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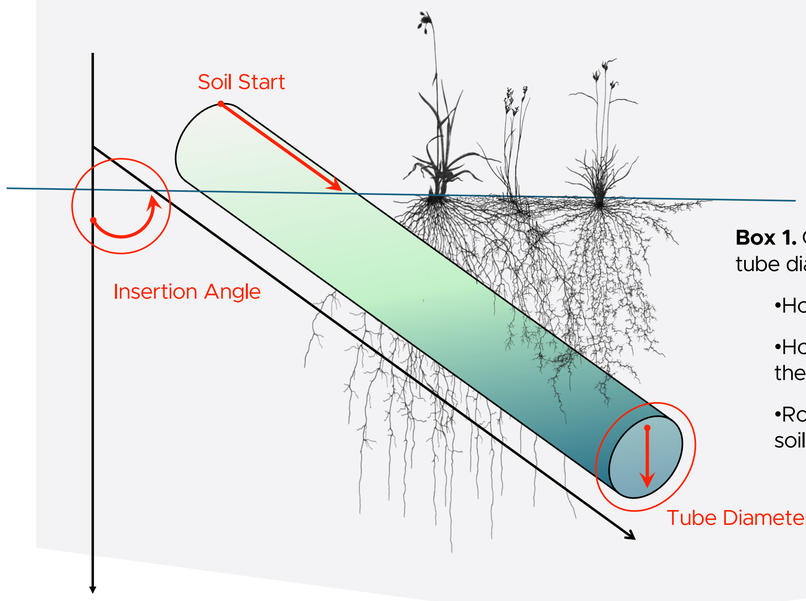
Quantifying Minirhizotron's Internal Root Prevalence Bias

A simple problem, a simple calibration solution – **Call to Action !**

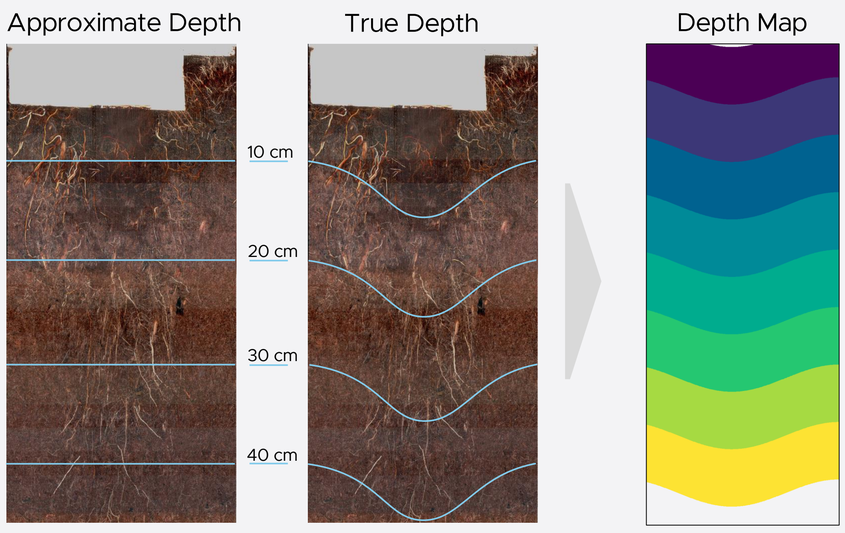
OUR Problem



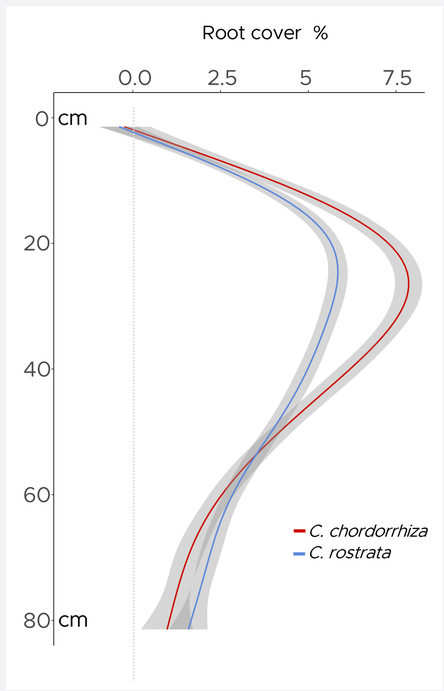
Box 1. Changing the insertion angle and tube diameter affects:

- How depth is displayed in the image
- How plants grow and interact with the tube surface
- Root distribution estimates (requires soil start calibration)

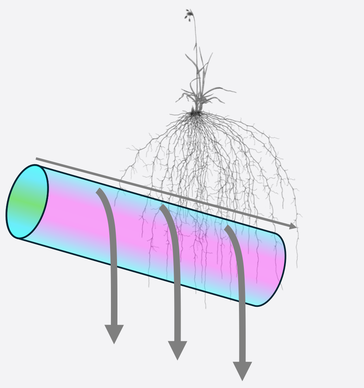
Box 2a. We can improve depth accuracy beyond the usual method. By considering factors like insertion angle, tube size, and where the soil starts, we can calculate specific depths for each part of the scan. To do this, we use a method called the "Phase-Shifted Amplitude-Adjusted Sine-Wave-Mapping Scheme." Knowing the soil's starting position is helpful. Below, we show a simplified version of the depth map to explain how depths are distributed.



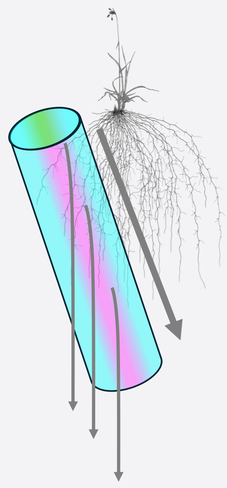
Box 2b. By using accurate depth measurements, we can better estimate root distributions across custom depth intervals. This figure shows a smooth curve (GAM) of root distributions from two plant groups in a sedge wetland at Oulanka National Park, Finland.



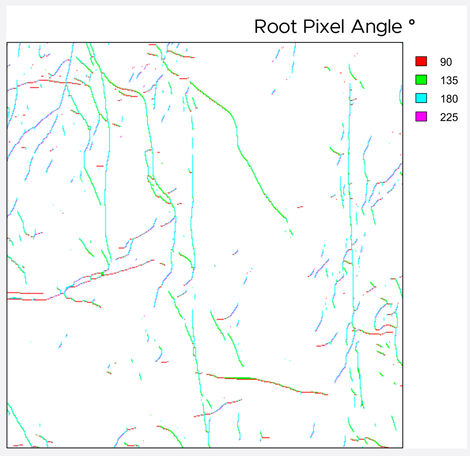
Box 3a. Roots grow differently on the tube surface depending on the tube's angle and size. By checking root growth angles, we can understand their behavior. This also helps us count how many roots grow straight down quickly—but only if the insertion angle is reported accurately.

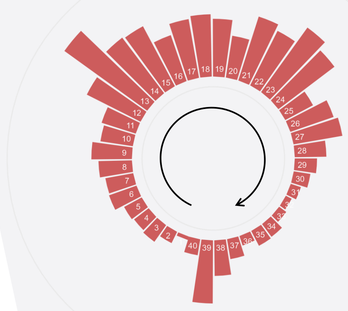


Fastest angle downward: 135° & 225°



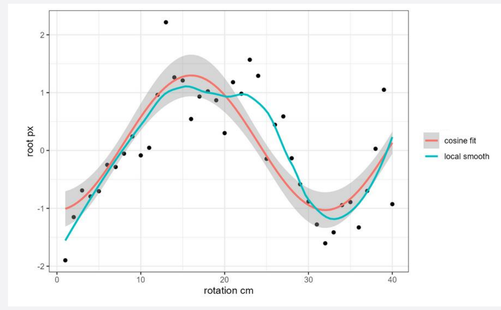
Fastest angle downward: 180°





Box 3b. Roots often grow more on the top of the tube than underneath. The image on the left shows a full scan rotation in 0.5 cm steps.*

We can measure this top-side growth by comparing sine wave patterns in the data. If we notice a rotational bias, we might be able to identify the starting position of scanners in older images.



*Analysed with R Package *MinirhizotronR* available at: https://github.com/jcunow/MinirhizotronR

YOU ARE The Solution

Get involved !

Find guidelines here

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Minirhizotron Bias

Calibrate your Scans

Note these parameters:

- Insertion Angle
- Tube Diameter
- Rotation Start
- Soil Start
- DPI
- ...

Let's re-analyse your scans and see how much bias we can find....