Tackling the challenge between lab- and field-based detection of floating plastics using hyperspectral remote sensing

Contact: **paolo.tasseron@wur.nl**

Tasseron, P., Schreyers, L., Peller, J., Biermann, L., van Emmerik, T.

Background and Objectives

- There is a need for innovative approaches to monitor the presence and abundance of plastics in aquatic ecosystems
- Hyperspectral imaging mainly done in controlled environments, and it is a challenge to use this data in aquatic environments.
- **Objective 1**: Assess plastic signatures in natural environments
- **Objective 2**: Compare reflectance patterns of natural environments with controlled environments
- **Objective 3**: Use lab-data to detect plastics in field images

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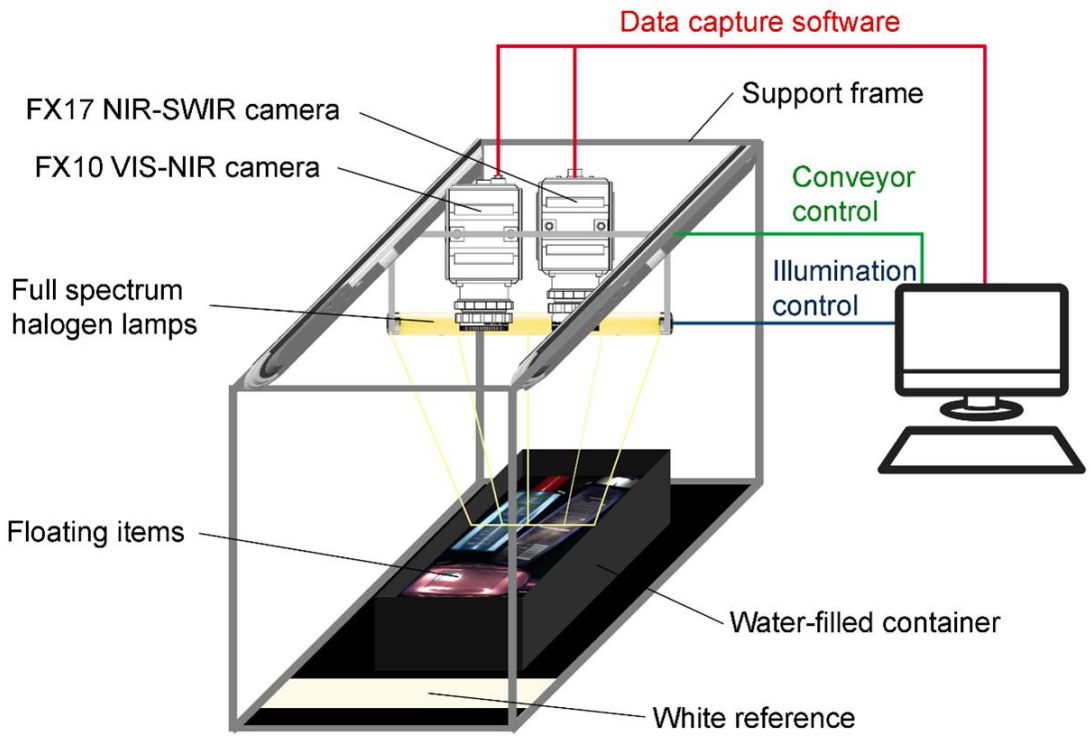
Experimental setup

Lab (controlled environment)



Field (riverbank)

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WAGENINGEN UNIVERSITY & RESEARCH

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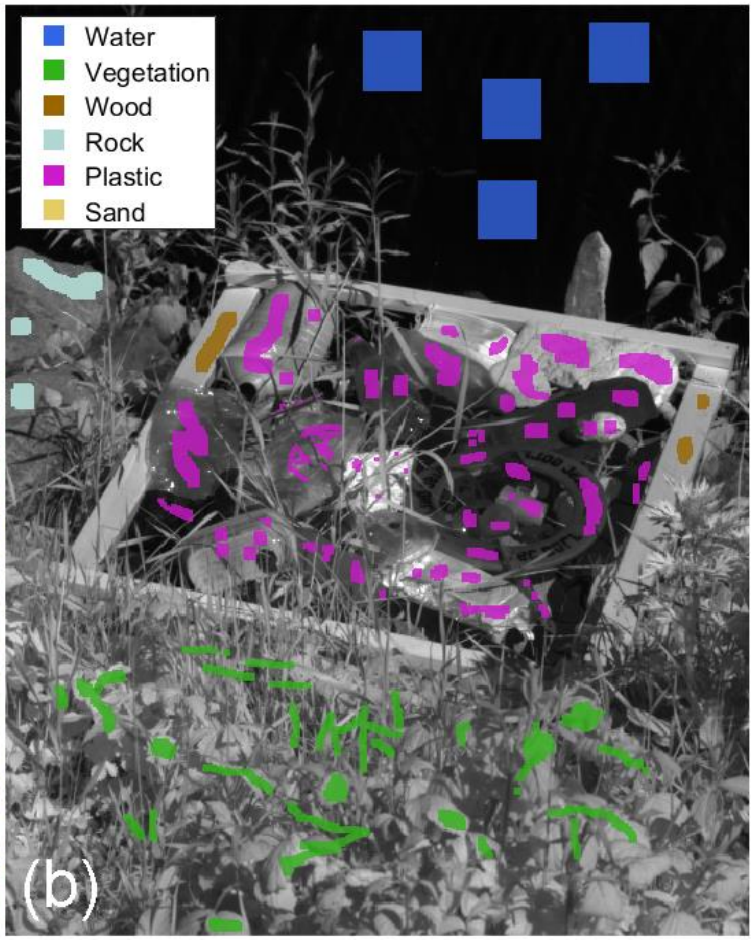

Data preparation & ROI selection

- Reflectance correction
- Intensity normalisation

Classifiers

- Support Vector Machine (SVM)
- Spectral Angle Mapper (SAM)
- Spectral Information Divergence (SID)

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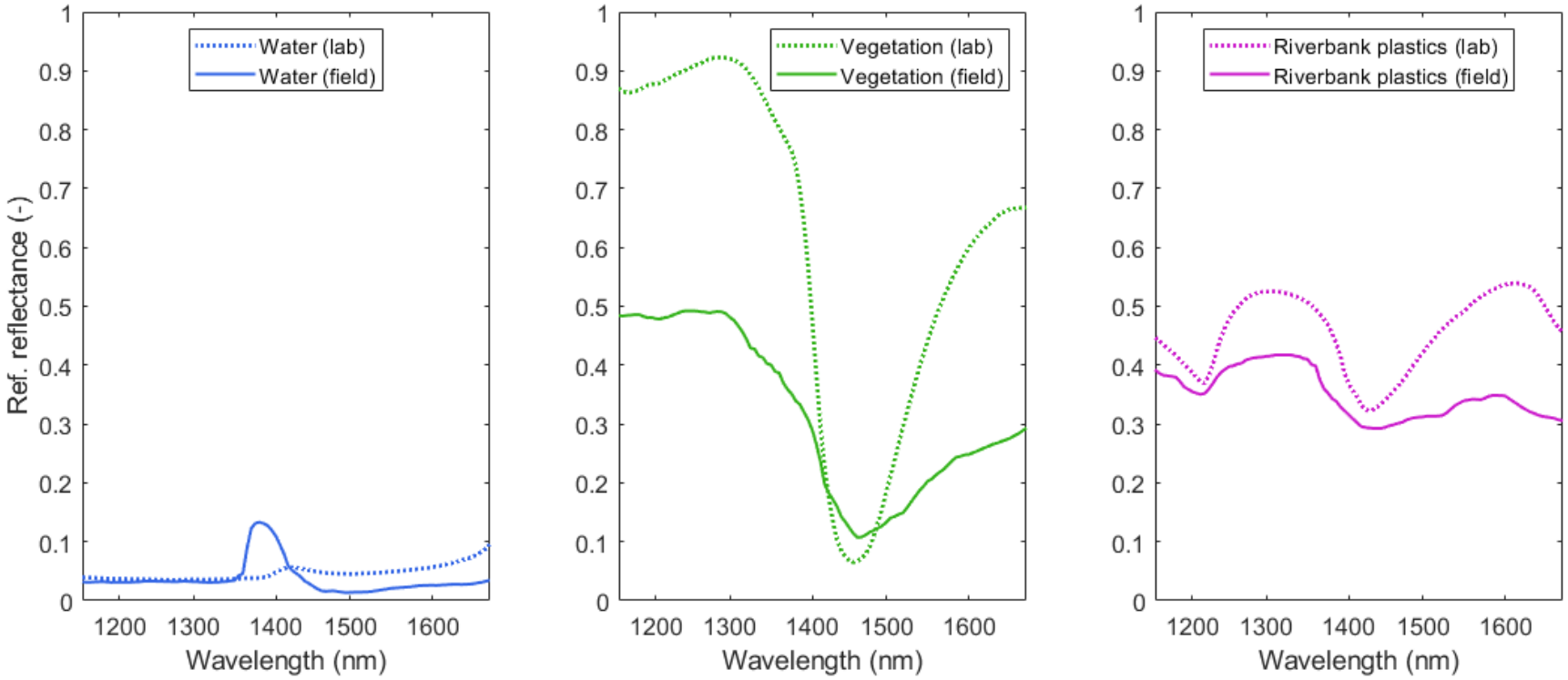
Objective 1 & 2: Reflectance patterns – lab and field



Differences

- Signal intensity
- Absorption window of H_2O molecules, causing low signal-to-noise ratio
- Less pronounced absorption peaks

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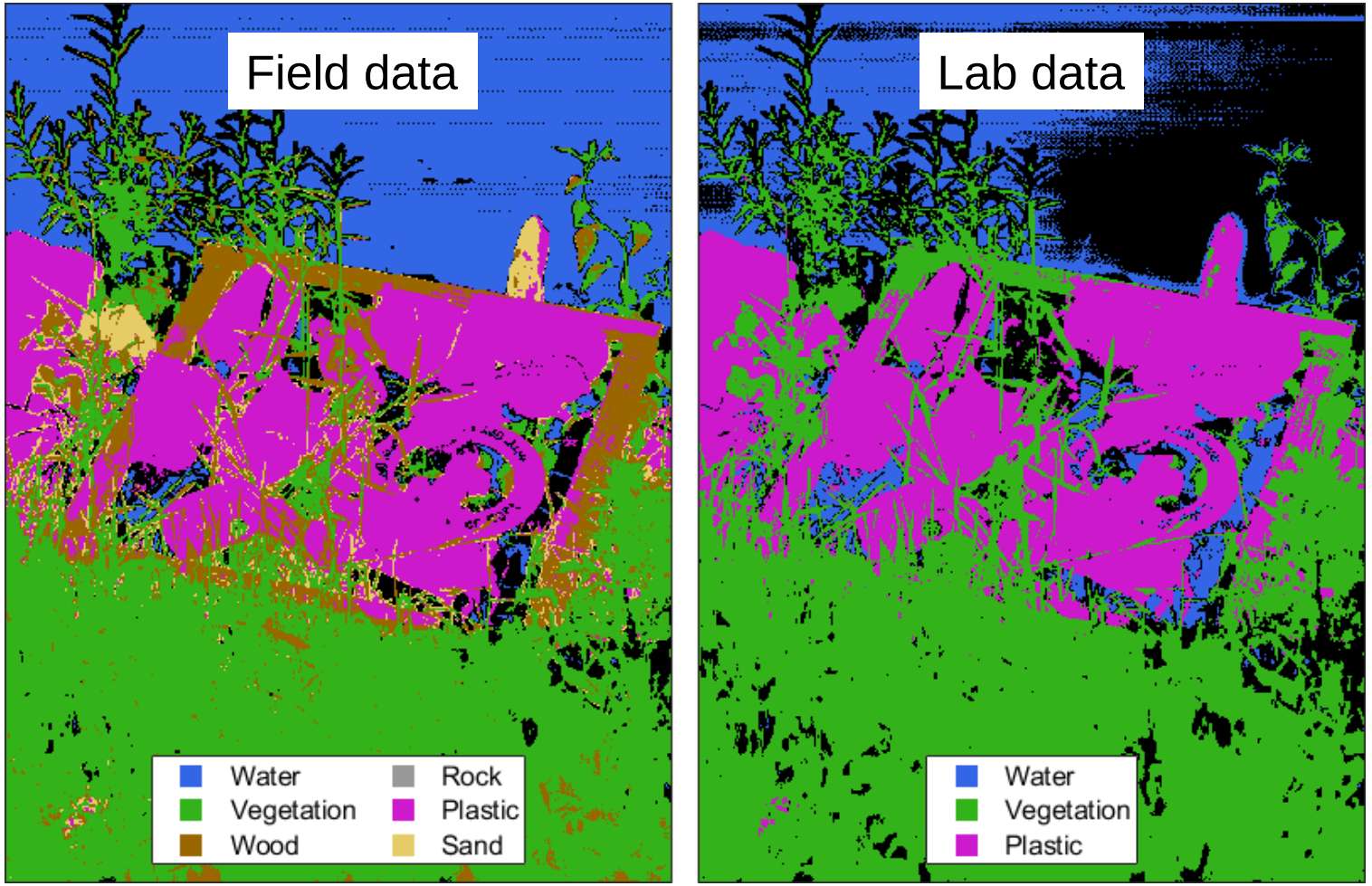

Objective 3

- Two classifications using SAM
- Black pixels indicate unclassified pixels, that do not fall within the decision boundary region.
- Using lab data for field detection of plastics with accuracies up to **93.6%**

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Concluding remarks

- Lab-based data can be used to classify field-based images
- Dynamic outside environment
  - Stationary samples
  - Clouds
  - Atmospheric transmittance
- (Open-access) Reference libraries

Future research

- Explore less accurate, cheaper sensors
  - Multispectral
  - Wider bands
- Larger image datasets captured with different environmental conditions (clouds / rainy / windy)
- Long term detection and monitoring of plastics