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Erratum

Core Idea

- The image size captured by the minirhizotron camera needs to be calibrated.

Erratum to "Construction of Minirhizotron Facilities for Investigating Root Zone Processes" and "Parameterization of Root Water Uptake Models Considering Dynamic Root Distributions and Water Uptake Compensation"

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Root counts and root lengths determined in minirhizotron images need to be normalized by the image area. To do so in our publications (Cai et al., 2016, 2018), in which we used a minirhizotron camera (Barth Technology Corporation), we used the values of 13.5 mm (width) and 18 mm (length) suggested by Bartz (Cahill et al., 2010; Trager and Wilson, 2017). However, these values are applicable when rhizotubes of the same inner and outer diameters as the ones that are sold by Bartz are used. Because we used rhizotubes with slightly different diameters, we should have recalibrated the image size. Calibration showed that the actual image size in our setup was 16.5 mm (width) by 23.5 mm (length). For the calibration, a piece of paper with grid lines (5 by 5 mm) was wrapped on a rhizotube which was the same tube that is used in our rhizotron facilities. A picture was taken from the inside of the rhizotube using the camera. The actual captured size of the picture was subsequently obtained by measuring the grids in millimeters. The pixels per millimeter (PPMM) value was determined as

$$\mathrm{PPMM} = \sqrt{\frac{\mathrm{pixel\_width} \times \mathrm{pixel\_length}}{\mathrm{width} \times \mathrm{length}}}$$

Root length in the images analyzed by Rootfly (Wells and Birchfield, 2009) was converted from pixels to millimeters by that PPMM value. Before calibration, the PPMM value was 397.8, and after calibration it was 314.9. Therefore, all our published root length values that were obtained using Rootfly need to be corrected according to the new PPMM.

The root counts per unit image area (here denoted as *root density*) were corrected according to the new image area:

$$\begin{aligned}\mathrm{root\ density}' &= \mathrm{root\ density}\frac{\mathrm{width} \times \mathrm{length}}{\mathrm{width}' \times \mathrm{length}'} \\ &\approx \mathrm{root\ density} \times 0.6\end{aligned}$$

where variables without and with a prime denote the information before and after calibration, respectively. Root length density (RLD) described by Cai et al. (2018) was estimated by two different methods. In the first method, corrected RLD′ was obtained from the published RLD as

$$\begin{aligned}\mathrm{RLD}' &= \mathrm{RLD}\frac{\mathrm{PPMM}}{\mathrm{PPMM}'}\frac{\mathrm{width} \times \mathrm{length}}{\mathrm{width}' \times \mathrm{length}'} \\ &= \mathrm{RLD}\sqrt{\frac{\mathrm{width} \times \mathrm{length}}{\mathrm{width}' \times \mathrm{length}'}} \approx \mathrm{RLD} \times 0.8\end{aligned}$$

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In the second method, the corrected RLD′ was obtained as

$$\mathrm{RLD}' = \mathrm{RLD}\frac{\mathrm{width}}{\mathrm{width}'} \approx \mathrm{RLD} \times 0.8$$

Therefore, a factor of 0.8 was used to correct RLD and total root length under a horizontal unit soil surface in Cai et al. (2018). The corrections are conducted in corresponding places in the two published papers below.

Construction of Minirhizotron Facilities for Investigating Root Zone Processes

First paragraph of the Methods section "Root Measurements in Rhizotubes"

"A digital camera with a visible frame of 13.5 mm (vertical) by 18 mm (horizontal) was used to capture the root images from both the left and right sides of the rhizotubes" should be replaced by "A digital camera with a visible frame of 16.5 mm (vertical) by 23.5 mm (horizontal) was used to capture the root images from both the left and right sides of the rhizotubes."

Second paragraph, third paragraph, last paragraph, Fig. 8, 9, 10, and 11 of the Results and Discussion section "Root Development and Distribution"

The phrase "roots were counted in 120 13.5- by 18-mm images" should be replaced by "roots were counted in 120 16.5- by 23.5-mm images."

"The SEM is around 0.06 counts cm^{-2} in the upper facility ..." should be replaced by "The SEM is around 0.04 counts cm^{-2} in the upper facility ...".

"the SEM was larger and reached up to 0.12 counts cm^{-2} at the 60- and 80-cm depth" should be replaced by "the SEM was larger and reached up to 0.07 counts cm^{-2} at the 60- and 80-cm depth."

"around 0.75 counts cm^{-2} in the sheltered and rainfed plots and 1.1 counts cm^{-2} in the irrigated plot" should be replaced by "around 0.45 counts cm^{-2} in the sheltered and rainfed plots and 0.66 counts cm^{-2} in the irrigated plot."

The values of root density in Fig. 8, 10 (left), and 11 should be rescaled by 0.6, whereas the values in Fig. 9 should be rescaled by 0.6^2 (0.36) according to the definition of a variogram.

Parameterization of Root Water Uptake Models Considering Dynamic Root Distributions and Water Uptake Compensation

Second paragraph of the Methods section "Measurements"

"The images with a size of 13.5 by 18 mm were analyzed by Rootfly" should be replaced by "The images with a size of 16.5 by 23.5 mm were analyzed by Rootfly."

Sixth paragraph of the Results and Discussion section "Optimized Parameters of the Two Root Water Uptake Models"

Total root length under a unit horizontal surface was obtained based on RLD values and the given rooting depth. Thus, the total root length has to be corrected according to the corrected RLD′ values. Therefore, "the calculated total root length per plant in Week 8 when roots were first observed at 80 cm was 47.20 and 5.77 m from observed lengths and observed impacts, respectively" should be replaced by "the calculated total root length per plant in Week 8 when roots were first observed at 80 cm was 37.76 and 4.62 m from observed lengths and observed impacts, respectively", and "the root hydraulic conductance per unit root length was 1.23×10^{-8} and 1.01×10^{-7} cm h^{-1} for Week 8" should be replaced by "the root hydraulic conductance per unit root length was 1.54×10^{-8} and 1.26×10^{-7} cm h^{-1} for Week 8."

Because normalized RLD was used in both the Feddes and Couvreur models, there was no effect on the inverse modeling and the simulation of root water uptake.

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