

**neo**

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NORSK ELEKTRO OPTIKK AS

Hyperspectral systems for Woodworking

Trond Løke - CEO

# HySpex product areas

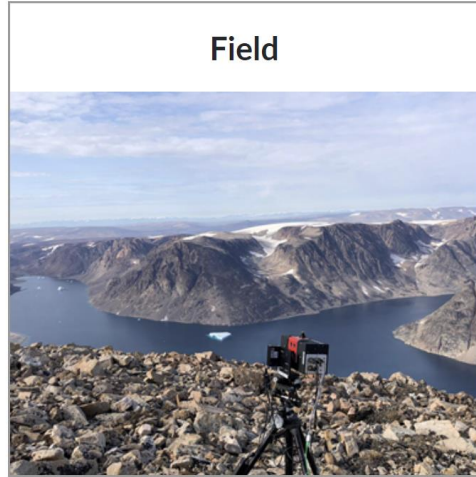
Airborne



Laboratory Systems



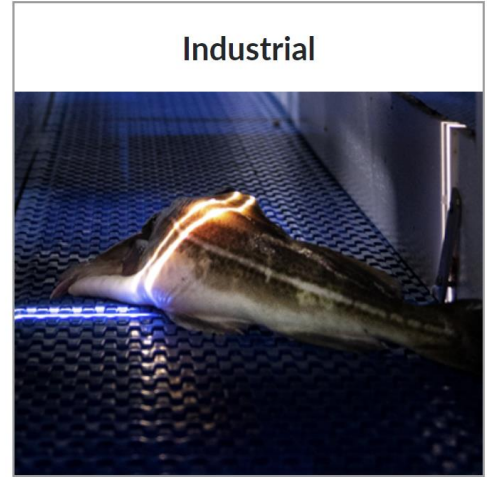
Field

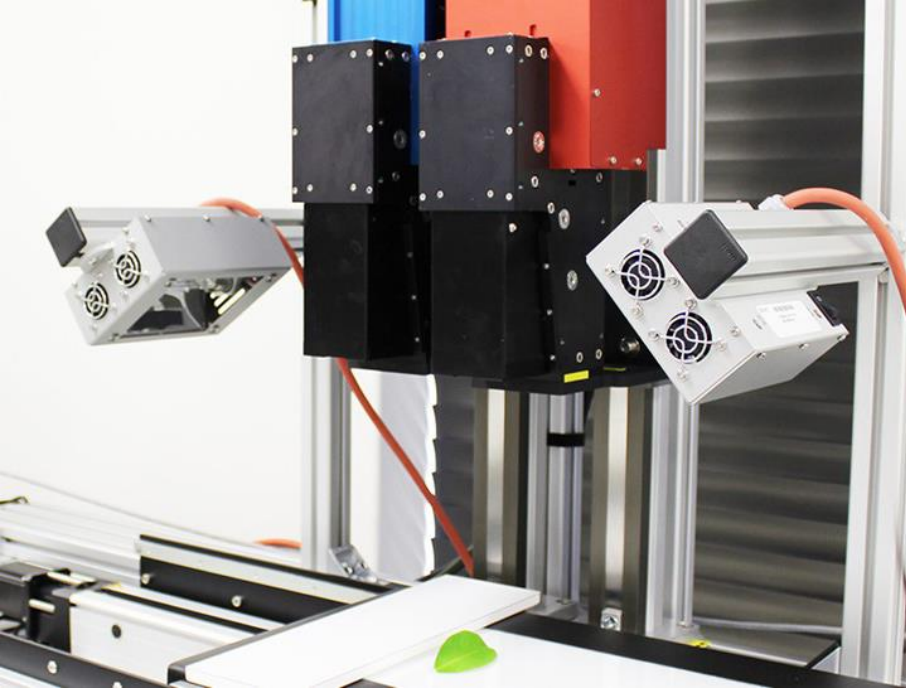


UAV

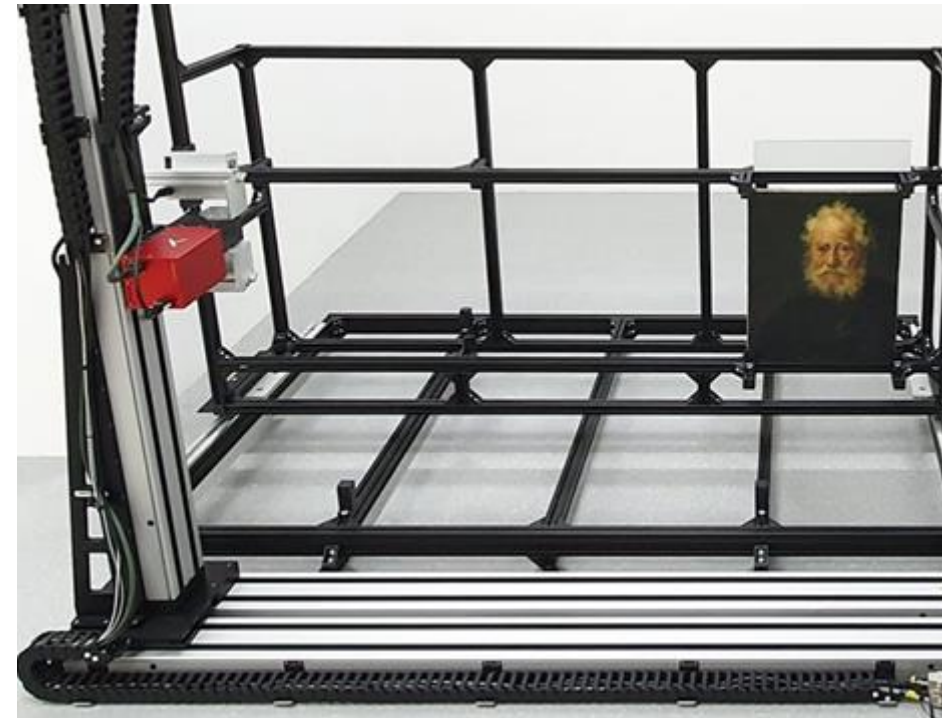



Industrial





Quality leader in the  
world of  
hyperspectral



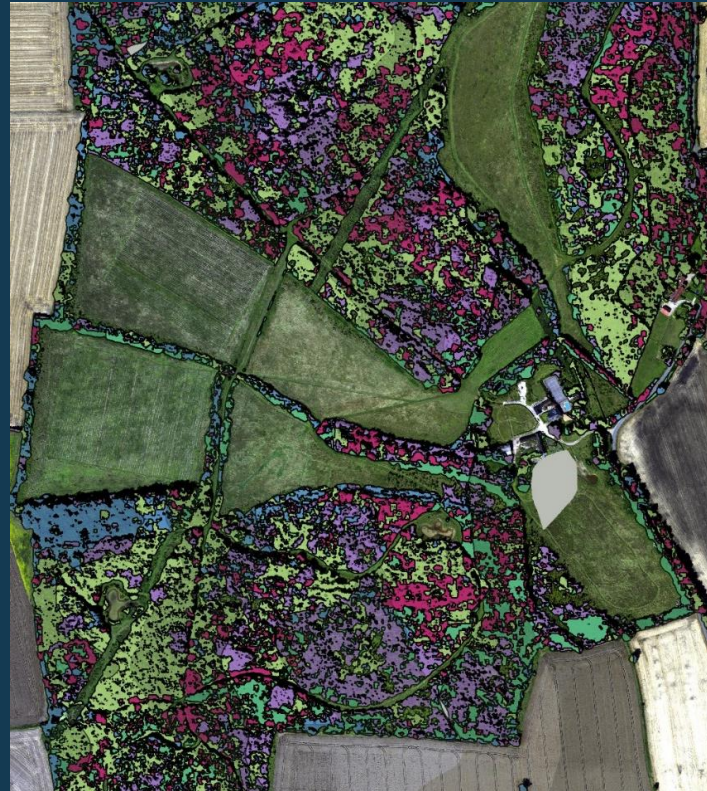
An aerial photograph showing a dense forest of green trees. In the lower-left corner, there is a construction site with several stacks of lumber and a large, multi-story building with a light-colored facade. The text is overlaid on a semi-transparent dark band across the center of the image.

# Hyperspectral Airborne Remote Sensing of Trees

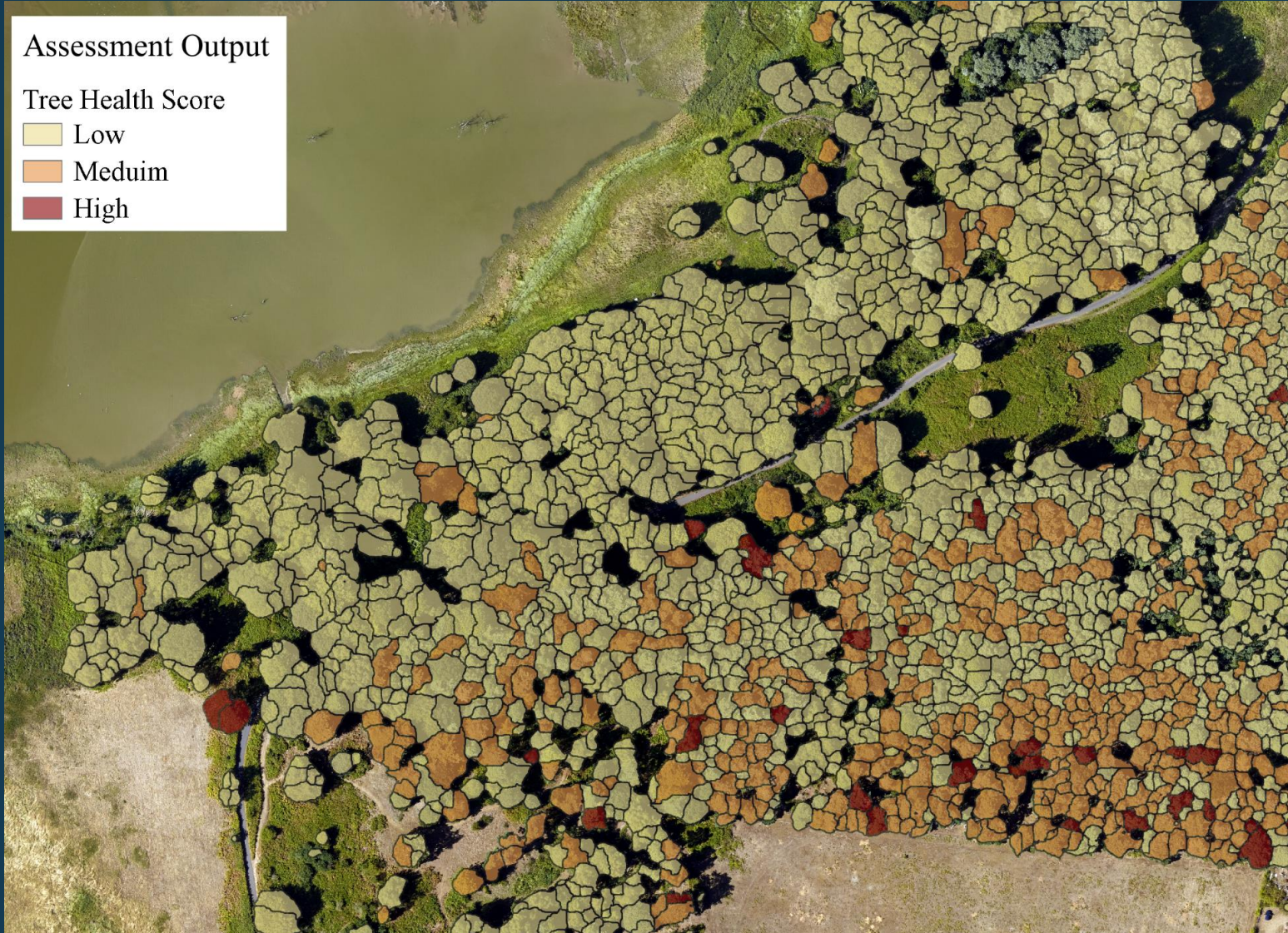
Examples from 4 customers

# Tree Species

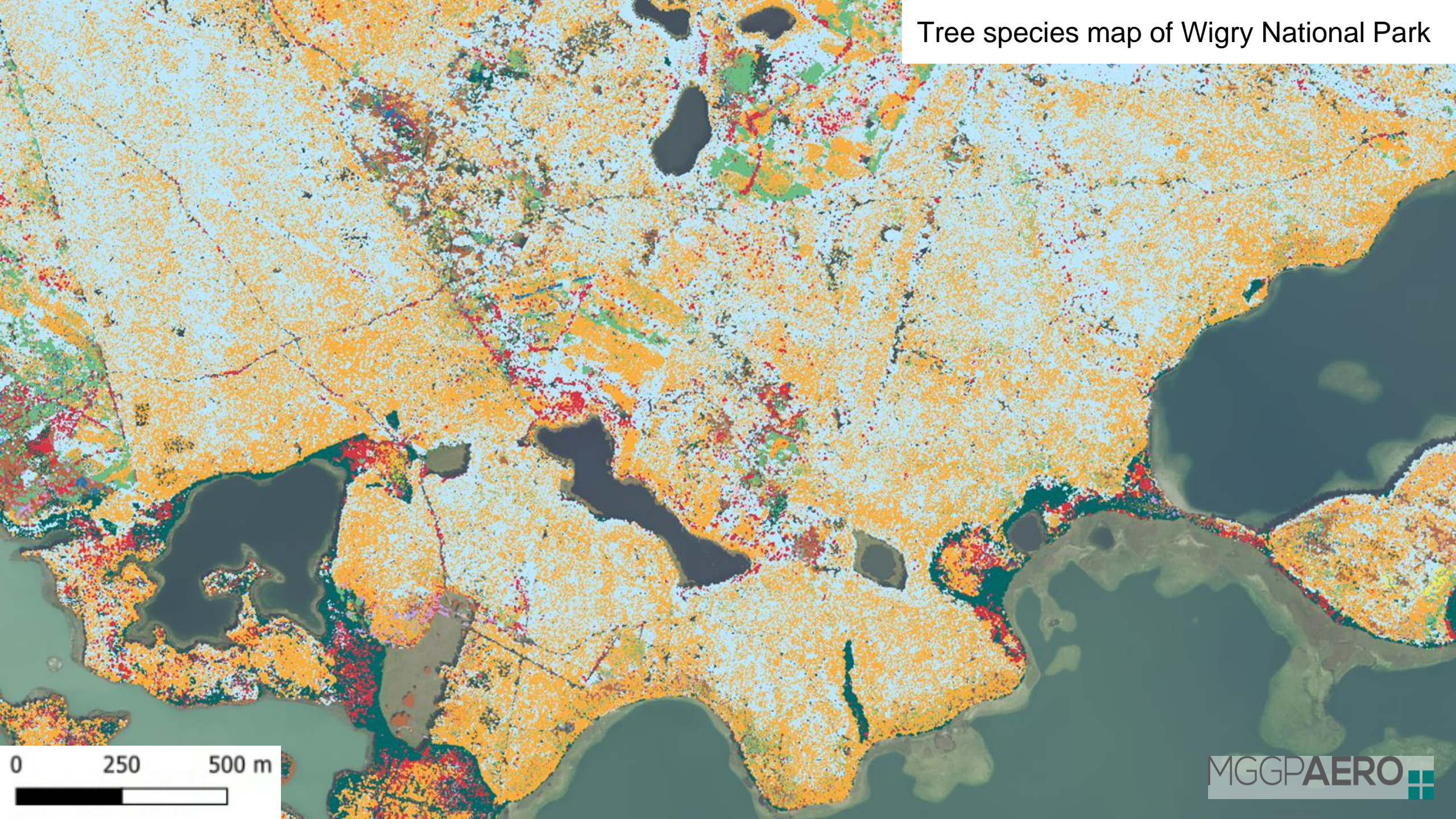
- ✘ Requires the exploitation of hyperspectral data
- ✘ Ground truth – model development and validation



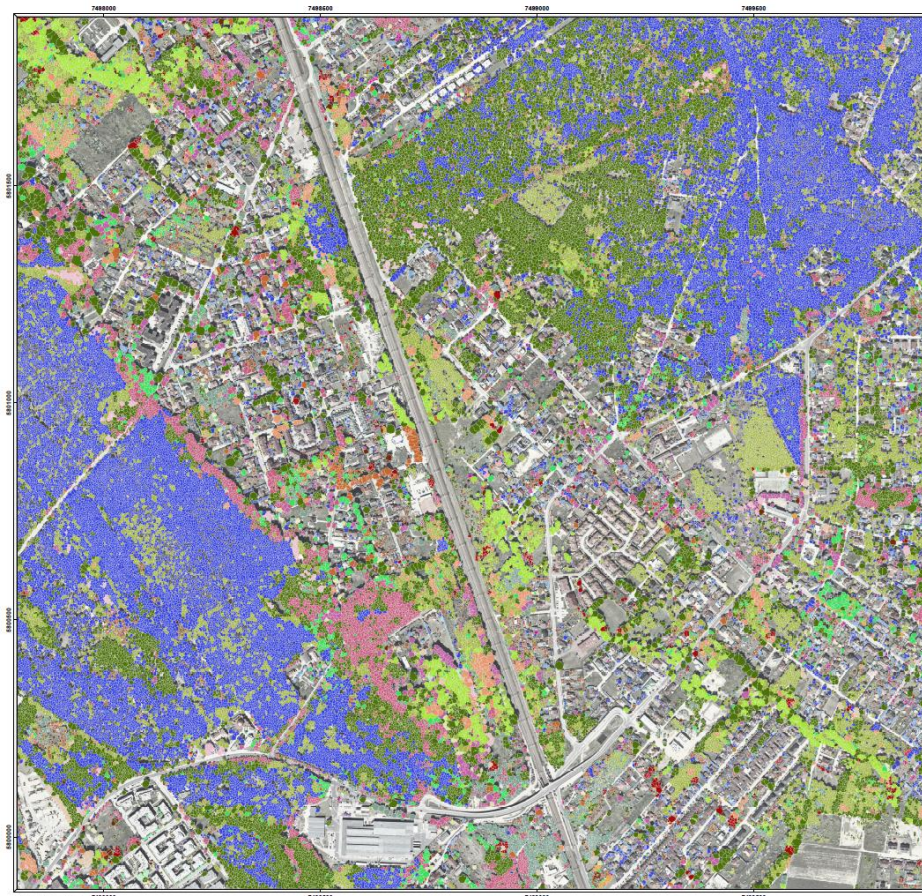
# Assessing tree health



# Tree species map of Wigry National Park



0 250 500 m



KMKD-TAKSN-WEK-B5

Identyfikator taksonu na Mapie Zasięgu Koron Drzew z uzupełnioną tabelą atrybutów

Opracowanie i dostarczenie kompleksowej Mapy Koron Drzew w wersji numerycznej dla obszaru m.st. Warszawy

1:5 000

<i>Quercus robur</i>	<i>Azalea japonica</i>	<i>Salix sp.</i>	<i>Salix caprea</i>
<i>Acer negundo</i>	<i>Salix sp. (pentandra)</i>	<i>Salix sp.</i>	<i>Salix sp.</i>
<i>Acer platanoides</i>	<i>Salix sp. (pentandra)</i>	<i>Salix sp.</i>	<i>Salix sp.</i>
<i>Acer platanoides</i>	<i>Salix sp. (pentandra)</i>	<i>Salix sp.</i>	<i>Salix sp.</i>
<i>Acer platanoides</i>	<i>Salix sp. (pentandra)</i>	<i>Salix sp.</i>	<i>Salix sp.</i>
<i>Acer platanoides</i>	<i>Salix sp. (pentandra)</i>	<i>Salix sp.</i>	<i>Salix sp.</i>
<i>Acer platanoides</i>	<i>Salix sp. (pentandra)</i>	<i>Salix sp.</i>	<i>Salix sp.</i>
<i>Acer platanoides</i>	<i>Salix sp. (pentandra)</i>	<i>Salix sp.</i>	<i>Salix sp.</i>
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<i>Acer platanoides</i>	<i>Salix sp. (pentandra)</i>	<i>Salix sp.</i>	<i>Salix sp.</i>

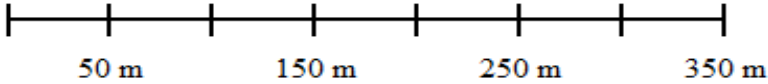




# Urban trees water stress



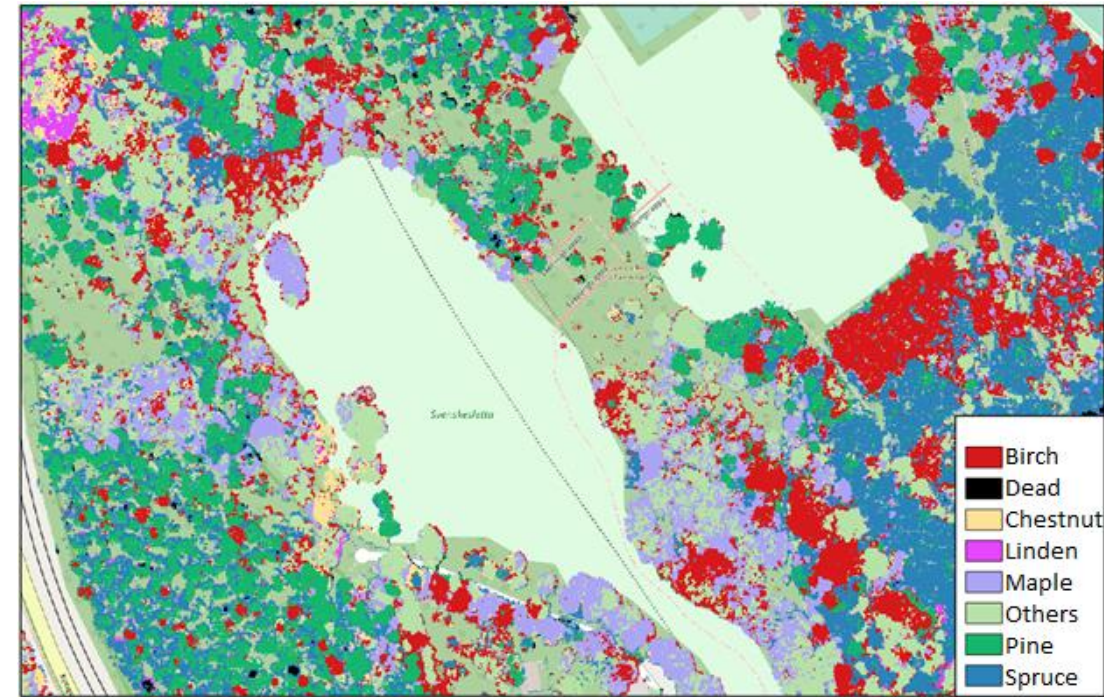
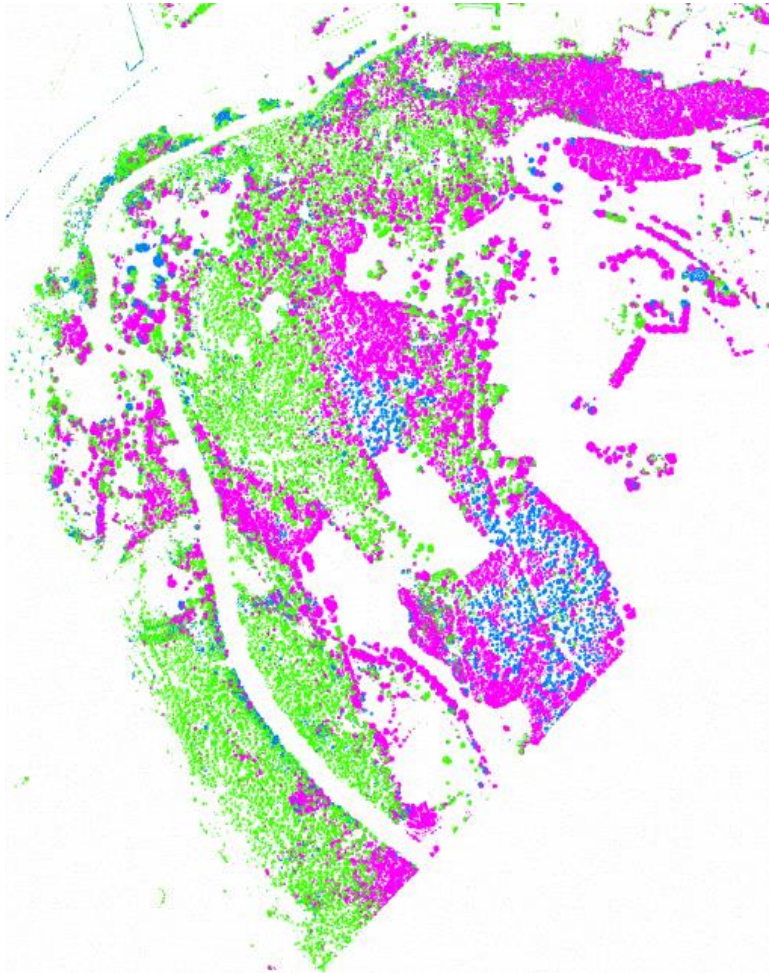
## Moisture Stress Index



Tatra Mountains National Park - map of dead spruce due to bark beetle



# Tree Species in Urban areas



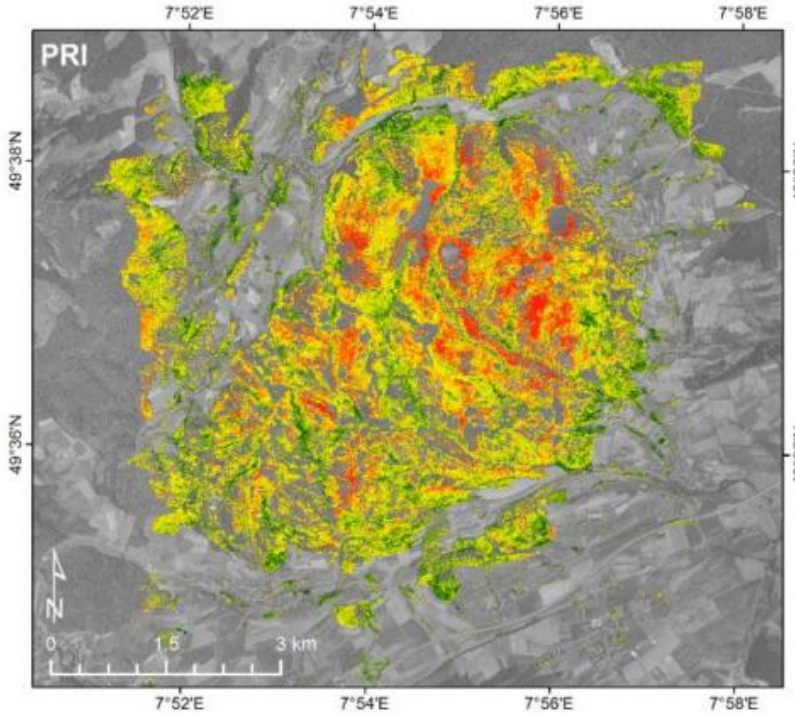
Dalponte, M., Aarsten, D., Frizzera, L., Jonassen, V. og Næsset, E. (2018) *Bruk av data fra flybåren hyperspektral skanner for klassifisering av treslag i et urbant landskap.* Ikke publisert.

Figure 2. Result of hyperspectral pixel classification of the Ekeberg area; green=pine, blue=spruce, pink=birch, white=no trees or outside of imaged area.

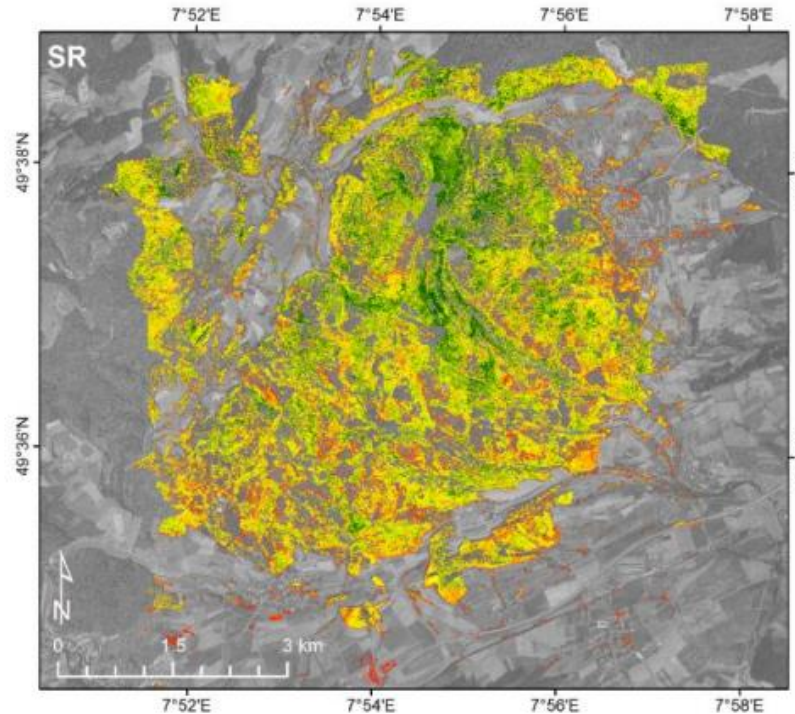
# Drought Stress (Flights by DLR, Analysis by University of Trier)

In this study, airborne hyperspectral data were used to assess the response of deciduous species (dominated by European beech and Sessile and Pedunculate oak) to water stress during a summery dry spell.

**Photochemical Reflectance Index (PRI)**



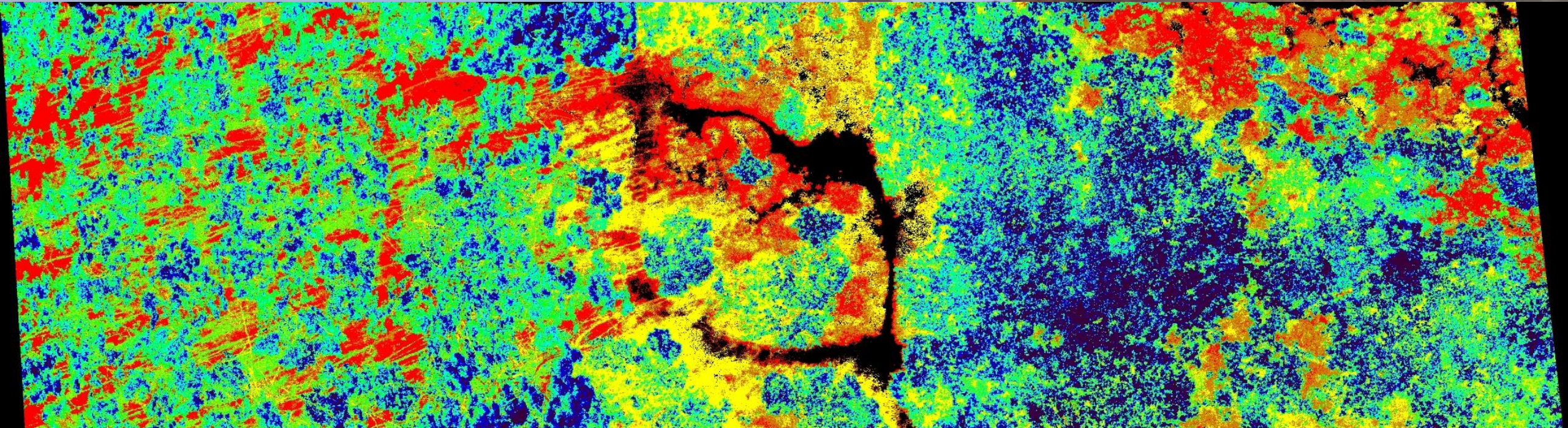
**Structure-sensitive simple ratio (SR) vegetation index**



Ref article:  
«The Potential of EnMAP and Sentinel-2 Data for Detecting Drought Stress Phenomena in Deciduous Forest Communities»

**Figure 10.** Spatial pattern of PRI (left) and SR (right) produced with the HySpex2.5 data set. All maps are colored from red (mean - 2 standard deviations) to green (mean + 2 standard deviations).

# Fire-Fuel with HySpex in California – UAV platform



# Industrial application

## Baldur industrial line of hyperspectral cameras

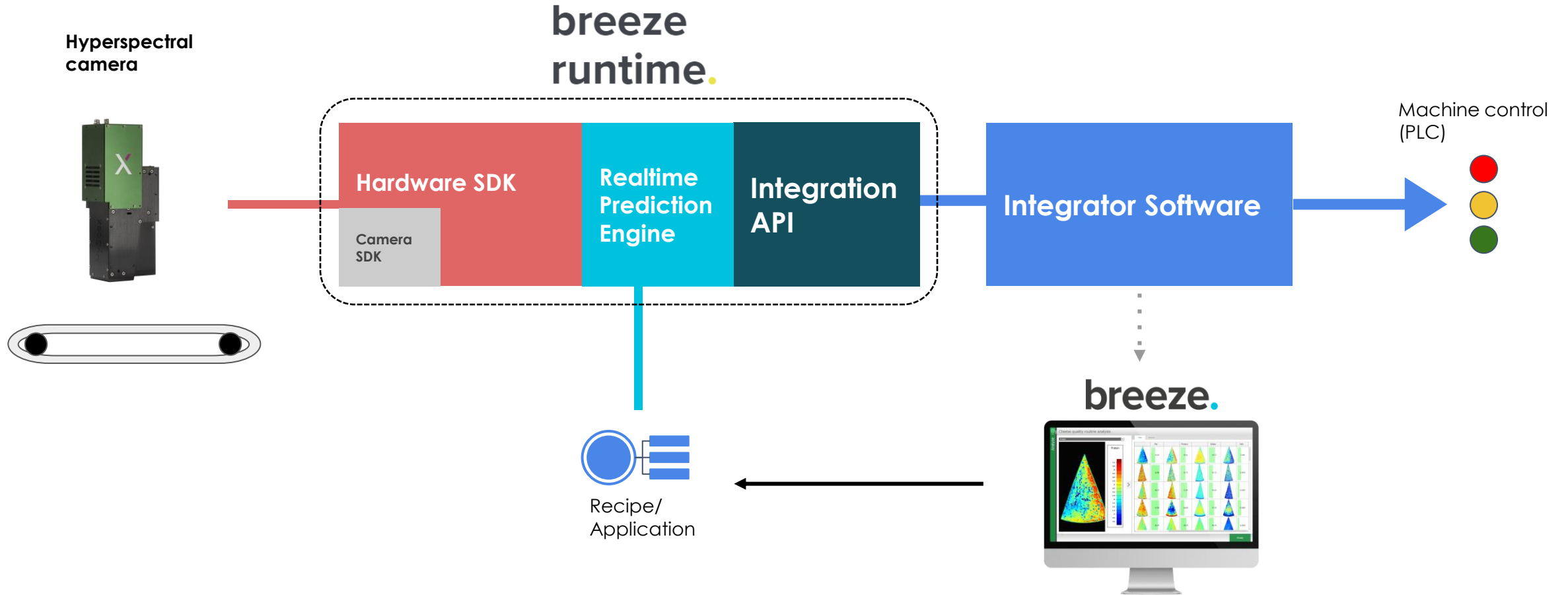
- Camera optimized for industry
- Spectral PSF = 2 bands to avoid spectral aliasing
- More light-sensitive than classical HySpex camera
- High speed, compatible with belt speeds up to many m/s \*
- Cheaper!



NEO also design industrial illumination without chromatic aberrations for our cameras.



# Embedded turnkey solutions / OEM



# Continuous on-line characterization of softwood chip quality using HSI

## NIR for chips control

Continuous information  
Wood chip properties



Chips  
(Scanchip)



Pine/Spruce  
Bark content



Density

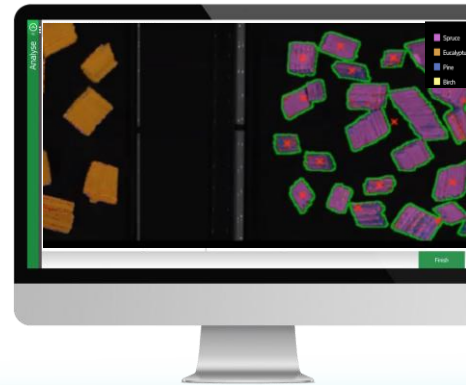


Moisture



HySpex  
by neo

Baldur - SWIR camera for  
industry applications



Prediktera.

Breeze + Runtime  
software to develop and run  
real time applications

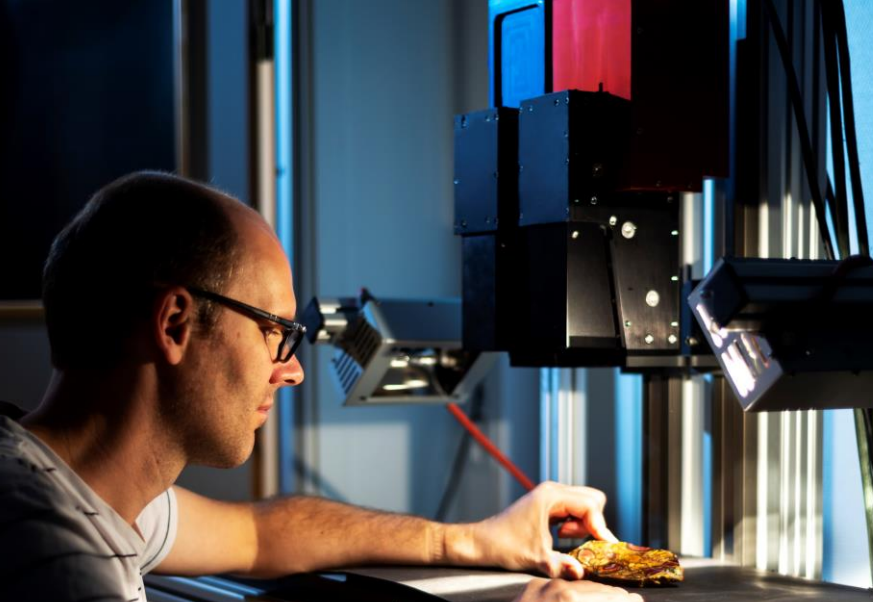


Current research project to improve the understanding of the wood chips impact on the end products quality variations and being able to further control and optimize the cooking conditions of the kraft pulping process



**WE ARE  
HIRING!**

- **3 persons in R&D**
  - Photonics/electronics/mechanics
- **2 persons in production**



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