

Enabling next level research on roots - automatizing MiniRhizotron Image Acquisition and Analysis (**NextMR-IAA**)

The Idea is to develop an **automatized MR image acquisition system** for permanent operation *in situ*, and an **image-processing pipeline** allowing for automatized, high-throughput quantification of root traits and soil water content



It could have applications in Precision Farming (early detection of root pests, optimize fertilization and irrigation, ...) & Environmental Research ("Ecosystem of Things, EoT"; carbon budgeting, ...)

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Roots - the “*hidden half*” of plants



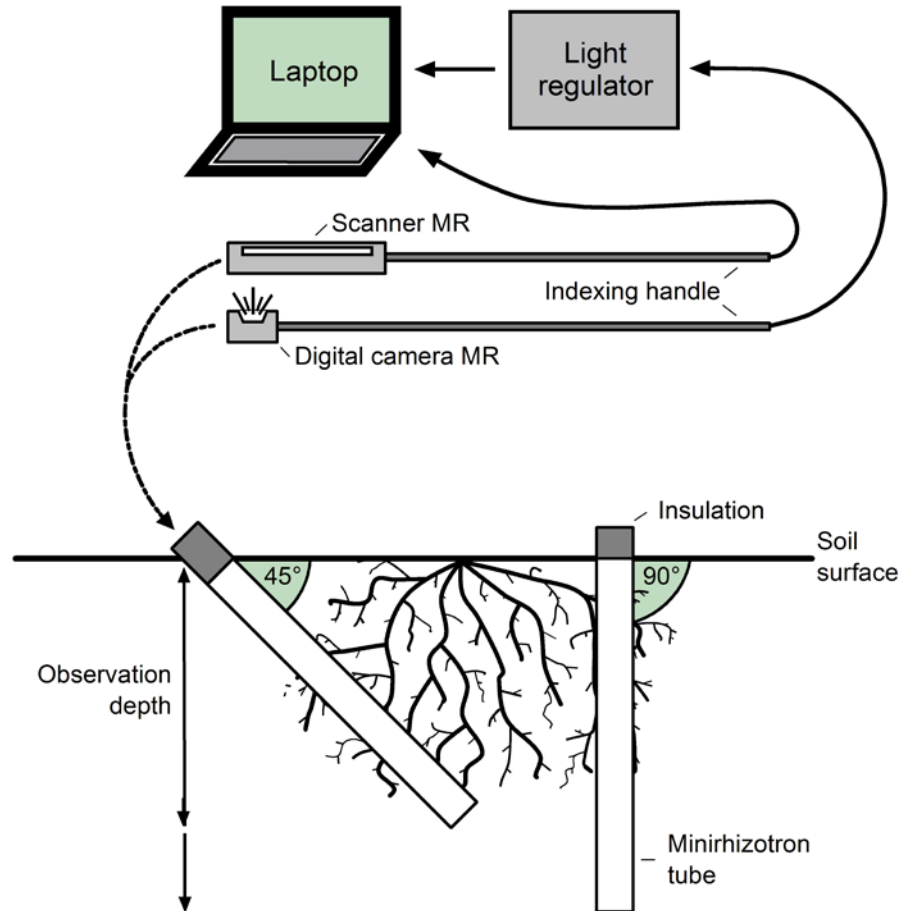
Plant functions

- Uptake
- Anchorage
- ...

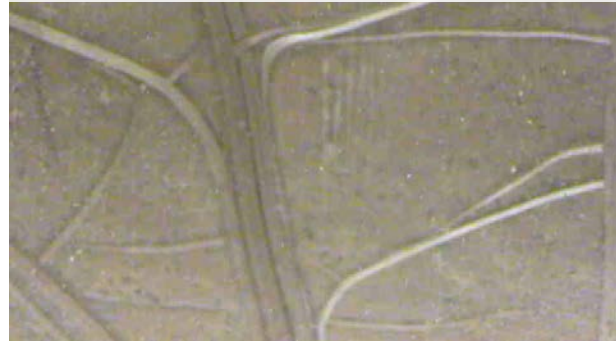
Ecosystem functions

- Water infiltration rates
- Soil carbon sequestration
- Nutrient cycling
- ...

Minirhizotron imaging – exploring roots *in-situ*



Root growth and turnover



Root symbionts



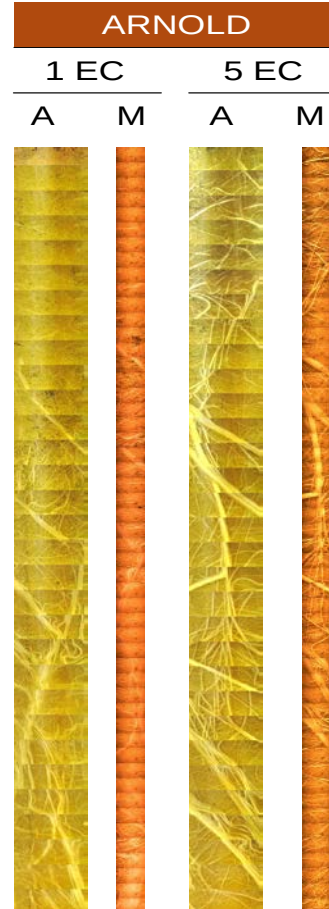
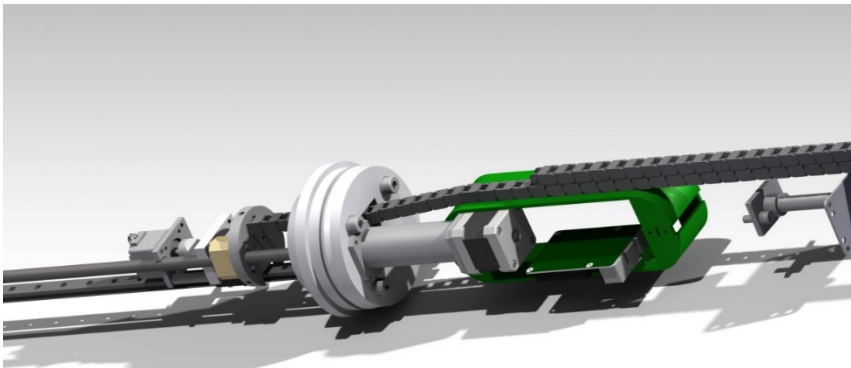
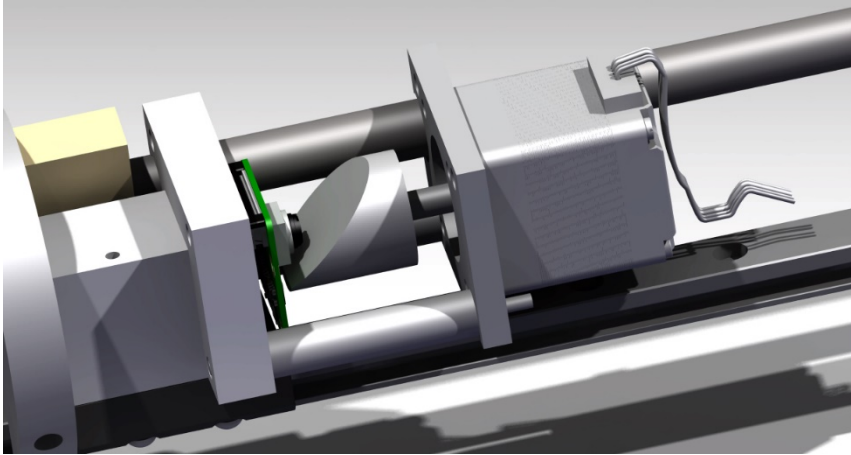
Root interaction



Root morphology



Automated MR – continuous root phenotyping

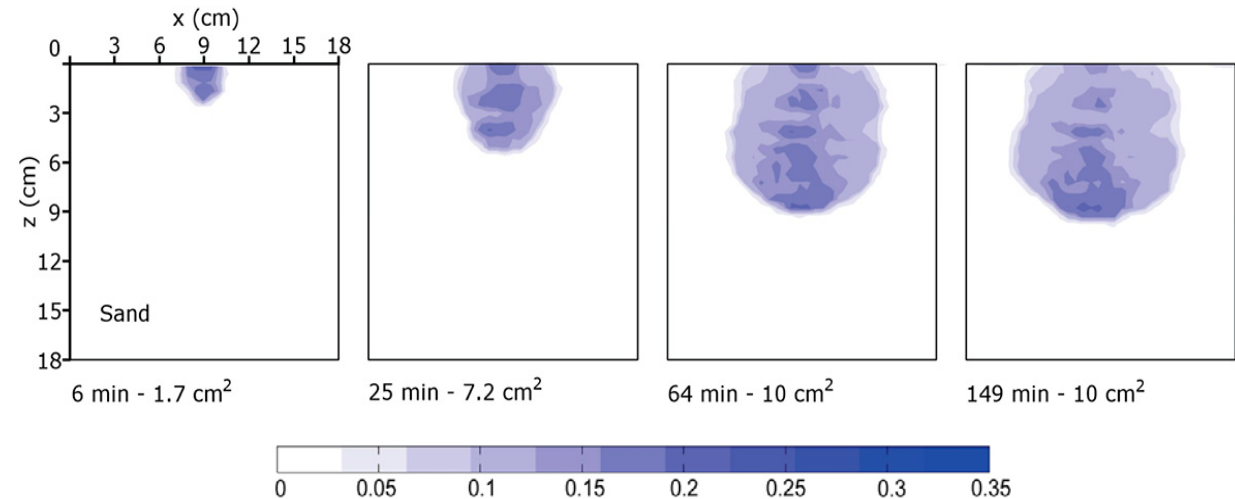
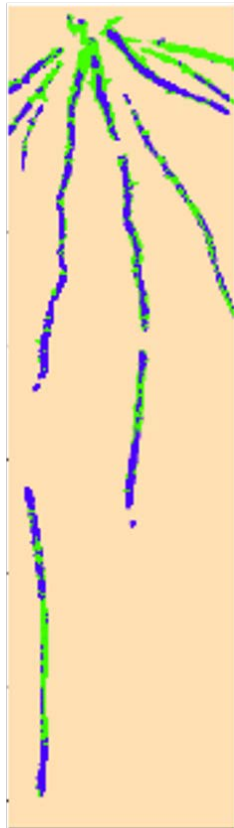
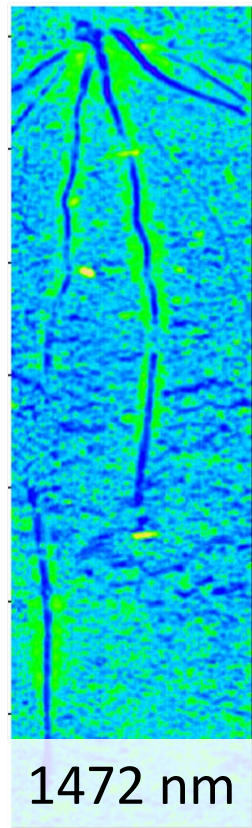


Example: Root growth in soil



- Tomato roots
- Time-laps' MR video over 10 days

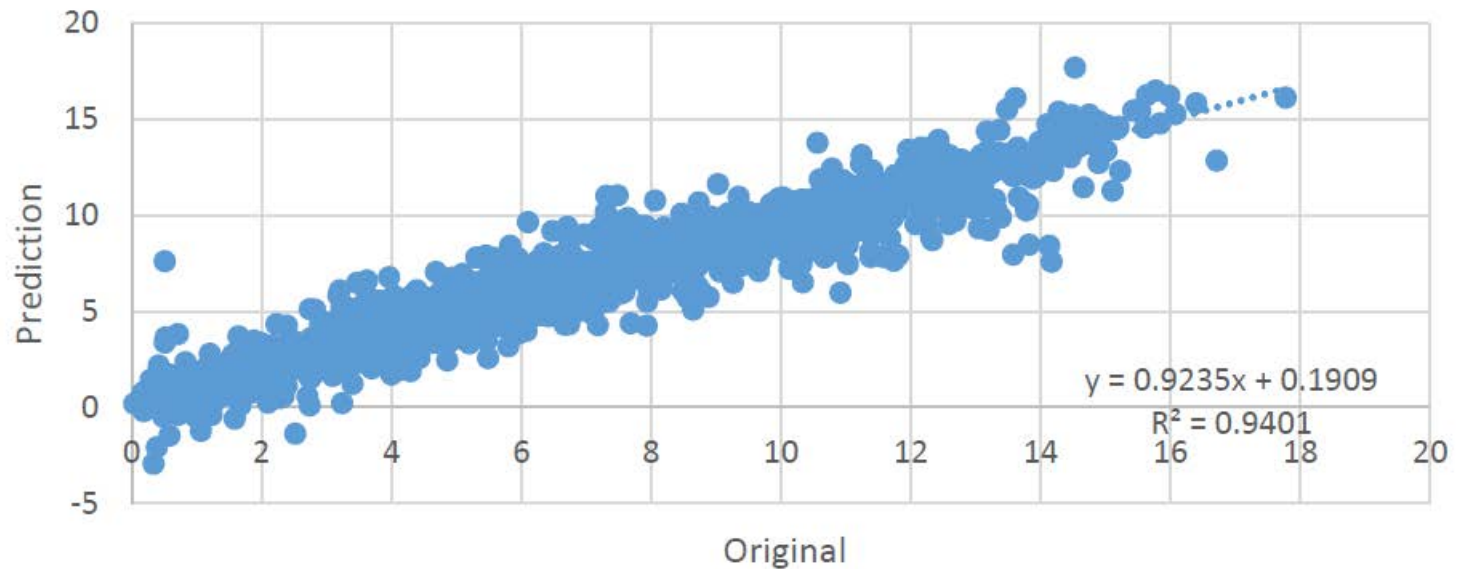
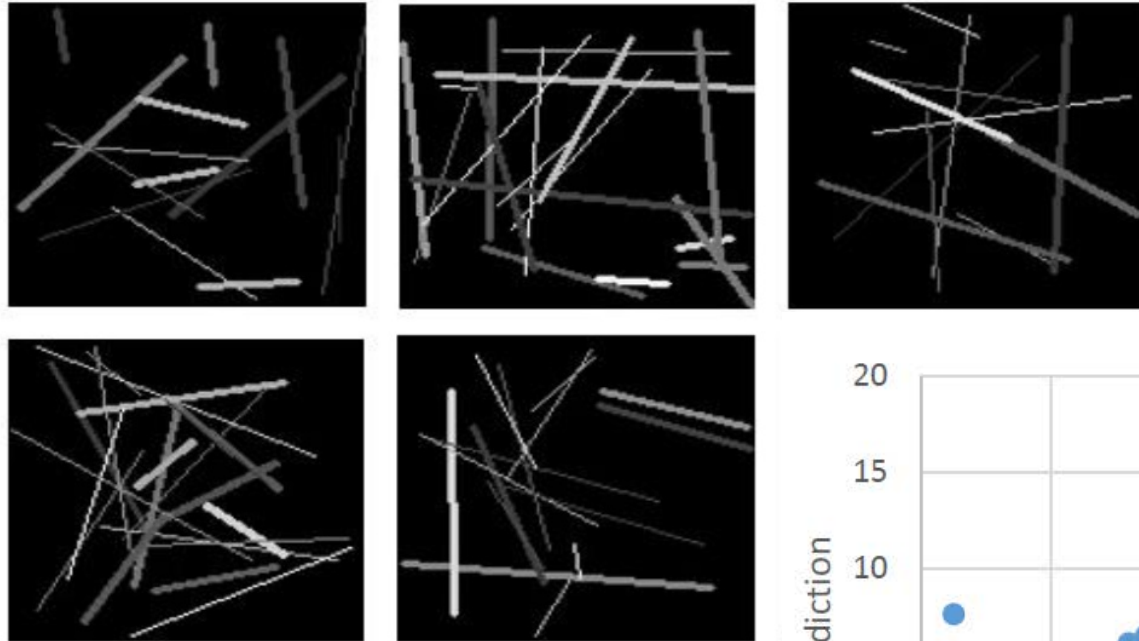
Identify wavebands – automated root segregation & classification, and soil moisture measurements



Estimating **soil water content** (RGB Imaging)

← **Root tracking & root trait** identification (Hyperspectral imaging)

Predicting root length – using deep learning (CNN)





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Thank you!

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