance

- Demonstrates a realistic platform for investigating rhizosphere flow processes that could support process understanding from the scale of a single plant to vegetation scales.
- The same integrative imaging-modeling method could also simulate more realistic root water uptake scenarios, easing comparisons to laboratory results, and therefore improving process understanding.