UNIVERSITY OF EASTERN FINLAND

Multidisciplinary assessment of NW European aapa mire ecosystems
SHIFTMIRE

ACADEMY OF FINLAND

Application of hyperspectral imaging of peat profiles to the case of fen-bog transition in aapa mires

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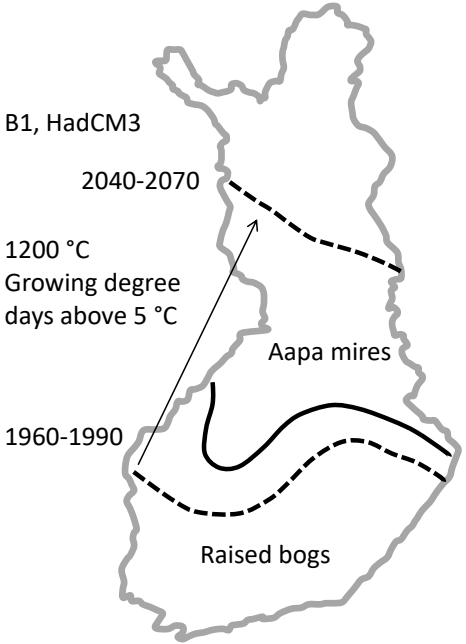
Shiftmire – Remote sensing

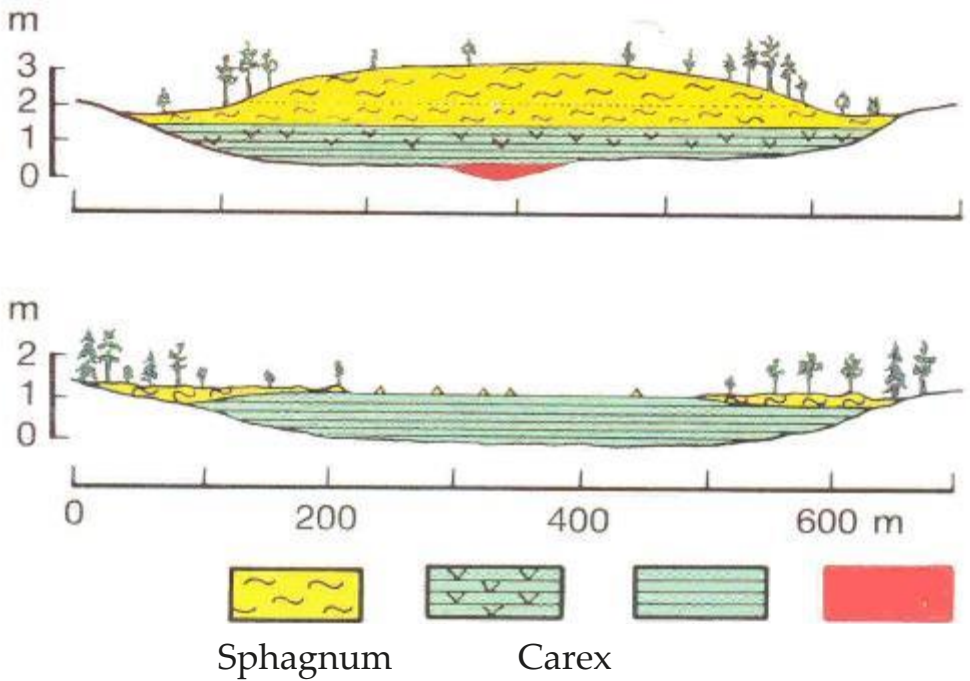
- Hydrological changes can launch rapid growth of *Sphaghnum* mosses in aapa mires
  - Fen to bog transitions



Shiftmire

Raised bog

Aapa mire



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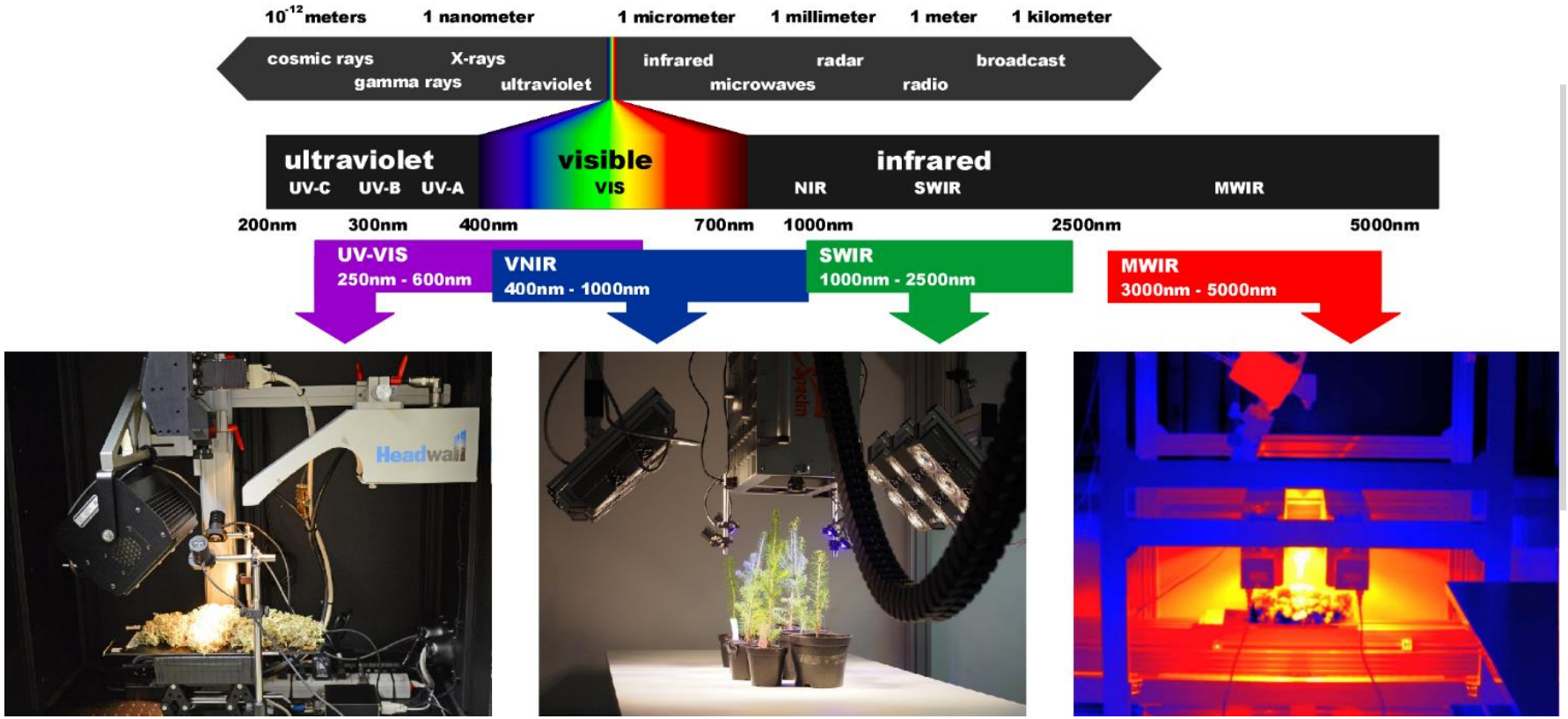
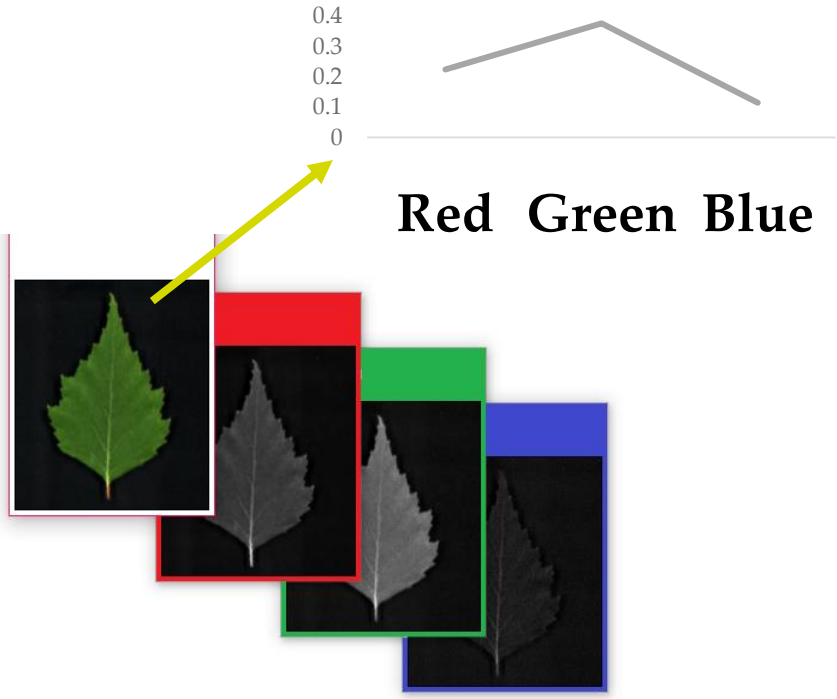
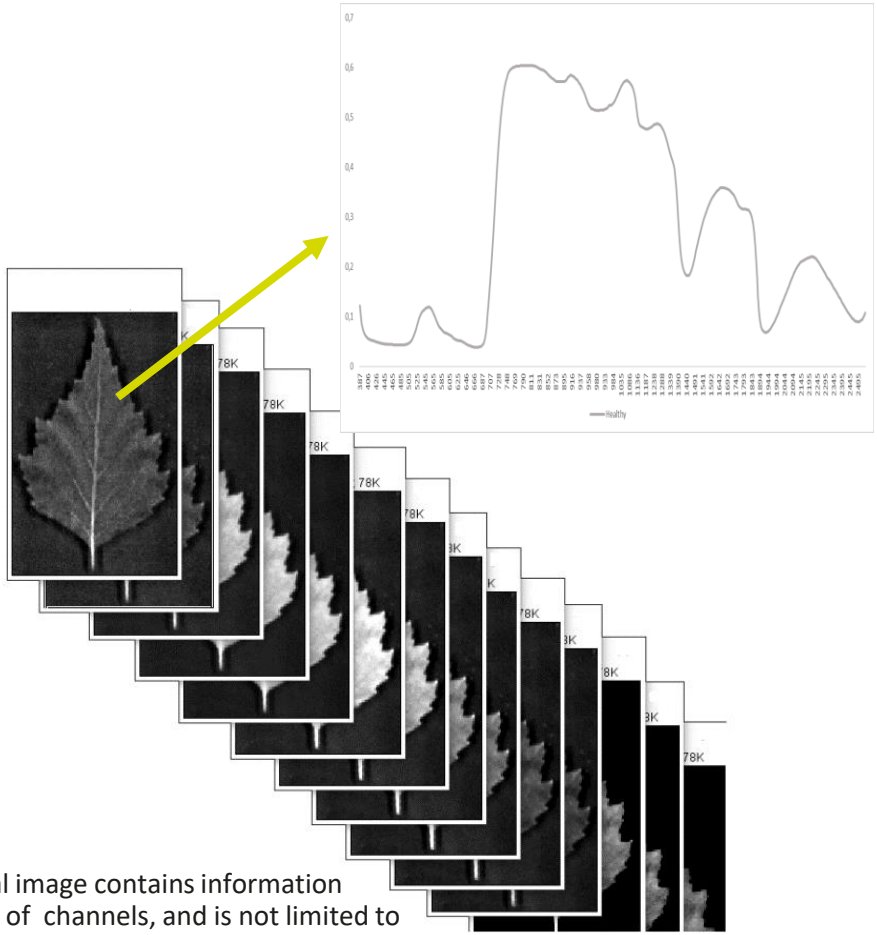
Spectromics laboratory



Hyperspectral imaging



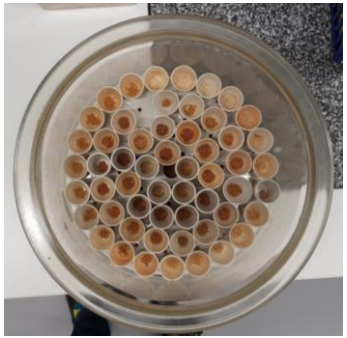
A ”normal” RGB image contains information from three separate channels



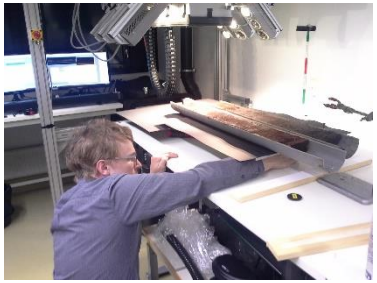
A hyperspectral image contains information from hundreds of channels, and is not limited to the visible region of light.

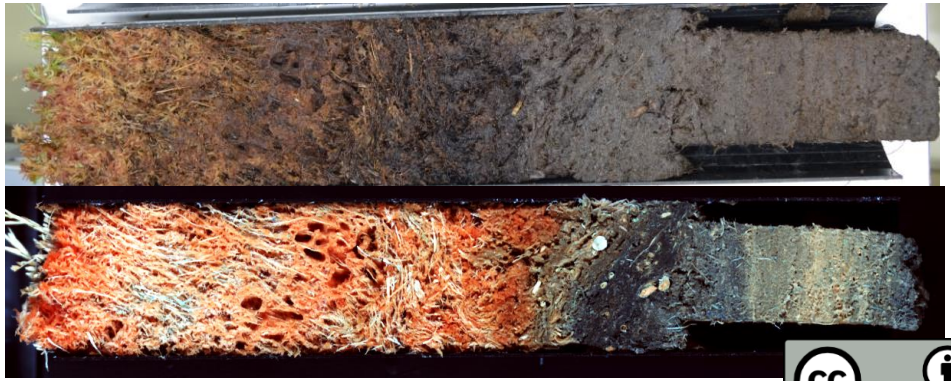
Objectives of hyperspectral core imaging

- Traditional sampling
  - Manual
  - Slow
  - Laborious



- Core imaging
  - Fast
  - Can be used to guide traditional sampling
  - Can create predictive maps of high spatial resolution

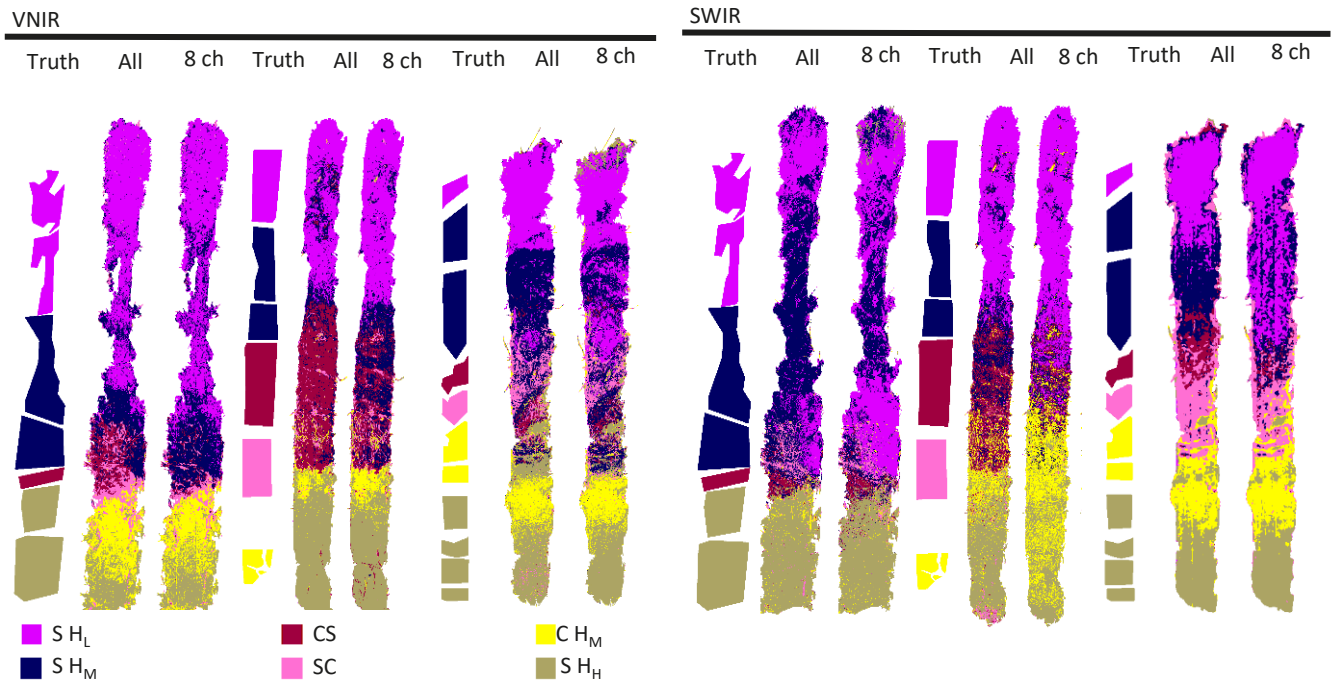




Spectral modelling

- 13 core samples from 5 mires were used to create spectral models
  - Support vector machines were used for the peat type classification
  - Spectral indices (NDI) were used for von Post quantification

- 3 samples from a separete mire were used as a independent test set



S = *Sphagnum*
C = *Carex*
H_L = low humification H1-2,
H_M = medium humification H3-5
H_H = high humification H6-9.

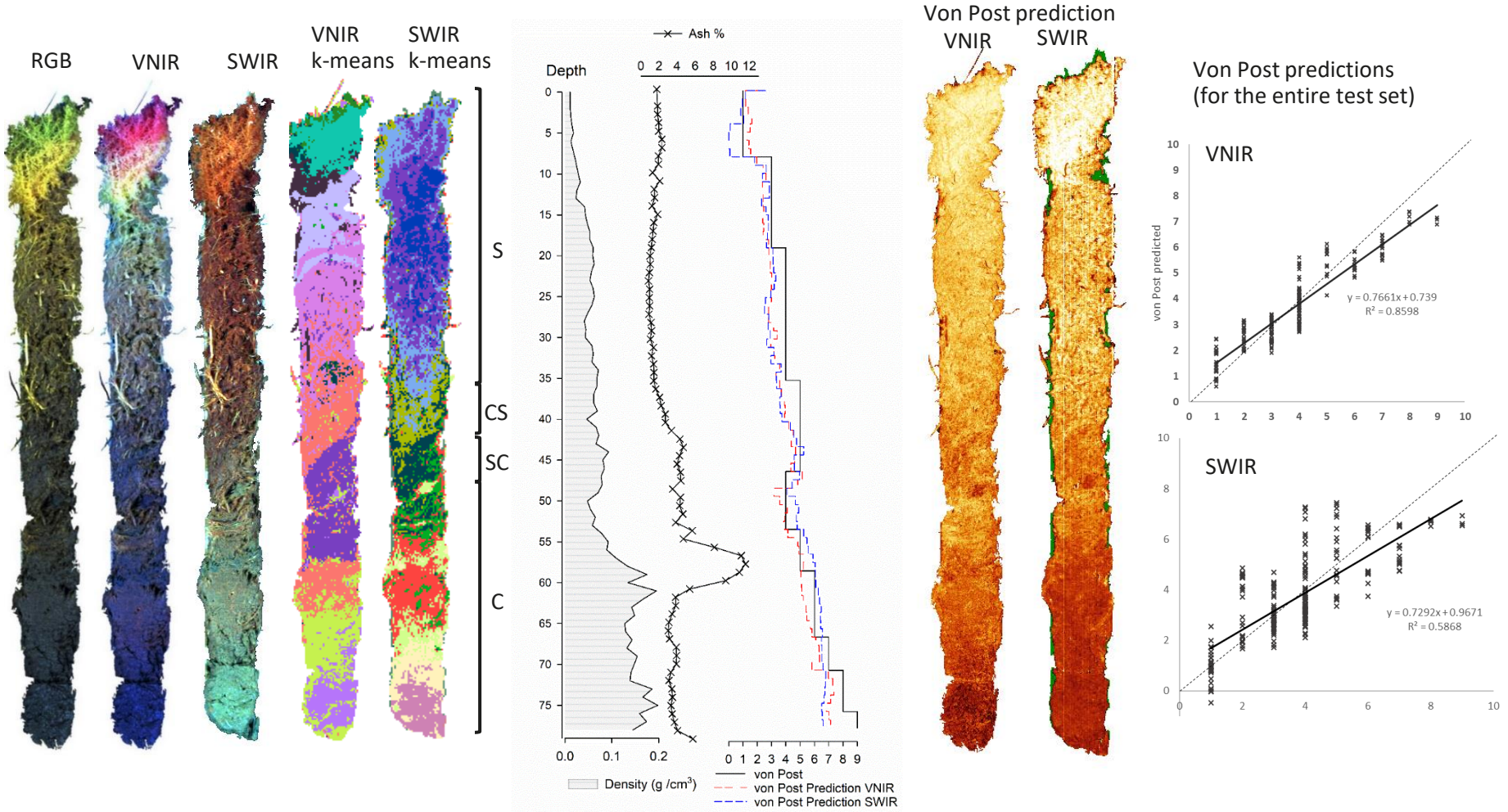
Truth=ground truth used for accuracy calculations

All = prediction with the entire VNIR- and SWIR-regions

8 ch = prediction using only eight spectral channels

Pixel-wise classification with support vector machines for the three unknown peat cores from Ilajansuo.

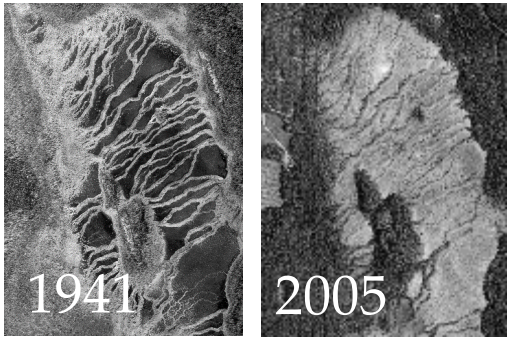
Overall accuracies for an independent test set (in predicting Spaghnum peat, Carex peat, and their transition) were 81 % and 82 % for the VNIR and SWIR, respectively. Predicting the humification was less accurate.



Test set peat core from Ilajansuo (N = 62.92149563, E = 31.21067094), with false colour images in the VNIR and SWIR- regions. The k-means clustering images with 12 classes show the complexly layered structure of peat.

The von Post predictions were calculated with NDI_{VP_VNIR} and NDI_{VP_SWIR}. Images of the von Post predictions are on the right.

Conclusions



- Aapa mires are potentially subject to ecosystem transitions due to hydrological change
- Hyperspectral imaging can reveal complex layering in peat cores in high detail with benefits for further sampling
- The method shows promise in both classification and the quantification of basic peat properties

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