Supplementary material to "How do roots interact with layered soils?"

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1. Introduction

This document presents images of root growth and graphs of void ratio and root volume ratio versus elevation, for:

- 2 samples, A (gravel on top) and B (clay on top),
- 5 different images, on days 1, 4, 8 11, and 15, after germination, and
- 3 different classifiers used for image segmentation, based on machine learning, which were trained using 5%, 10% and 20% of the images for each sample.

The void ratio and root volume ratio are calculated for Regions of Interest (ROI) of varying sizes, corresponding to laminar cylinders of radii 3.5 mm, 7.1 mm, 10.6 mm and 14.1 mm around the root, for each depth, along with a global measurement where the ROI is equal to the whole container.

2. Root growth images

Figure S1, Figure S2 and Figure S3, demonstrate root growth for sample A, when 5%, 10% and 20% of all images were used to train the image classifier. The following Figure S4, Figure S5, and Figure S6 demonstrate root growth for sample B, when 5%, 10% and 20% of all images were used to train the image classifier.

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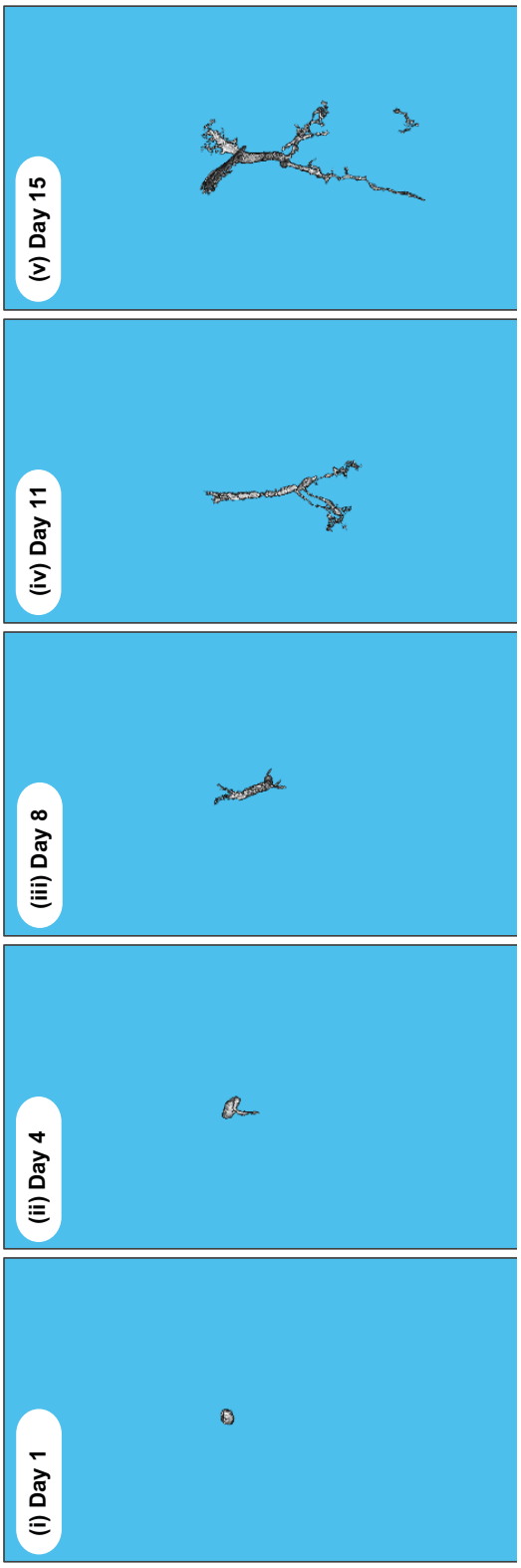

Figure S1: Root growth in sample A with time using the classifier trained based on 5%.

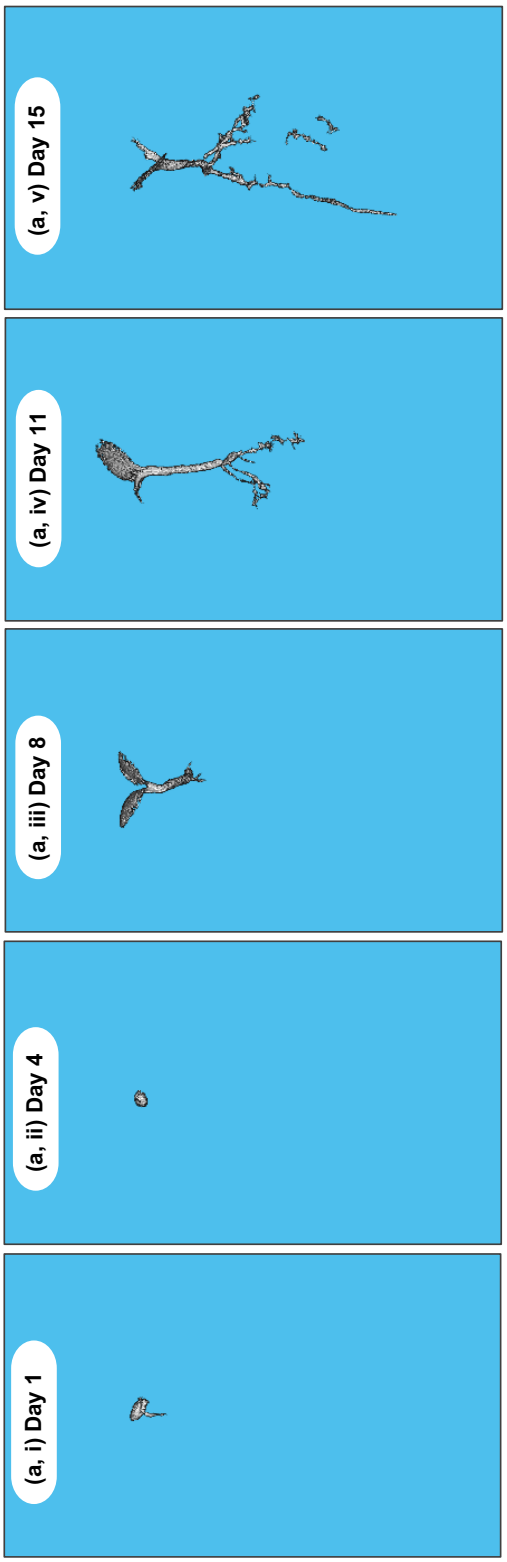

Figure S2: Root growth in sample A with time using the classifier trained based on 10%.

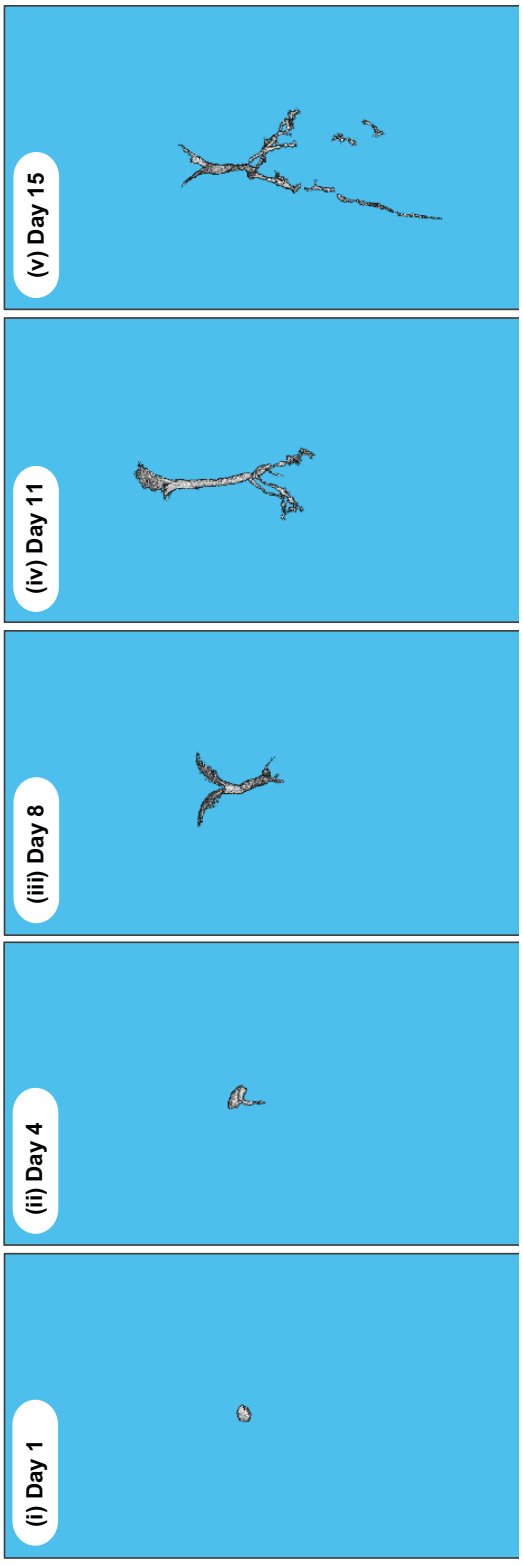

Figure S3: Root growth in sample A with time using the classifier trained based on 20%.

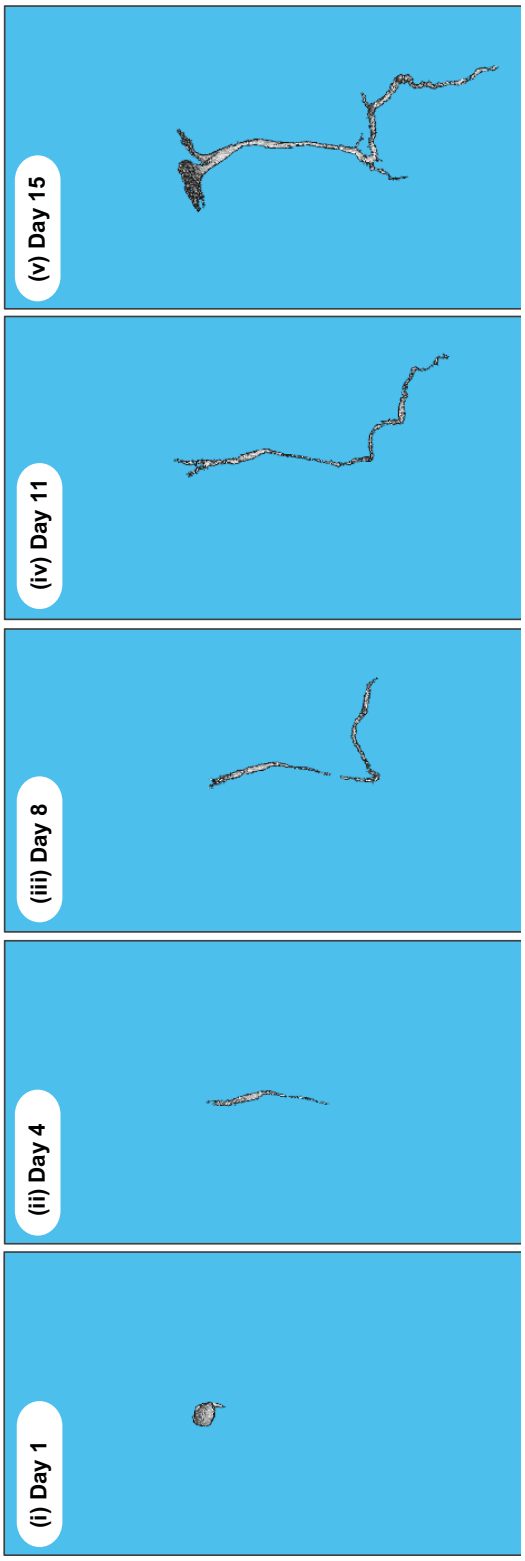

Figure S4: Root growth in sample B with time using the classifier trained based on 5%.

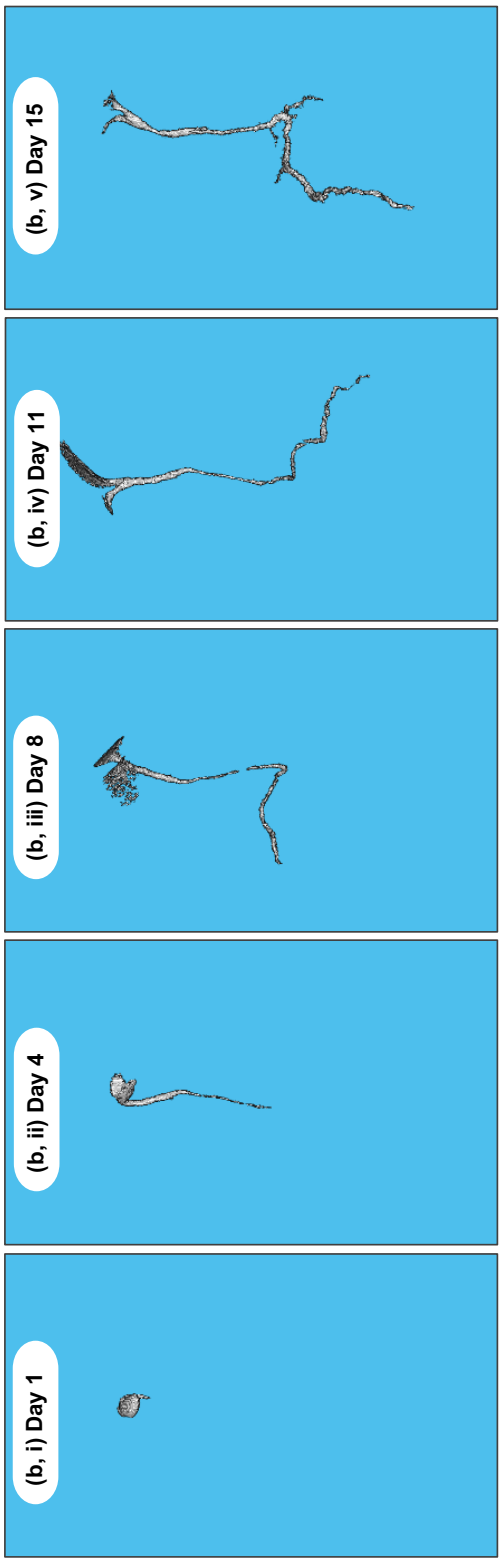

Figure S5: Root growth in sample B with time using the classifier trained based on 10%.

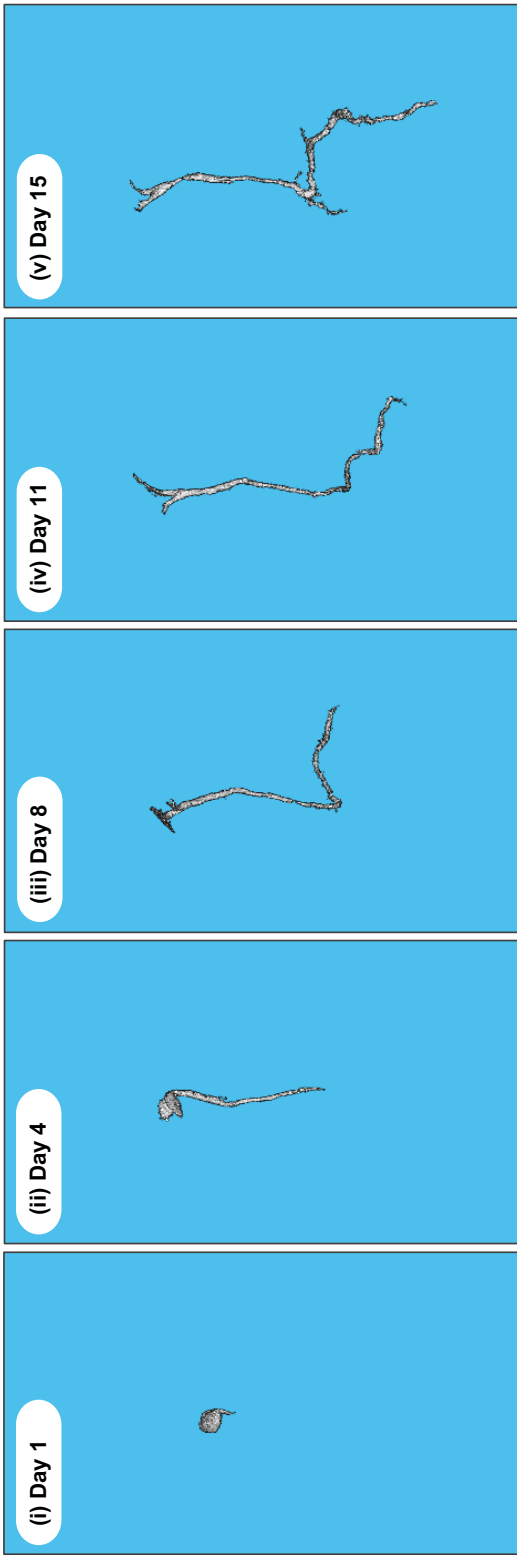

Figure S6: Root growth in sample B with time using the classifier trained based on 20%.

3. Sample A: void ratio & root volume ratio graphs

3.1. Day 1

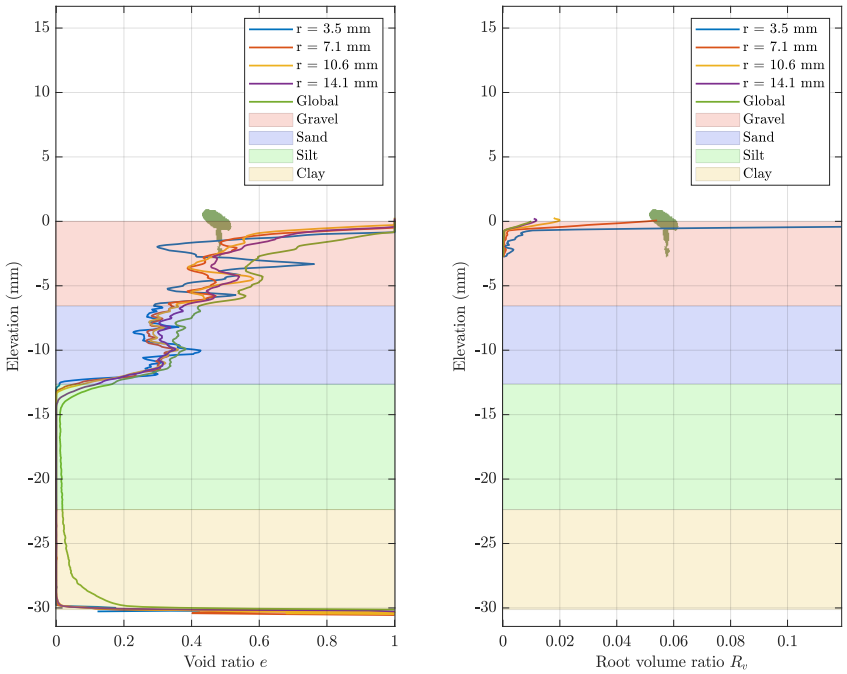

Figure S7: Void ratio e and root volume ratio R_v for sample A, day 1 and a classifier trained using 5% of the images.

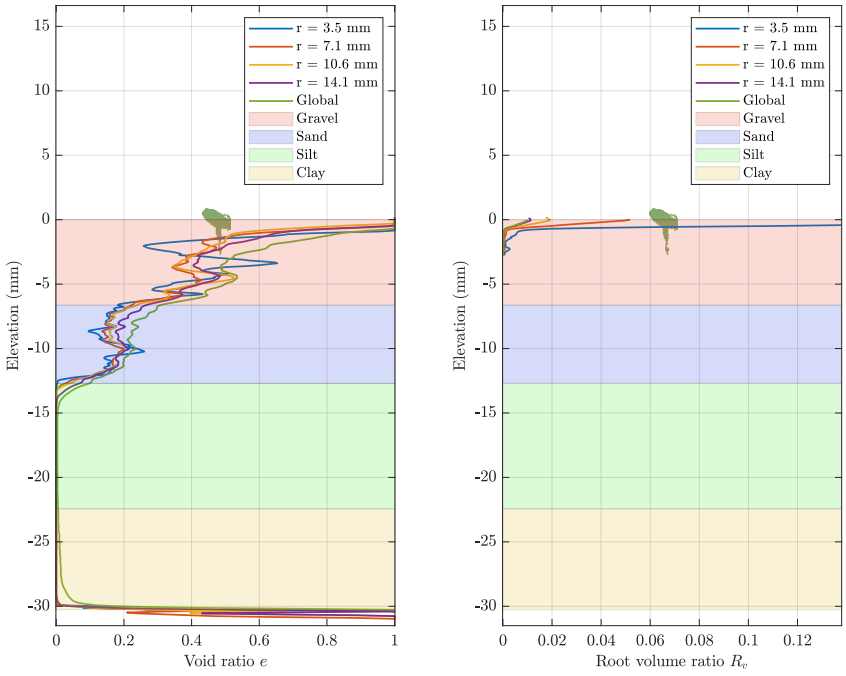

Figure S8: Void ratio e and root volume ratio R_v for sample A, day 1 and a classifier trained using 10% of the images.

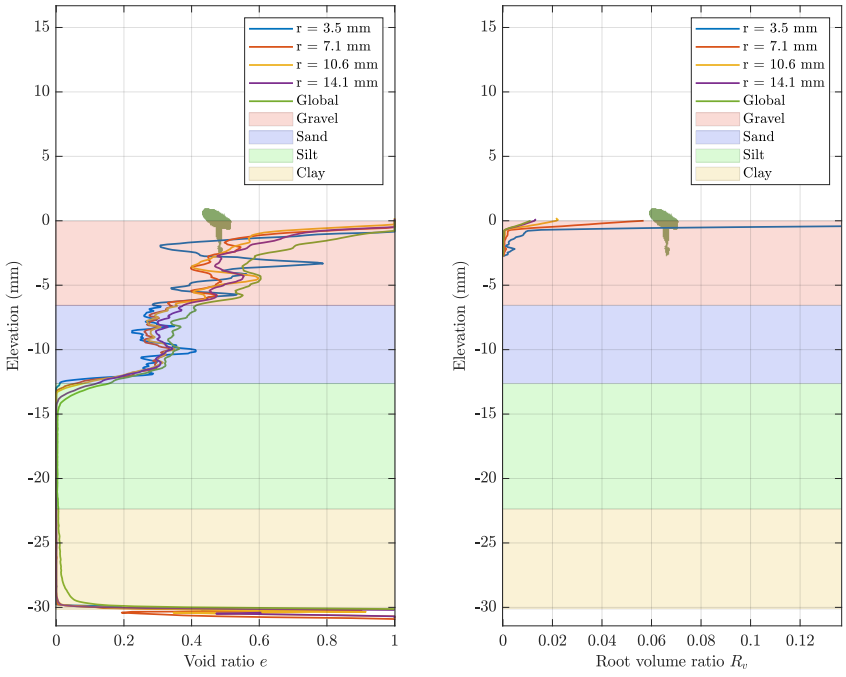

Figure S9: Void ratio e and root volume ratio R_v for sample A, day 1 and a classifier trained using 20% of the images.

3.2. Day 4

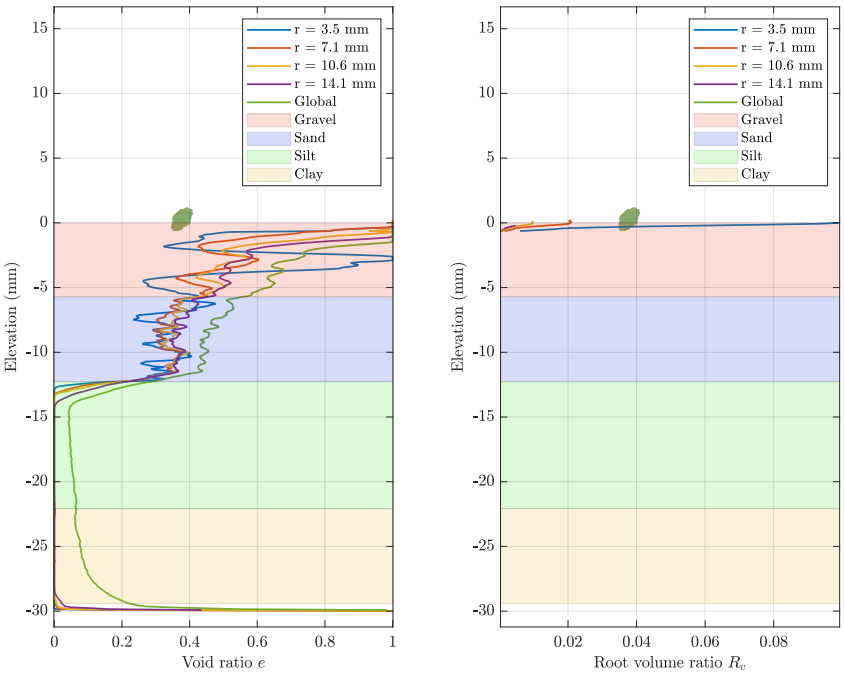

Figure S10: Void ratio e and root volume ratio R_v for sample A, day 4 and a classifier trained using 5% of the images.

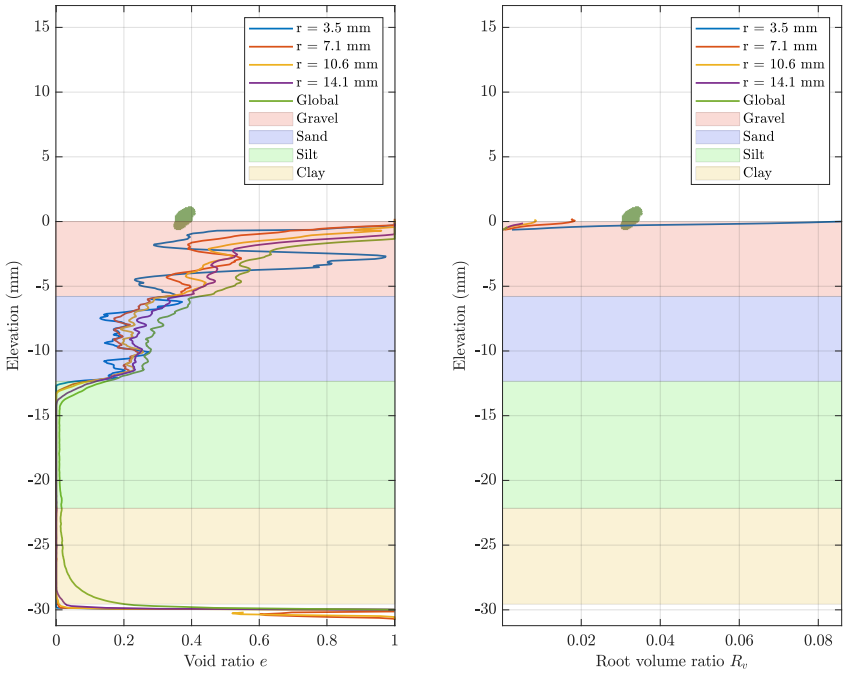

Figure S11: Void ratio e and root volume ratio R_v for sample A, day 4 and a classifier trained using 10% of the images.

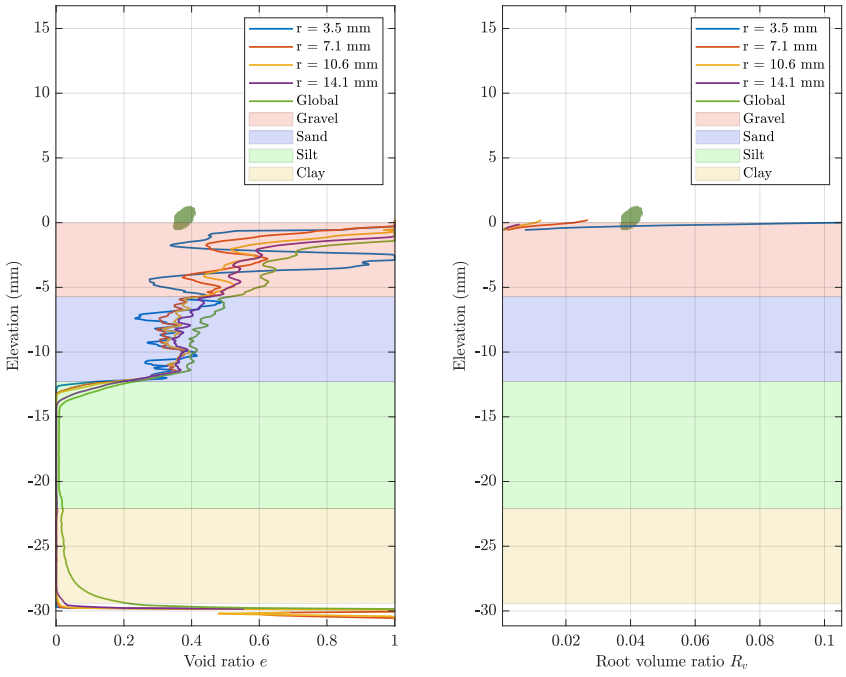

Figure S12: Void ratio e and root volume ratio R_v for sample A, day 4 and a classifier trained using 20% of the images.

3.3. Day 8

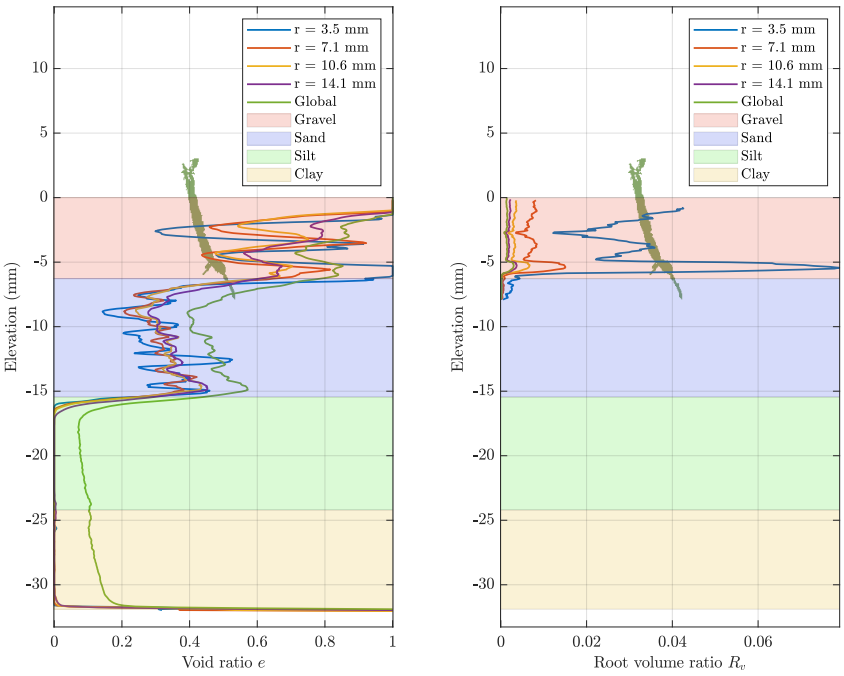

Figure S13: Void ratio e and root volume ratio R_v for sample A, day 8 and a classifier trained using 5% of the images.

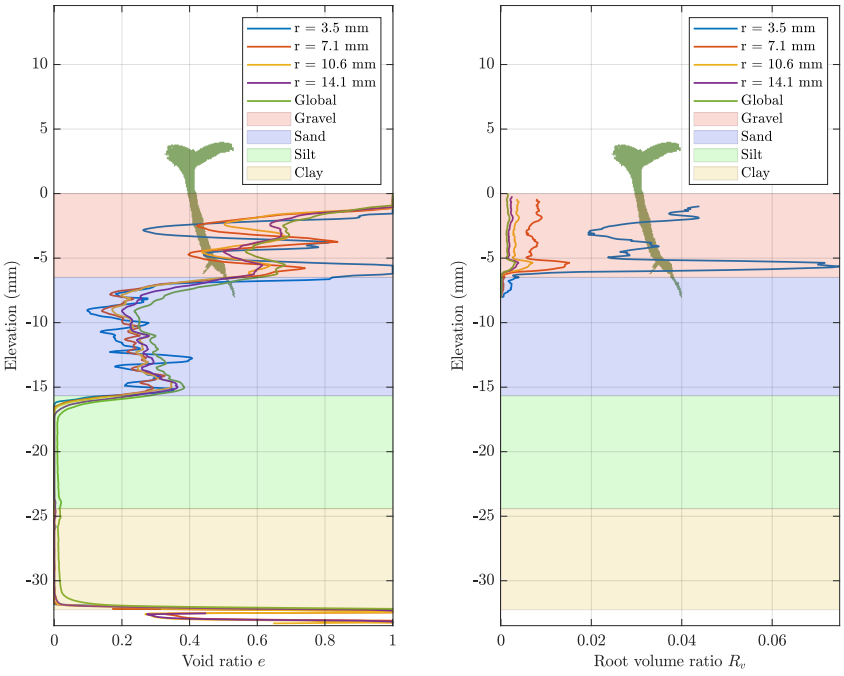

Figure S14: Void ratio e and root volume ratio R_v for sample A, day 8 and a classifier trained using 10% of the images.

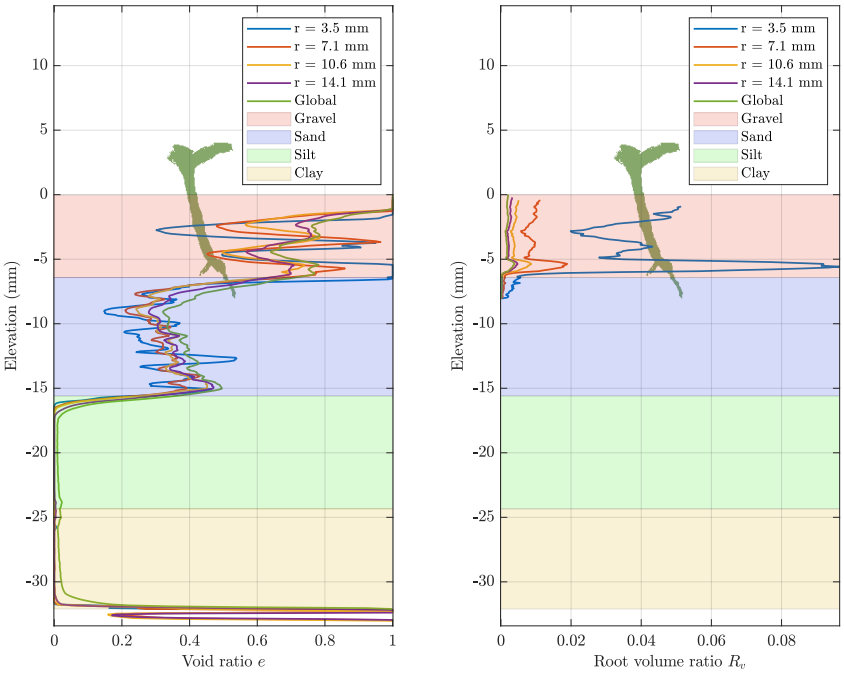

Figure S15: Void ratio e and root volume ratio R_v for sample A, day 8 and a classifier trained using 20% of the images.

3.4. Day 11

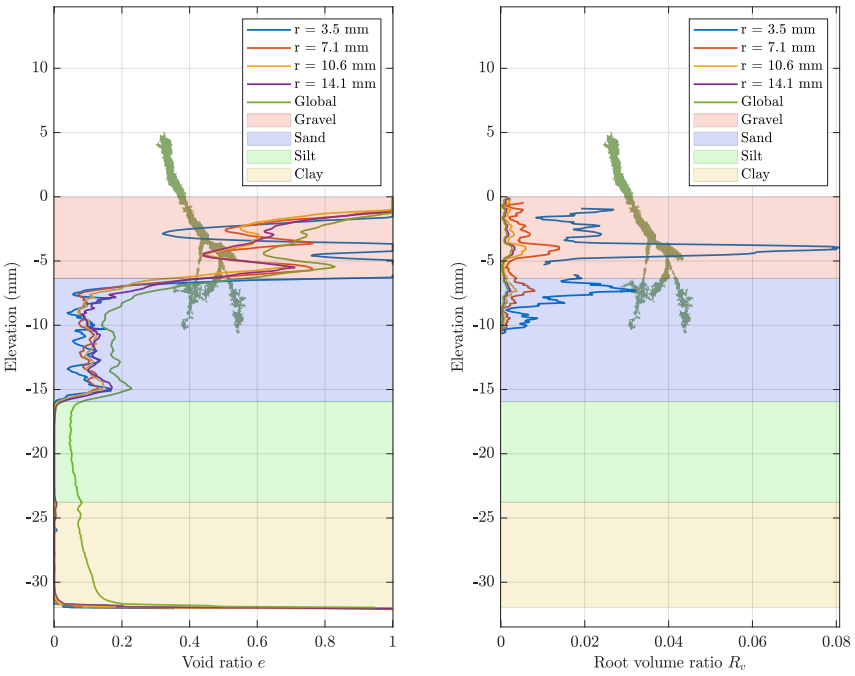

Figure S16: Void ratio e and root volume ratio R_v for sample A, day 11 and a classifier trained using 5% of the images.

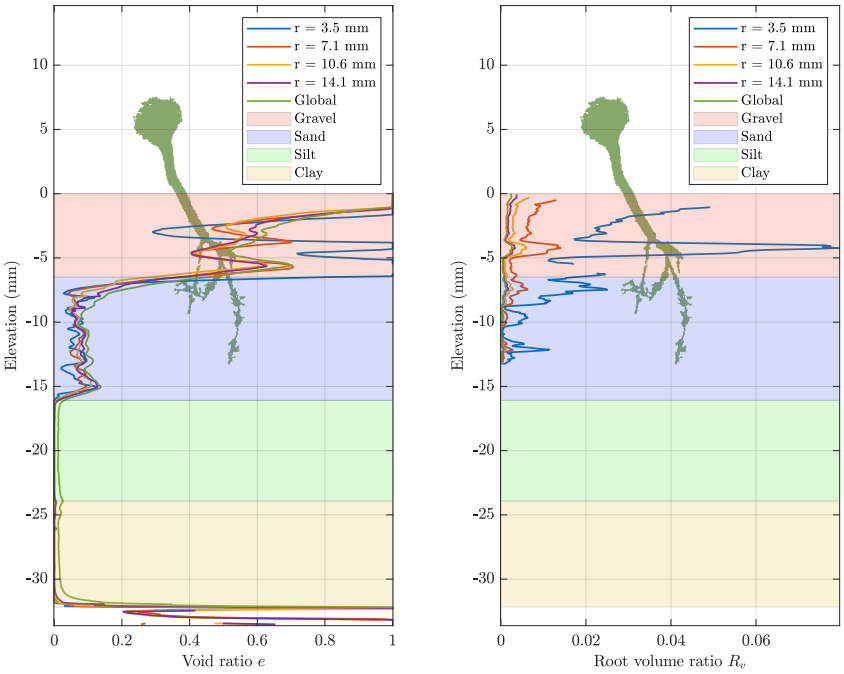

Figure S17: Void ratio e and root volume ratio R_v for sample A, day 11 and a classifier trained using 10% of the images.

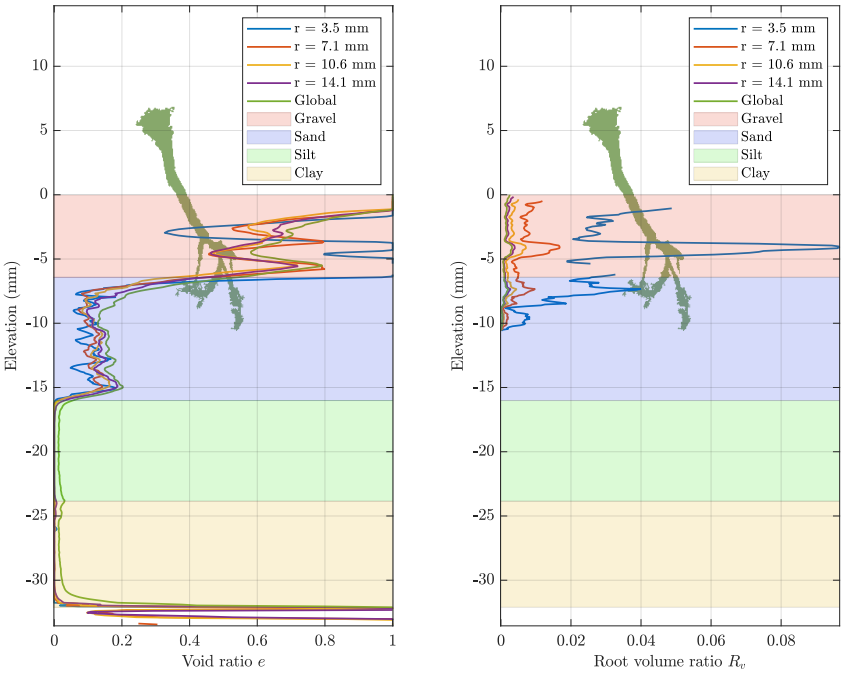

Figure S18: Void ratio e and root volume ratio R_v for sample A, day 11 and a classifier trained using 20% of the images.

3.5. Day 15

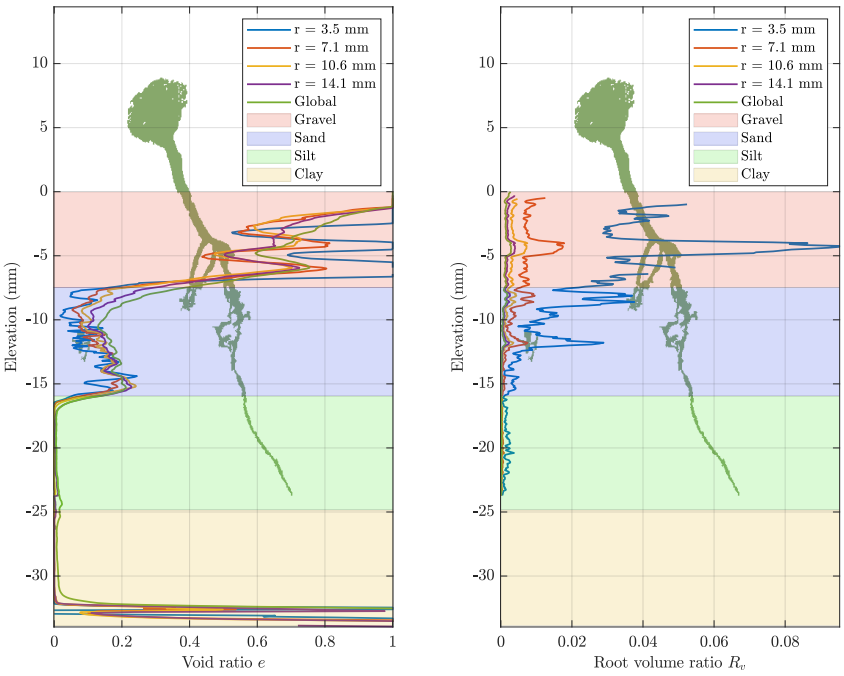

Figure S19: Void ratio e and root volume ratio R_v for sample A, day 15 and a classifier trained using 5% of the images.

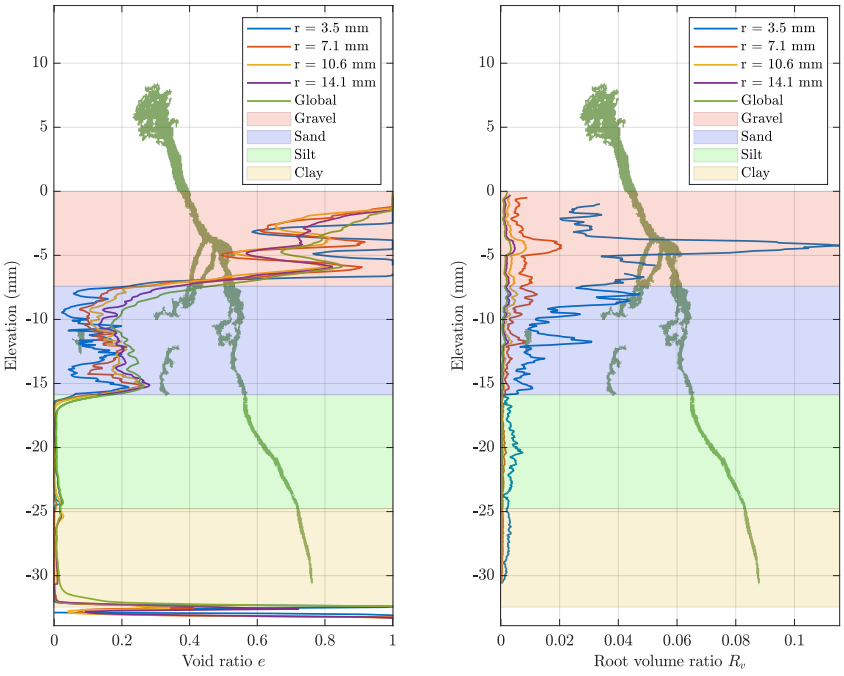

Figure S20: Void ratio e and root volume ratio R_v for sample A, day 15 and a classifier trained using 10% of the images.

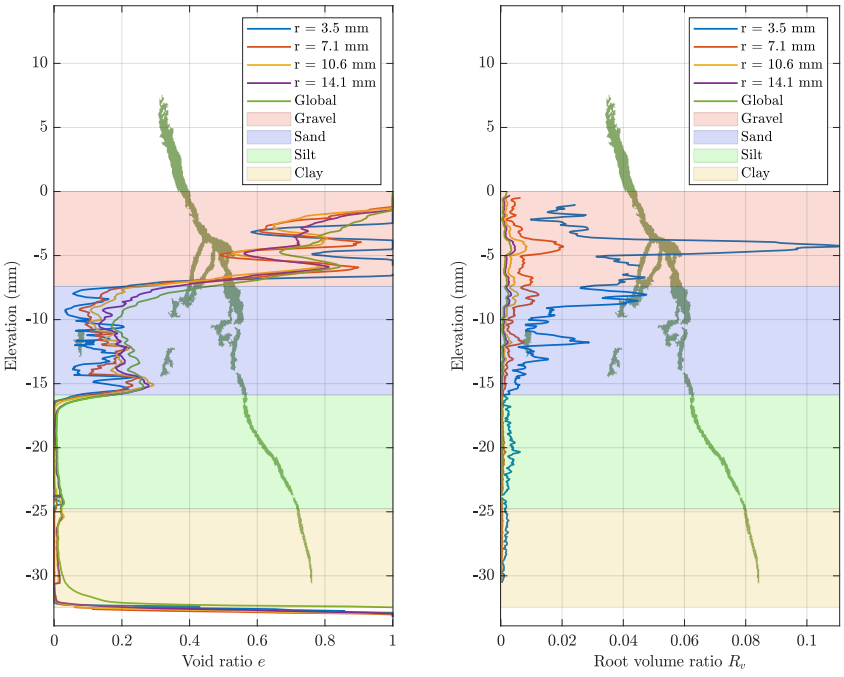

Figure S21: Void ratio e and root volume ratio R_v for sample A, day 15 and a classifier trained using 20% of the images.

4. Sample B: void ratio & root volume ratio graphs

4.1. Day 1

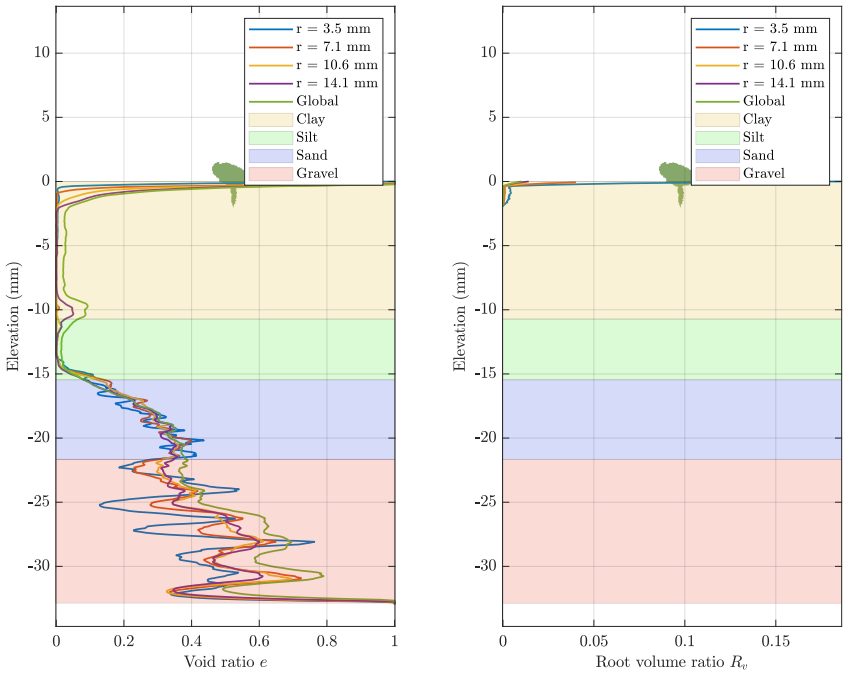

Figure S22: Void ratio e and root volume ratio R_v for sample B, day 1 and a classifier trained using 5% of the images.

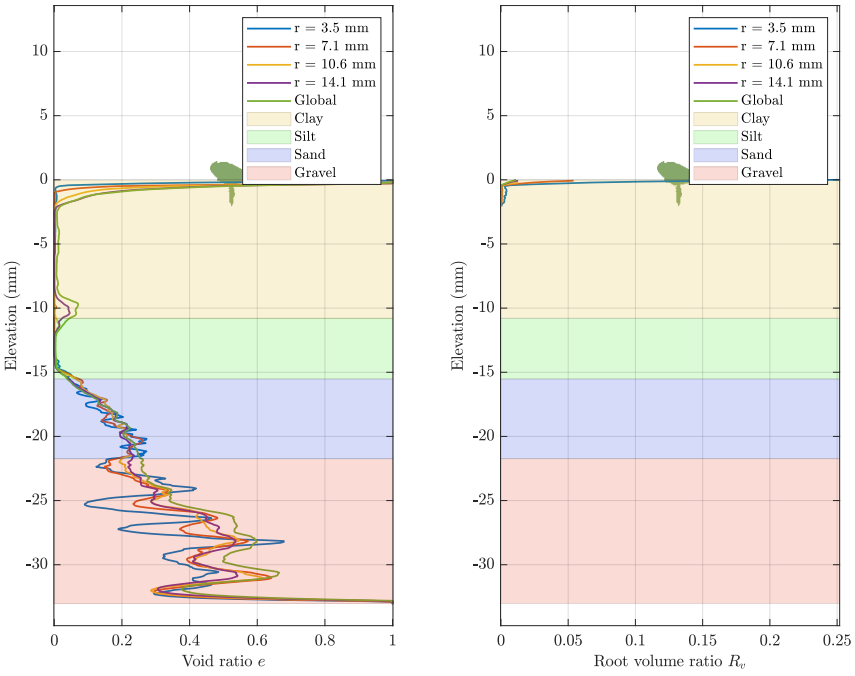

Figure S23: Void ratio e and root volume ratio R_v for sample B, day 1 and a classifier trained using 10% of the images.

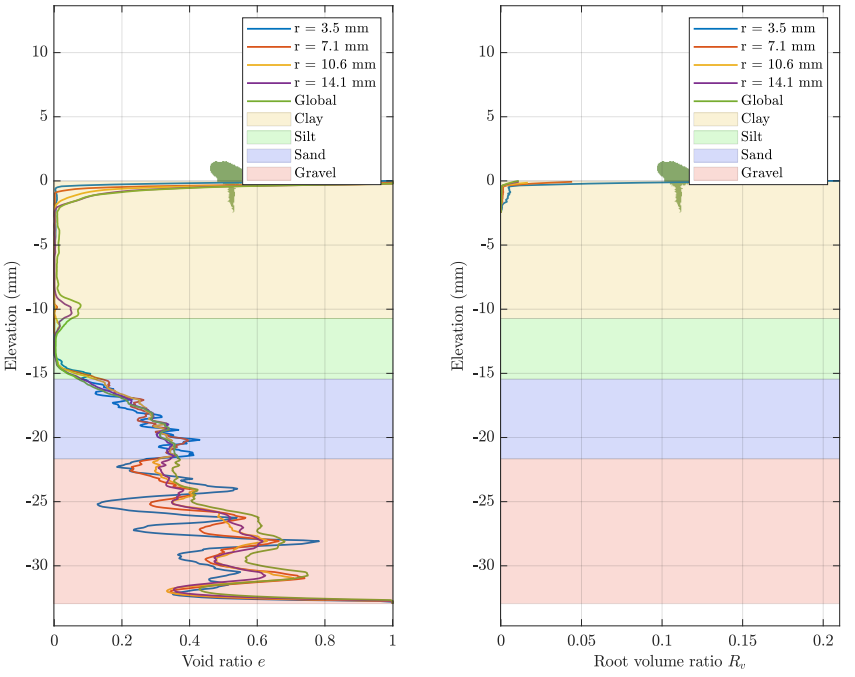

Figure S24: Void ratio e and root volume ratio R_v for sample B, day 1 and a classifier trained using 20% of the images.

4.2. Day 4

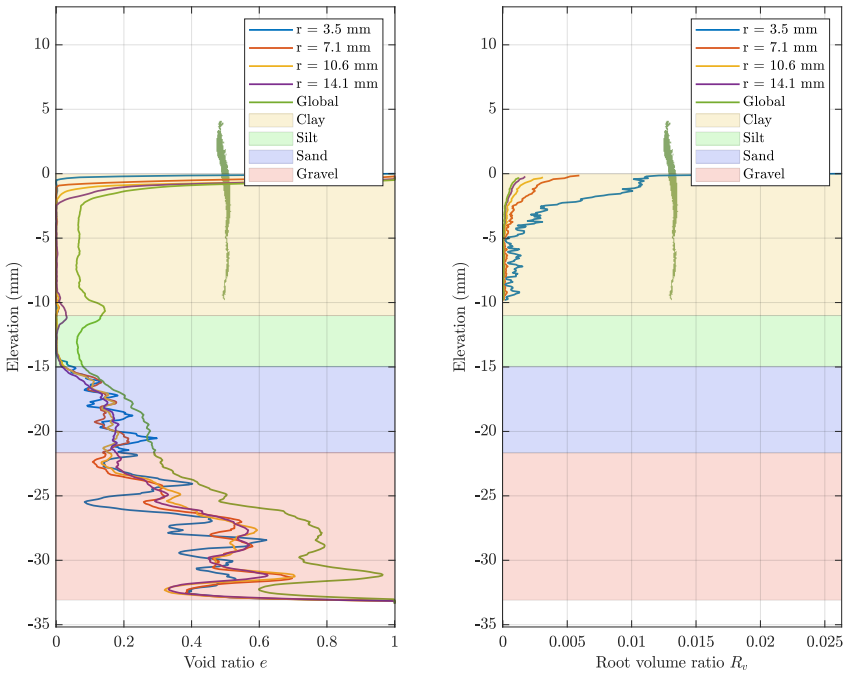

Figure S25: Void ratio e and root volume ratio R_v for sample B, day 4 and a classifier trained using 5% of the images.

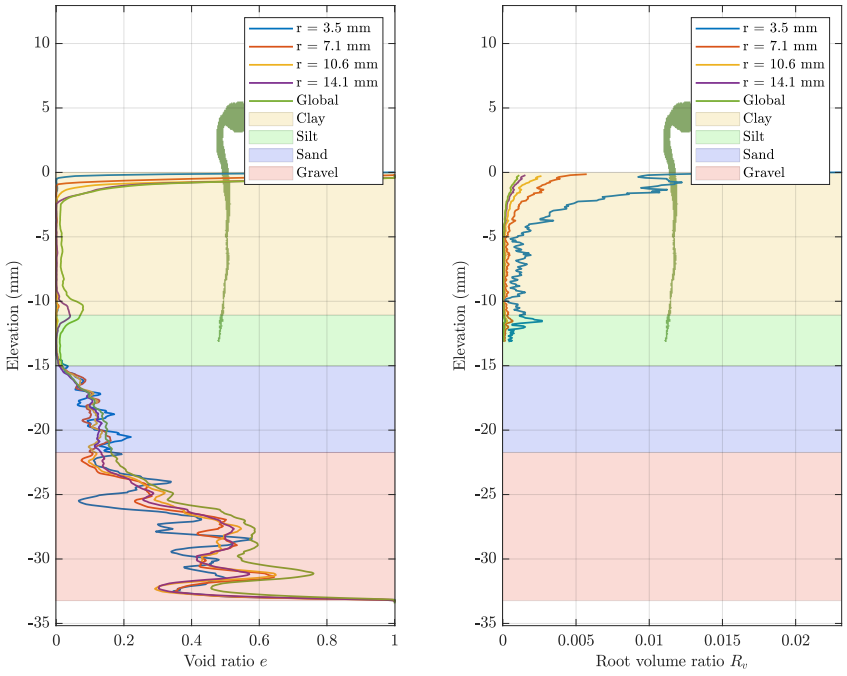

Figure S26: Void ratio e and root volume ratio R_v for sample B, day 4 and a classifier trained using 10% of the images.

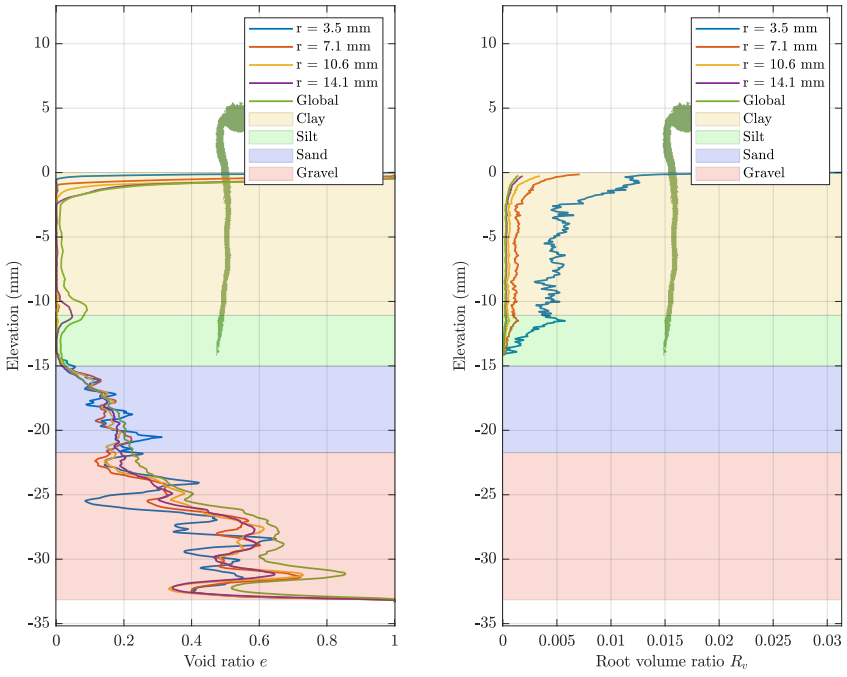

Figure S27: Void ratio e and root volume ratio R_v for sample B, day 4 and a classifier trained using 20% of the images.

4.3. Day 8

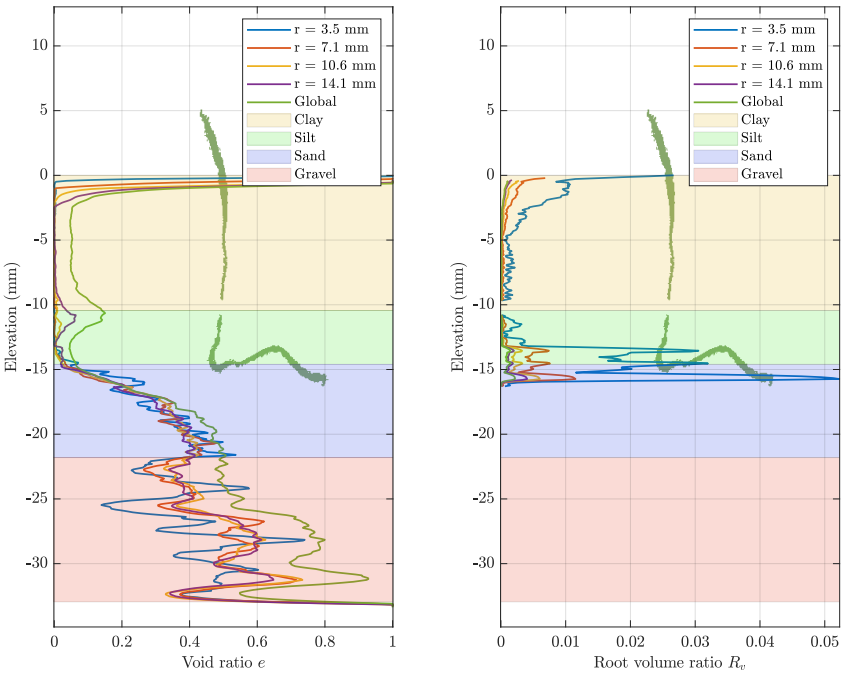

Figure S28: Void ratio e and root volume ratio R_v for sample B, day 8 and a classifier trained using 5% of the images.

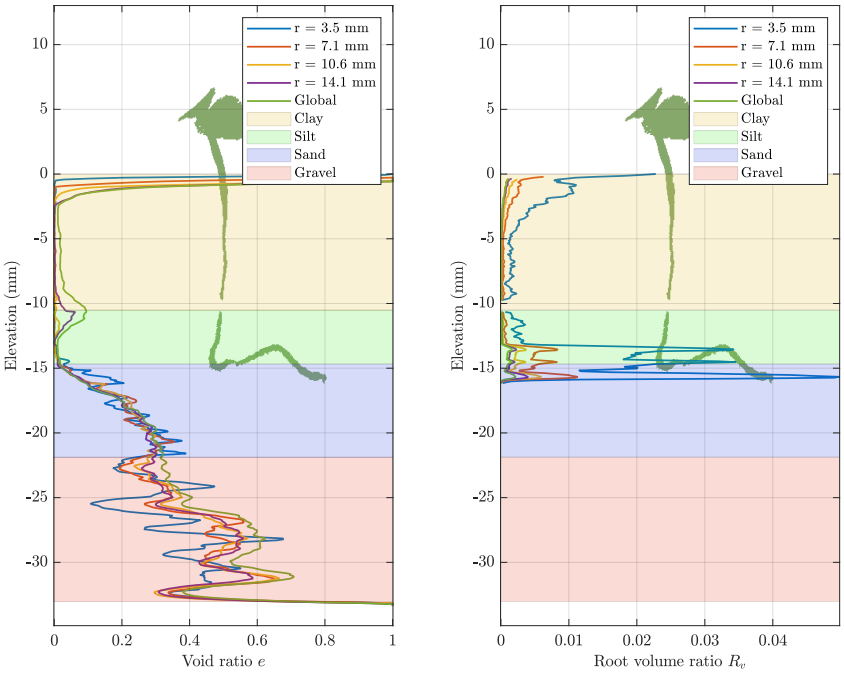

Figure S29: Void ratio e and root volume ratio R_v for sample B, day 8 and a classifier trained using 10% of the images.

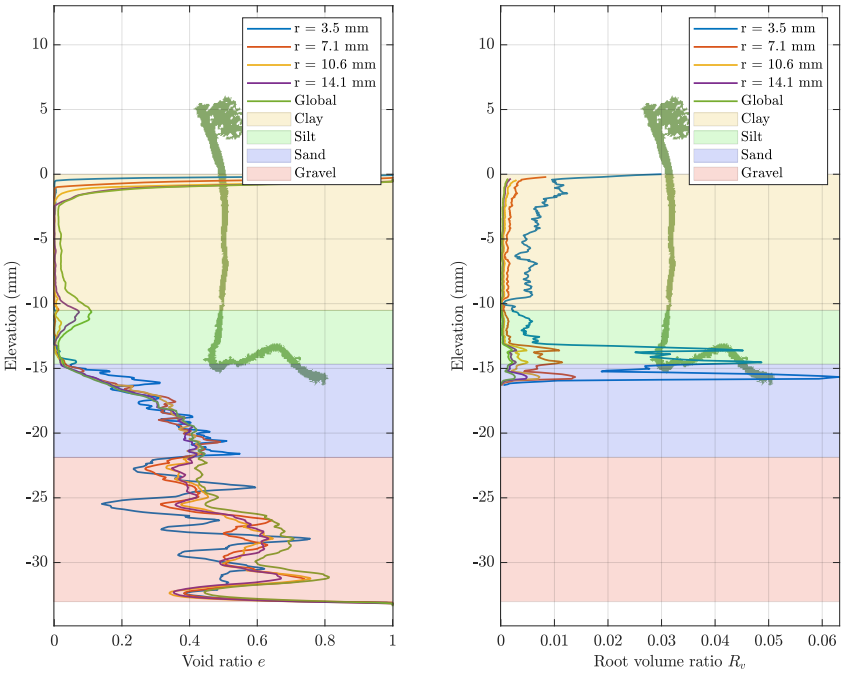

Figure S30: Void ratio e and root volume ratio R_v for sample B, day 8 and a classifier trained using 20% of the images.

4.4. Day 11

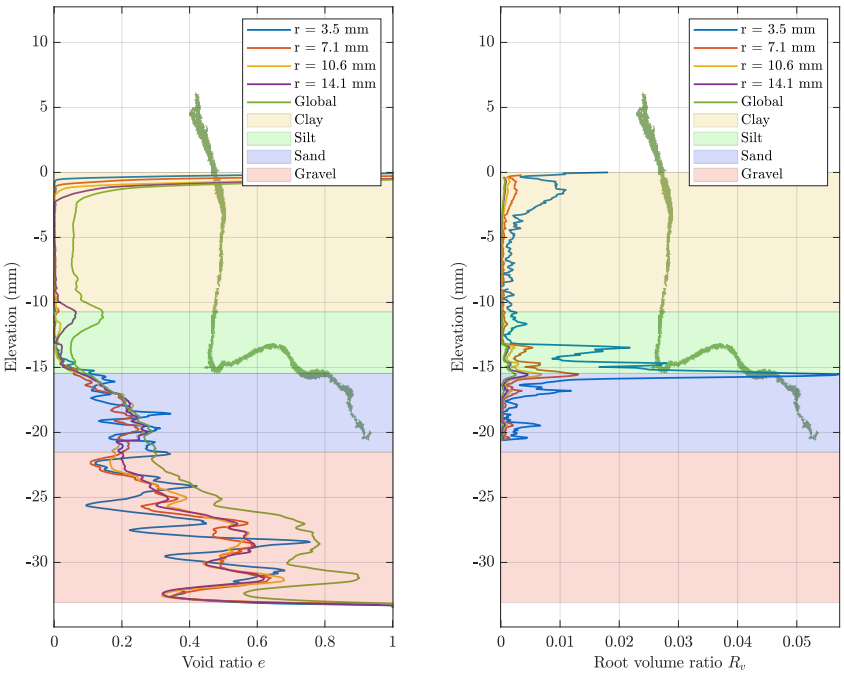

Figure S31: Void ratio e and root volume ratio R_v for sample B, day 11 and a classifier trained using 5% of the images.

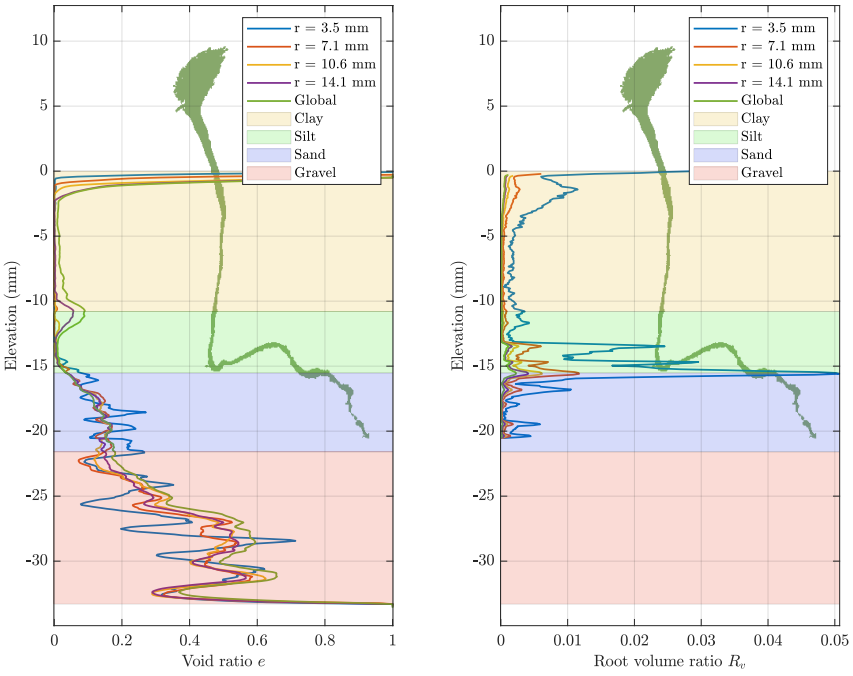

Figure S32: Void ratio e and root volume ratio R_v for sample B, day 11 and a classifier trained using 10% of the images.

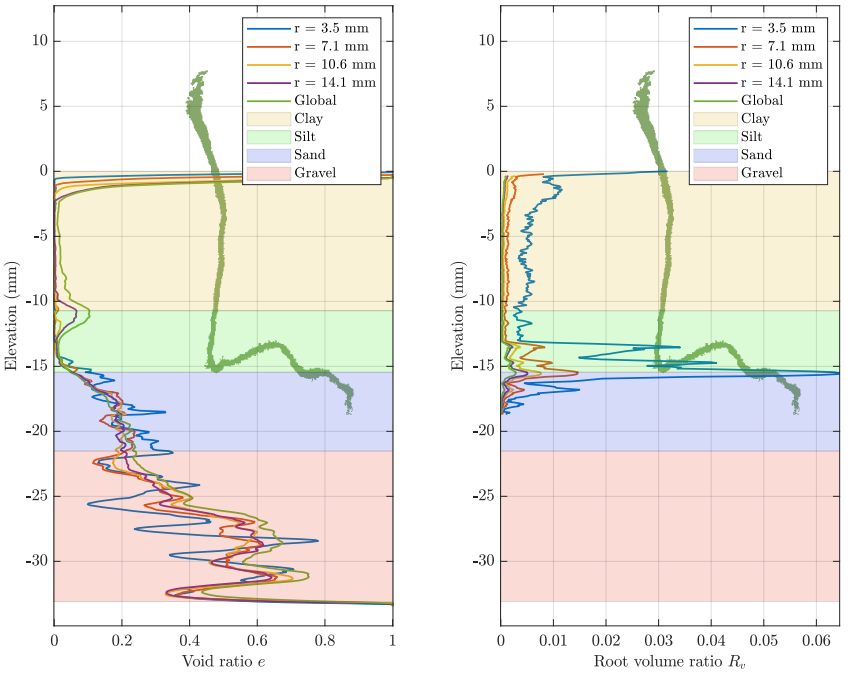

Figure S33: Void ratio e and root volume ratio R_v for sample B, day 11 and a classifier trained using 20% of the images.

4.5. Day 15

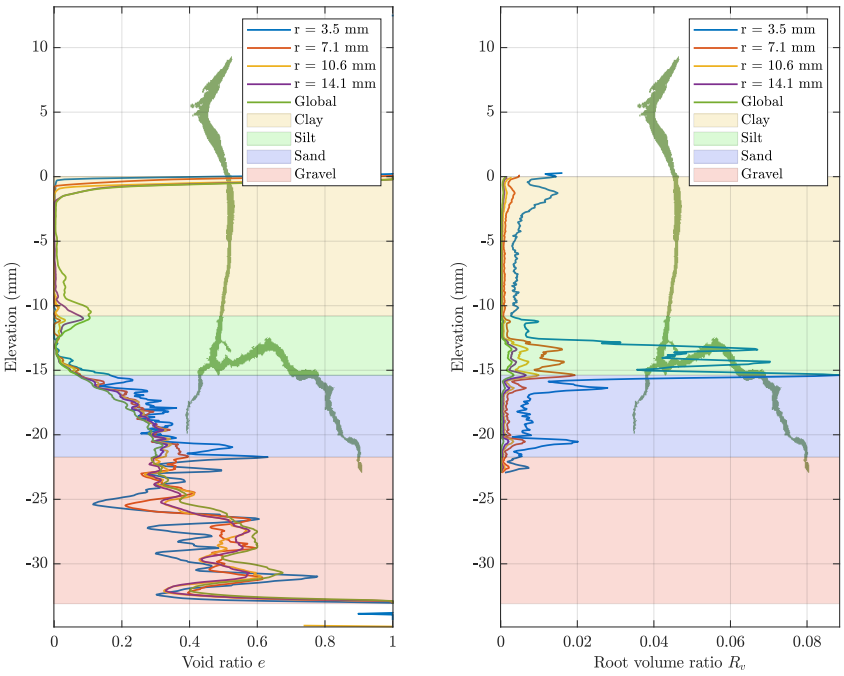

Figure S34: Void ratio e and root volume ratio R_v for sample B, day 15 and a classifier trained using 5% of the images.

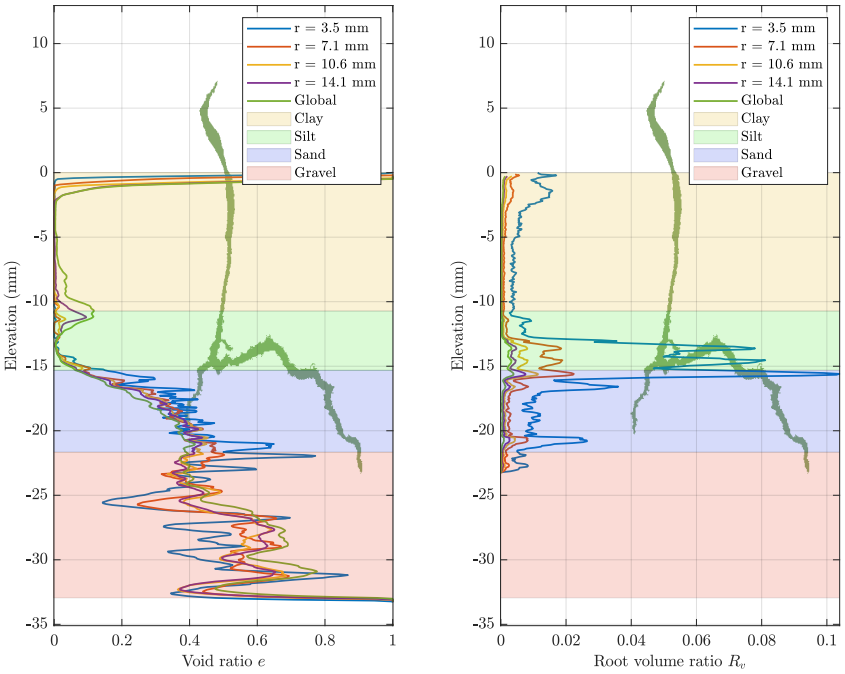

Figure S35: Void ratio e and root volume ratio R_v for sample B, day 15 and a classifier trained using 10% of the images.

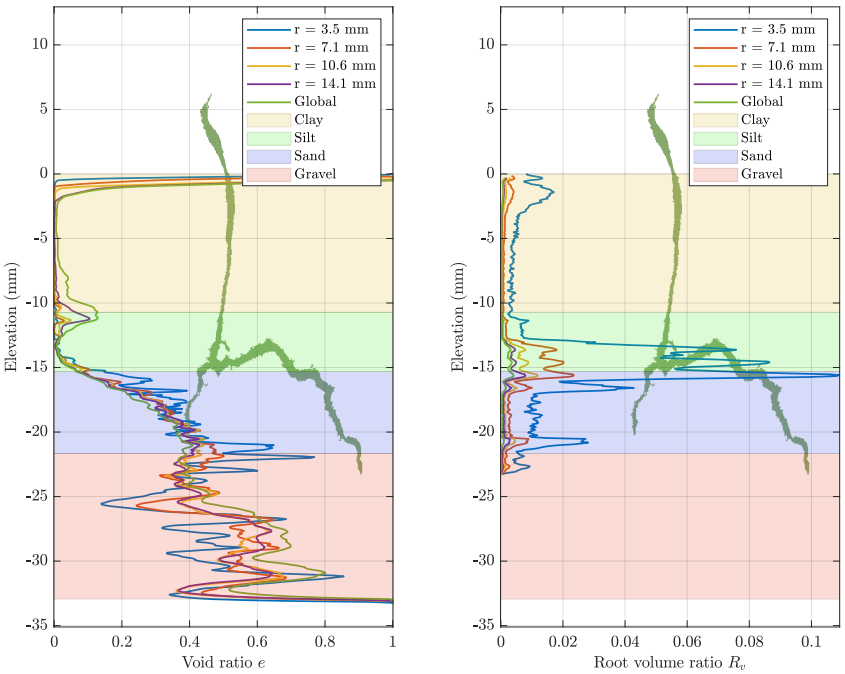

Figure S36: Void ratio e and root volume ratio R_v for sample B, day 15 and a classifier trained using 20% of the images.