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# Remote sensing studies in Finnish project sites

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# Drone flights by University of Eastern Finland

- Before-restoration flights conducted end of July 2023
- First after-restoration flights beginning of August 2024
- Multispectral (spatial resolution of 5 cm) and thermal imagery (spatial resolution of 30 cm) with MicaSense Altum-PT
- Drone LiDAR
  - Digital terrain and surface models with 10 and 20 cm resolution

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# Vegetation inventories

- Initially 206 plots were established
- Species level inventories conducted 153/206 of the plots
- Rest of the plots have Plant Functional Type coverage inventoried
  - Aim is to integrate these plots to classification system which is constructed from species-level plots

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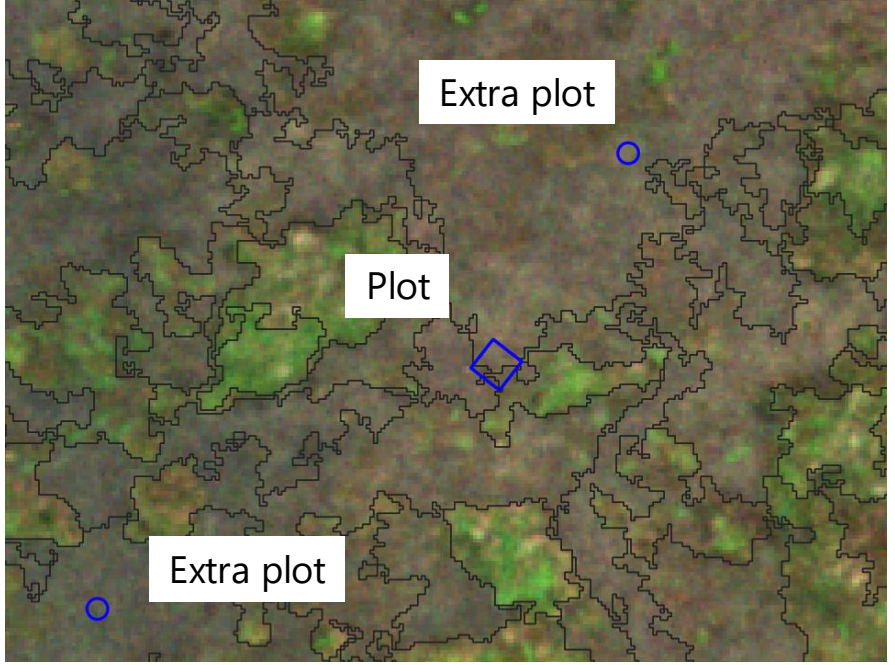
# Upscaling strategy




- Object-based image analyses
  - Drone spectral bands and indices
  - LiDAR topographical features
  - NLS Aerial image and textures (GLCMs)
  - Mean shift segmentation and random forest classification
- Preliminary tests with vegetation data-based clusters
  - Clustering performed by Jack Chapman (FMI)
  - 7 clusters
  - Due to limited number of plots, I added 2 extra train plots per true plot with visual interpretation → better capture variation in RS data within clusters
- Classification to GEST-types later

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# Cluster classification accuracy

- Overall accuracy around 70%
  - With 153 plots overall accuracy was around 53%
  - Spatial autocorrelation might be a problem with increased dataset
- Some clusters classify more accurate than others
  - Mudbottom, i.e. hollow/flark
  - Lindbergii lawn
- Wet forest/diverse hollow and pleurozium hollow mix up quite a lot
  - Both clusters occupy treed areas

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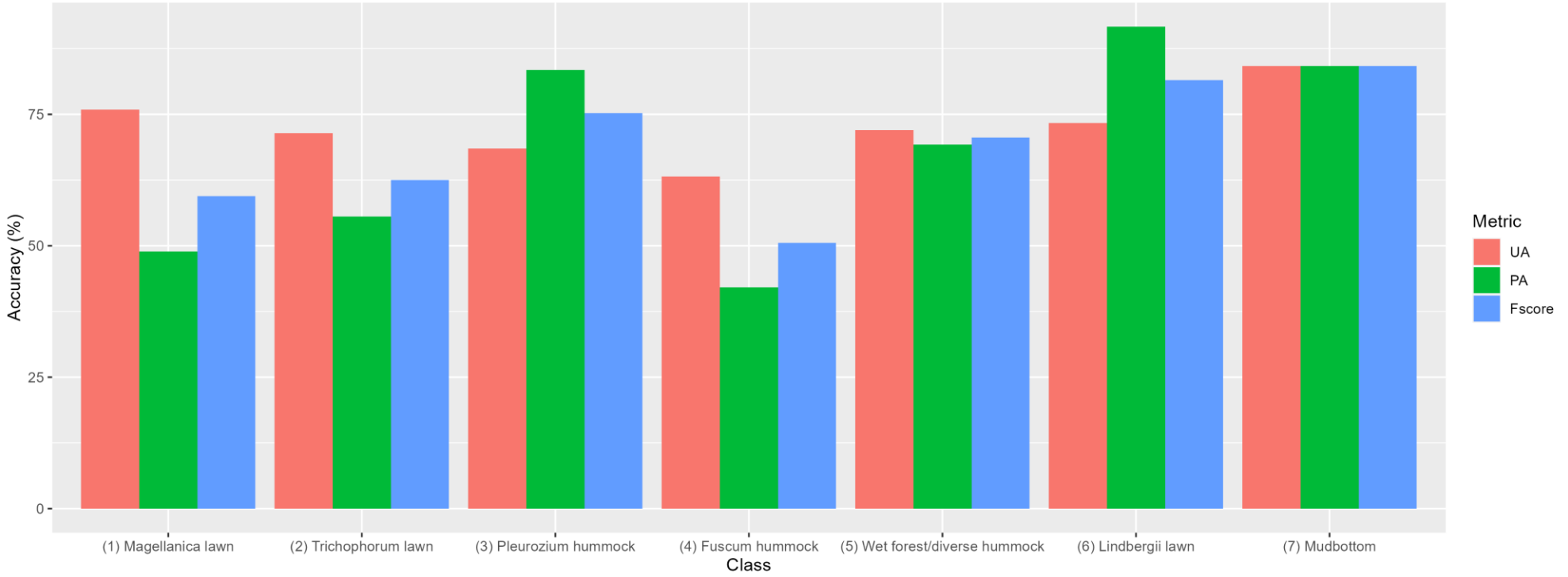
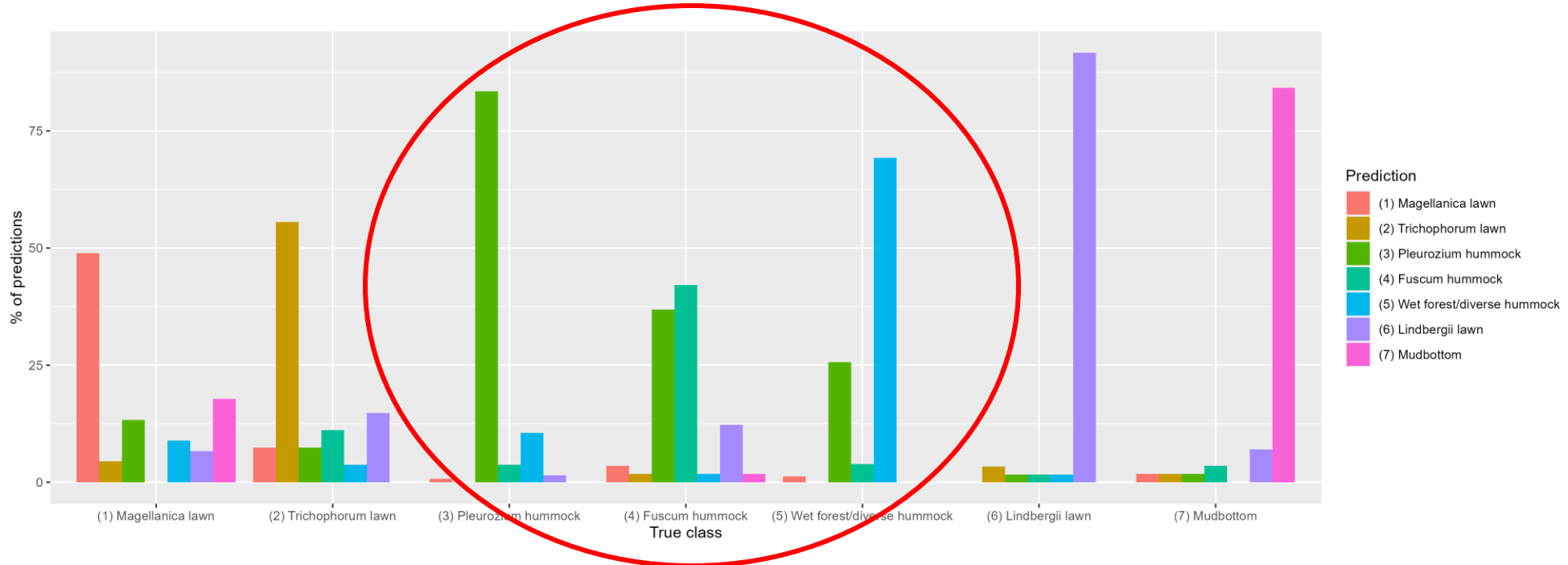

Accuracy (%)
75
50
25
0
(1) Magellanica lawn
(2) Trichophorum lawn
(3) Pleurozium hummock
(4) Fuscum hummock
(5) Wet forest/diverse hummock
(6) Lindbergii lawn
(7) Mudbottom
Class
Metric
UA
PA
Fscore


% of predictions
75
50
25
0
(1) Magellanica lawn
(2) Trichophorum lawn
(3) Pleurozium hummock
(4) Fuscum hummock
(5) Wet forest/diverse hummock
(6) Lindbergii lawn
(7) Mudbottom
True class
Prediction
(1) Magellanica lawn
(2) Trichophorum lawn
(3) Pleurozium hummock
(4) Fuscum hummock
(5) Wet forest/diverse hummock
(6) Lindbergii lawn
(7) Mudbottom

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0
0.25
0.5 km
0
0.5
1 km
(1) Magellanica lawn
(2) Trichophorum lawn
(3) Pleurozium hummock
(4) Fuscum hummock
(5) Wet forest/diverse hummock
(6) Lindbergii lawn
(7) Mudbottom
N

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# Wetness related studies

- Manual water table measurements from vegetation plots during July 2023
- Downscaling satellite-based information with drone imagery
- Does the downscaling improve relationship between WT and satellite-based moisture index?
- How other drone-based variables relate to WT?
- Performed by Saara Heikkinen
  - Worked as a trainee last summer for closely related project
  - Currently writing master thesis
- Additionally, synergy possibilities with University of Oulu with integrated ground water modelling and remote sensing

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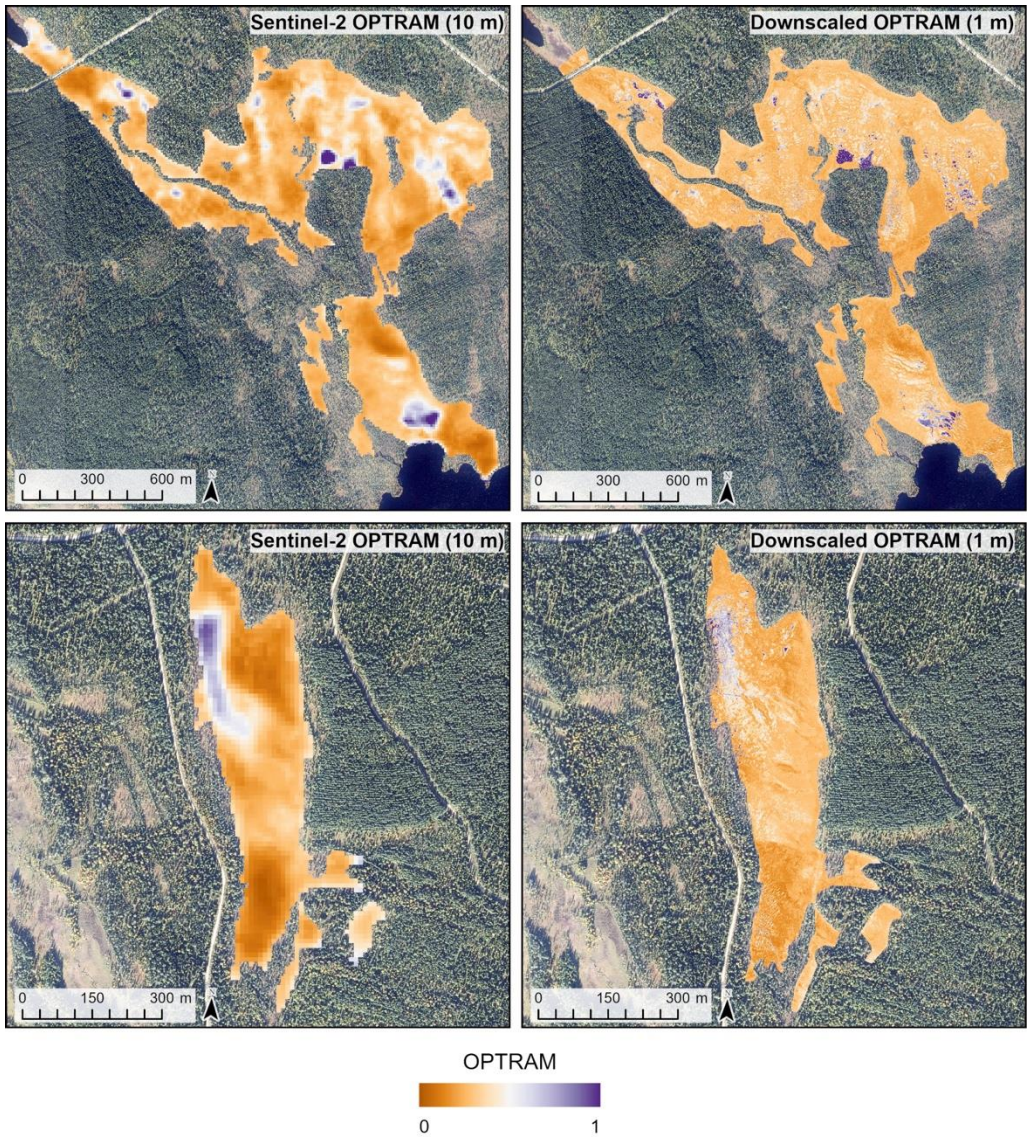


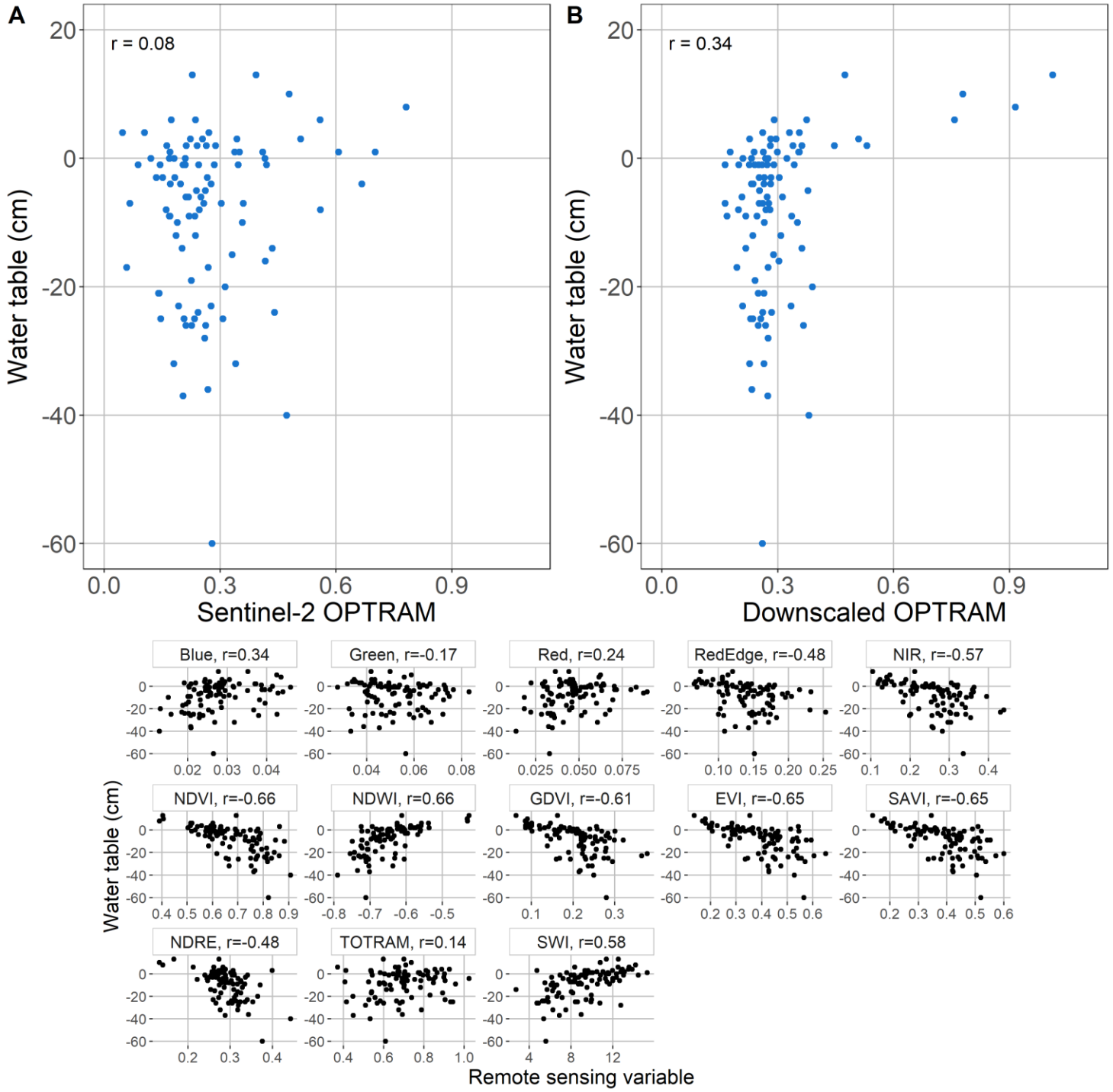


Figures: Heikkinen MSc thesis in prep.

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# Thank you!

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