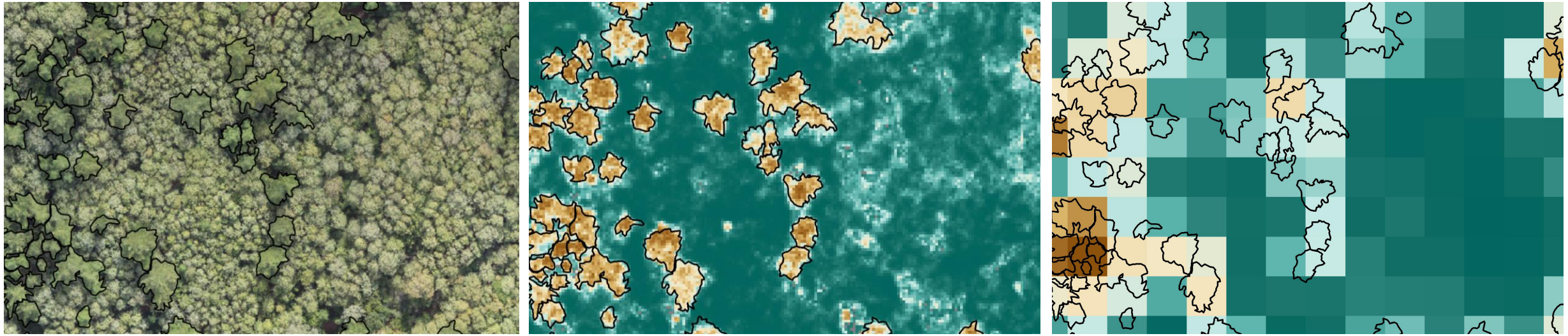
# Mapping of invasive plant species with Sentinel-1 and -2 data calibrated with UAV-based training data

**Teja Kattenborn, Javier Lopatin, Michael Förster, Fabian Fassnacht**

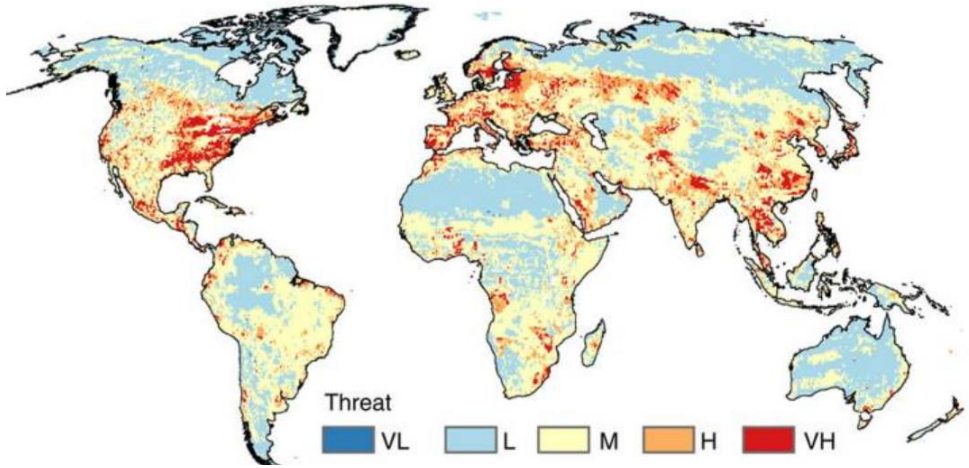
**Institute for Geography and Geoecology (ifgg)**



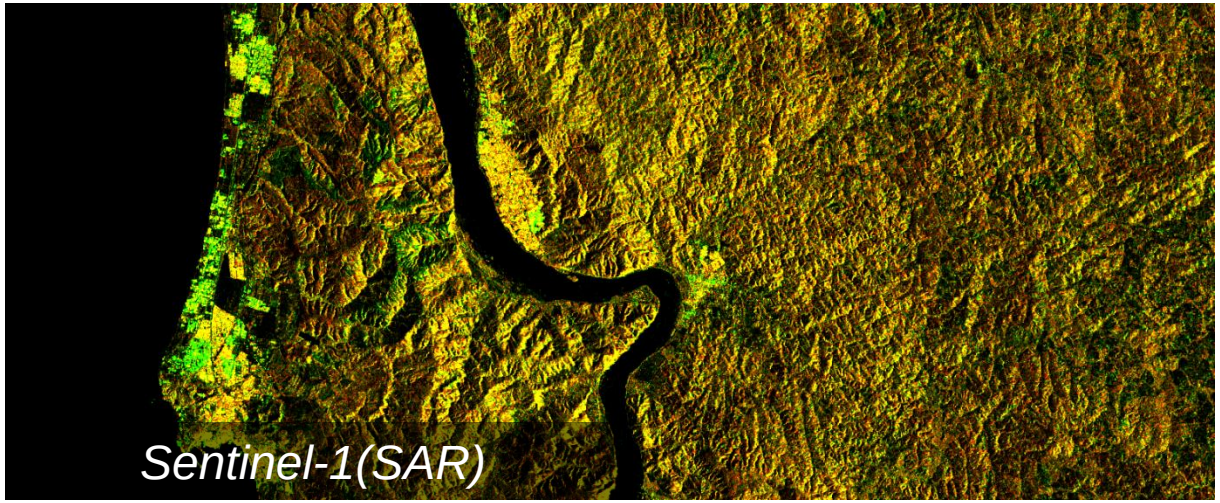
# Rationale

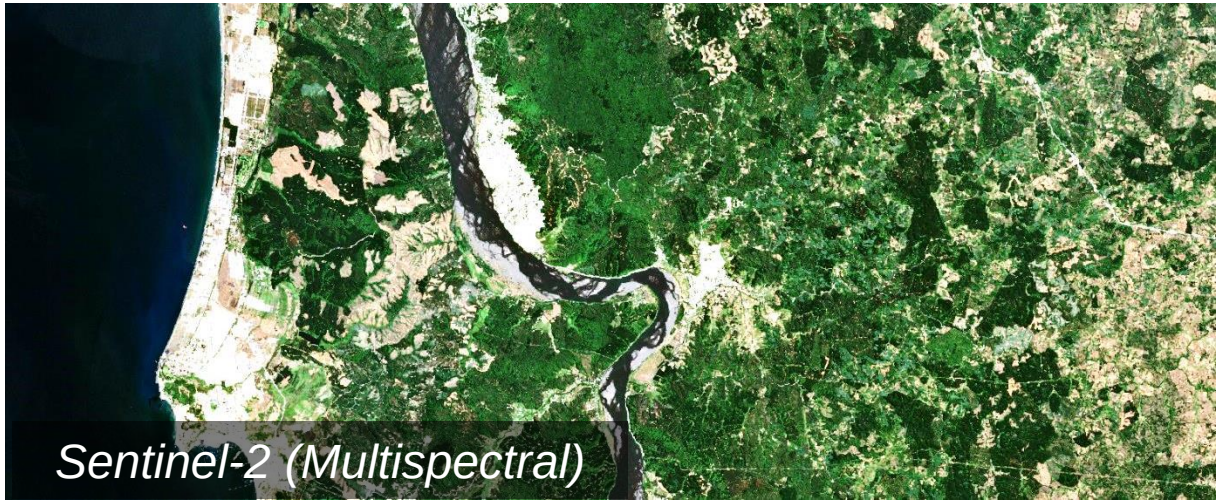
- Invasive plant species can pose major threats to biodiversity, ecosystem functioning and services

- Sentinel-1 (SAR) and Sentinel-2 (Multispectral) satellite data have unpreceded spatial and temporal resolution with global coverage




Early, R. et al. (2016), *Nature Communications*



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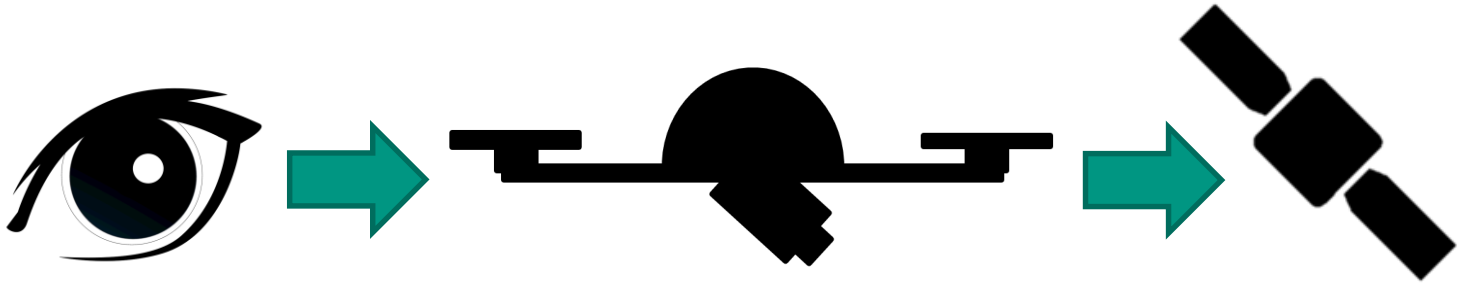


Visual interpretation

UAV photogrammetry

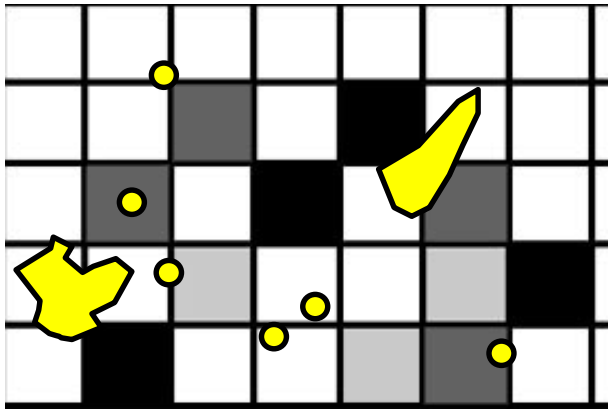
Sentinel data

Field sampling is expensive and time consuming

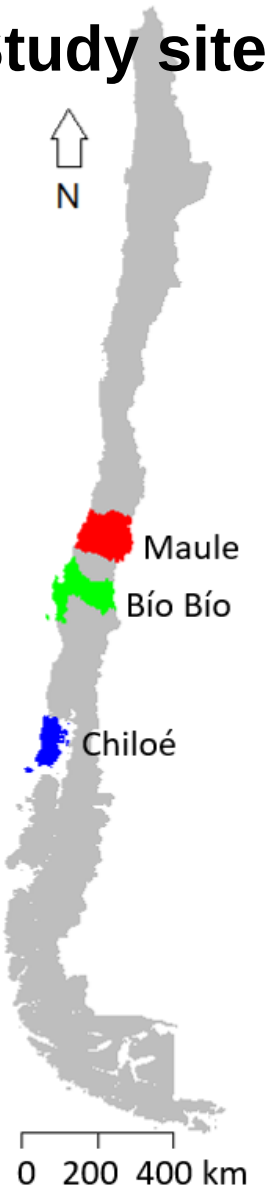
Field sampling is often biased by accessibility

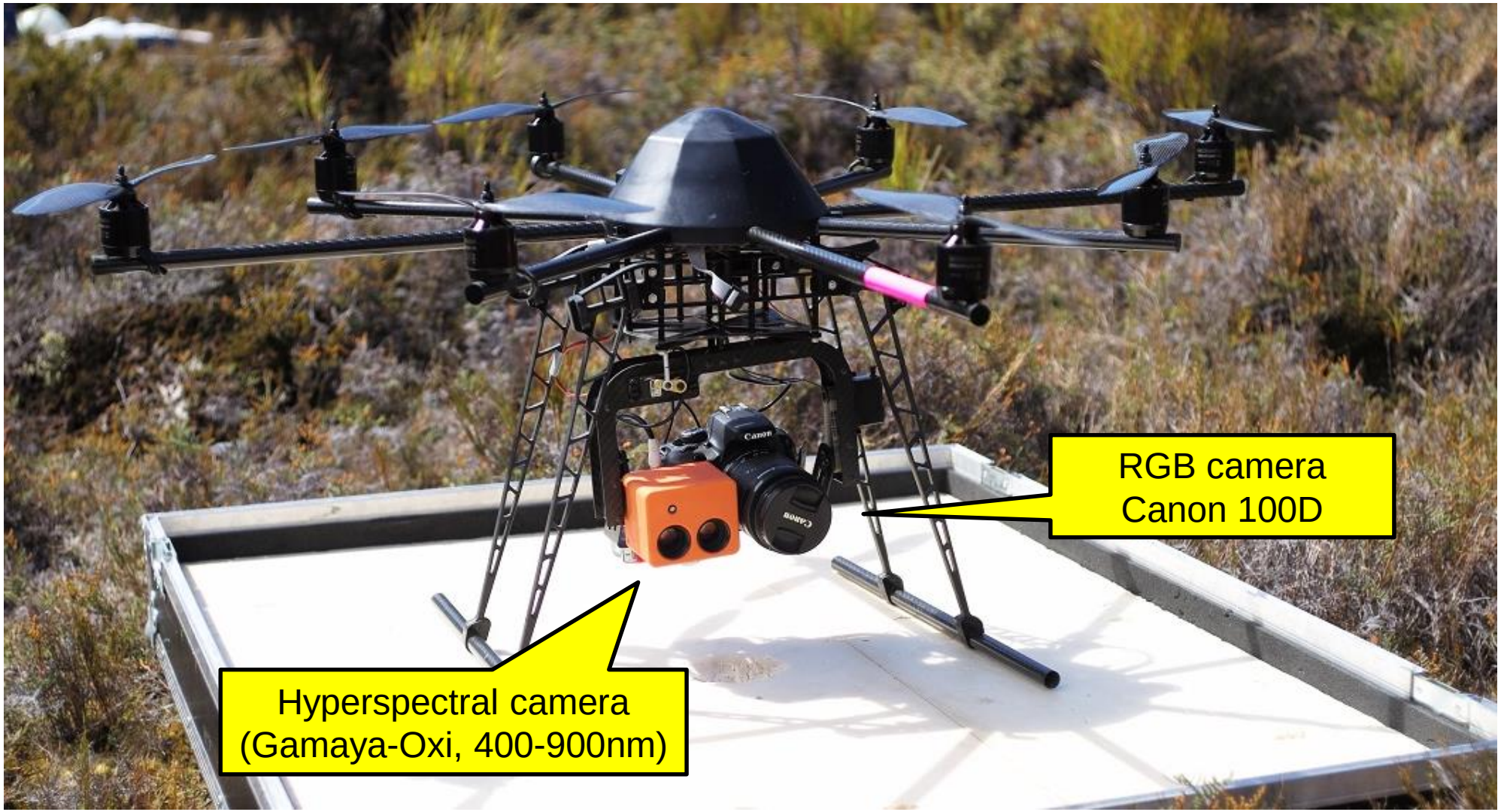
Linking discrete field samples to the remote sensing scale is challenging

Field samples often do no match the ‘bird perspective’



# Study site


N
Maule
Bío Bío
Chiloé
0 200 400 km

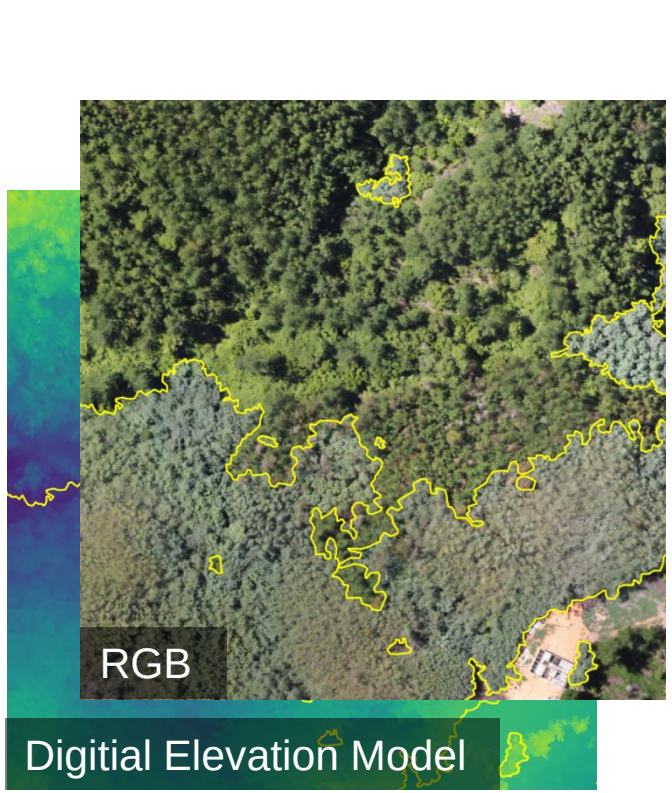

RGB camera
Canon 100D
Hyperspectral camera
(Gamaya-Oxi, 400-900nm)

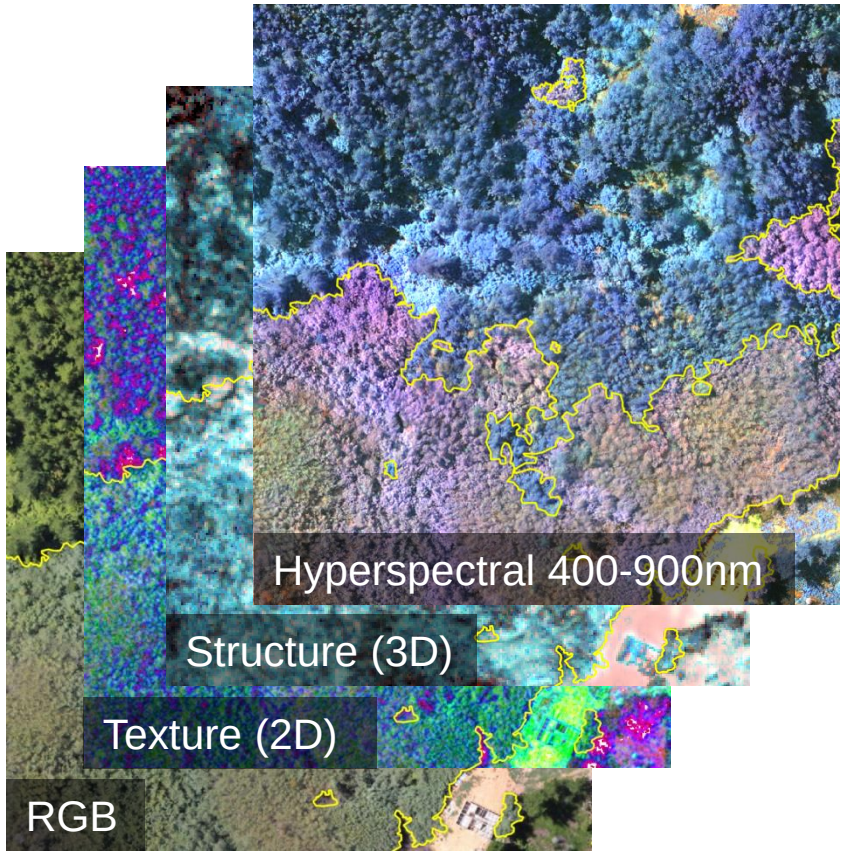
# Proposed workflow

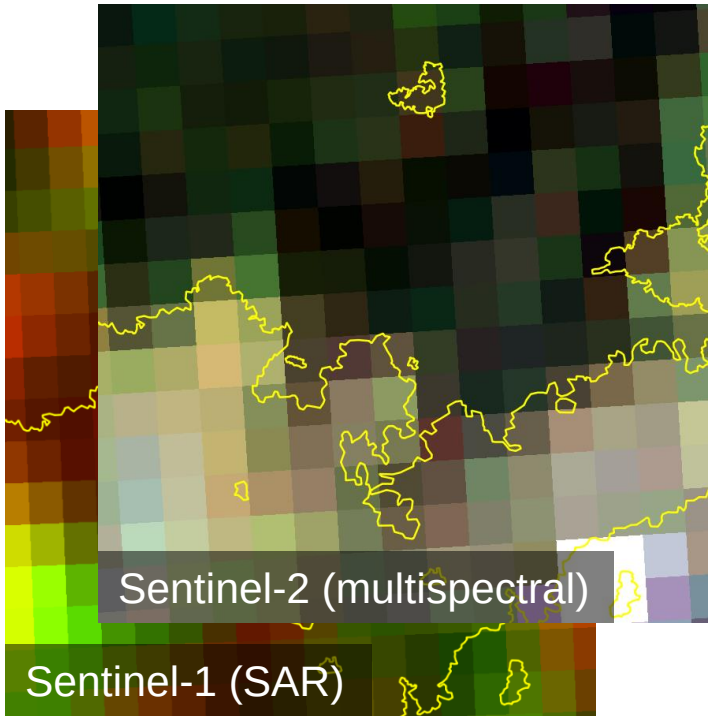
Visual interpretation of UAV products

Automatic classification (MaxEnt) using UAV–based predictors

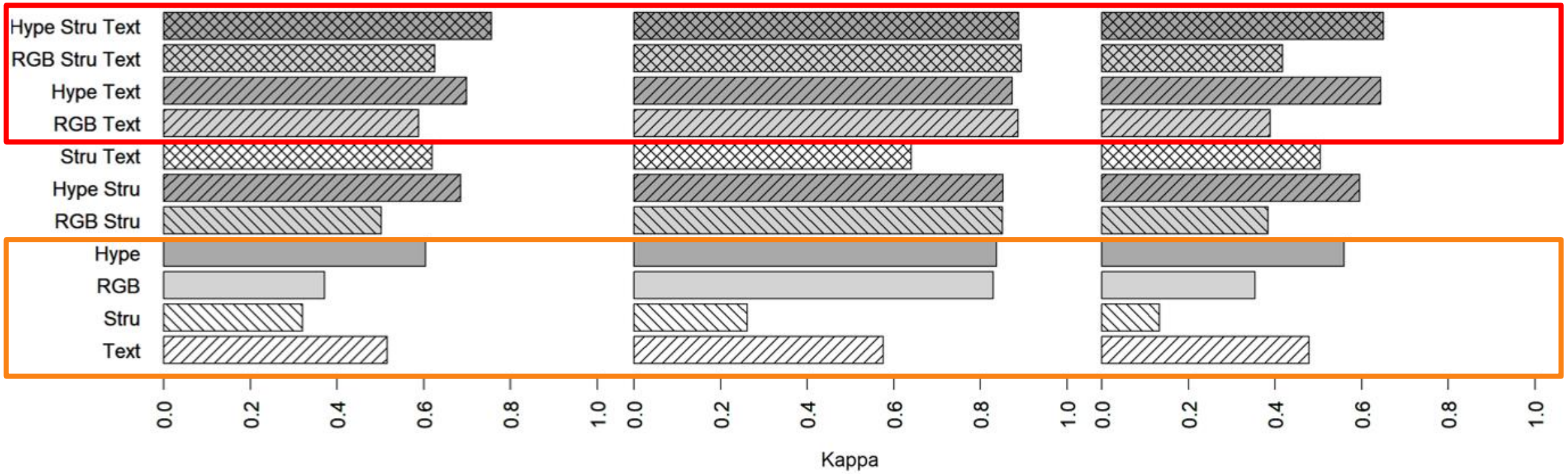
Upscaling from UAV (0.1m) to the Sentinel scale (10m) by random forest



# UAV-based classification



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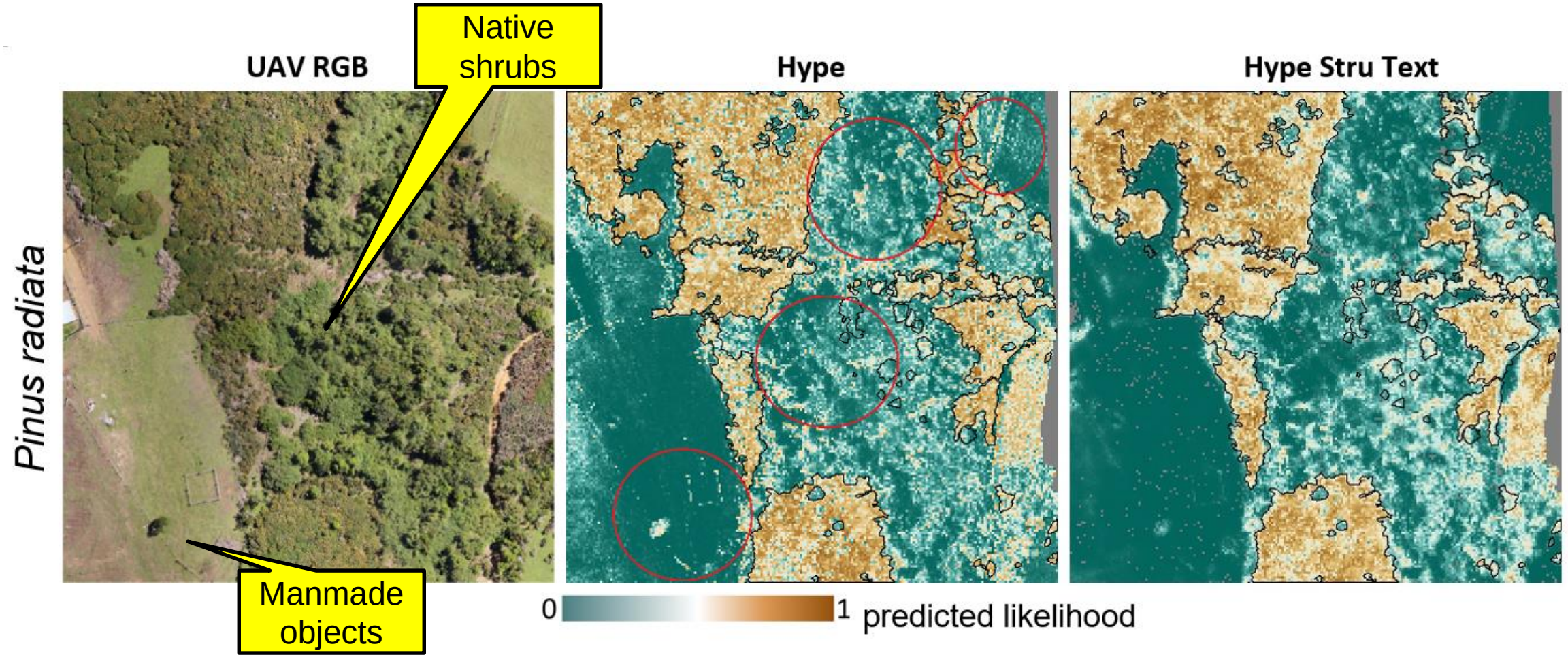
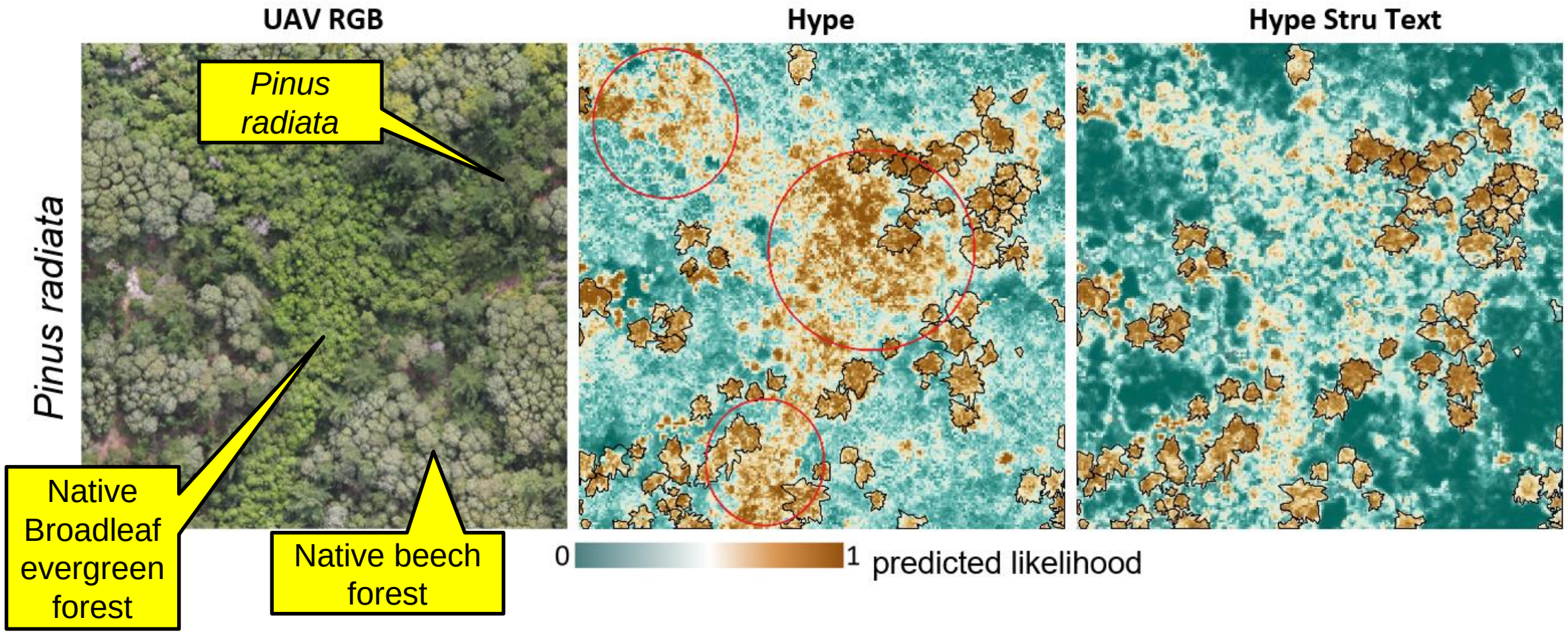
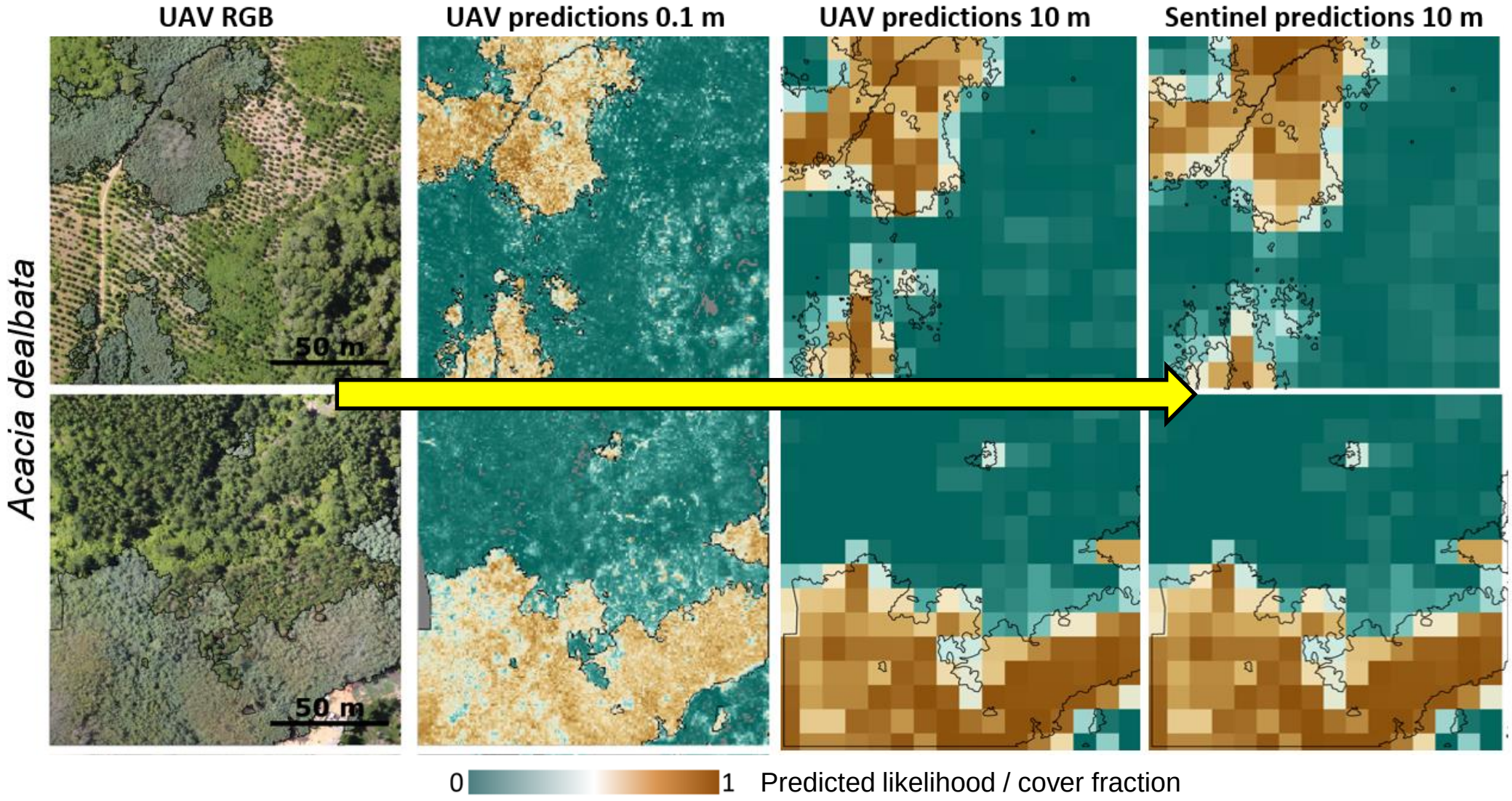


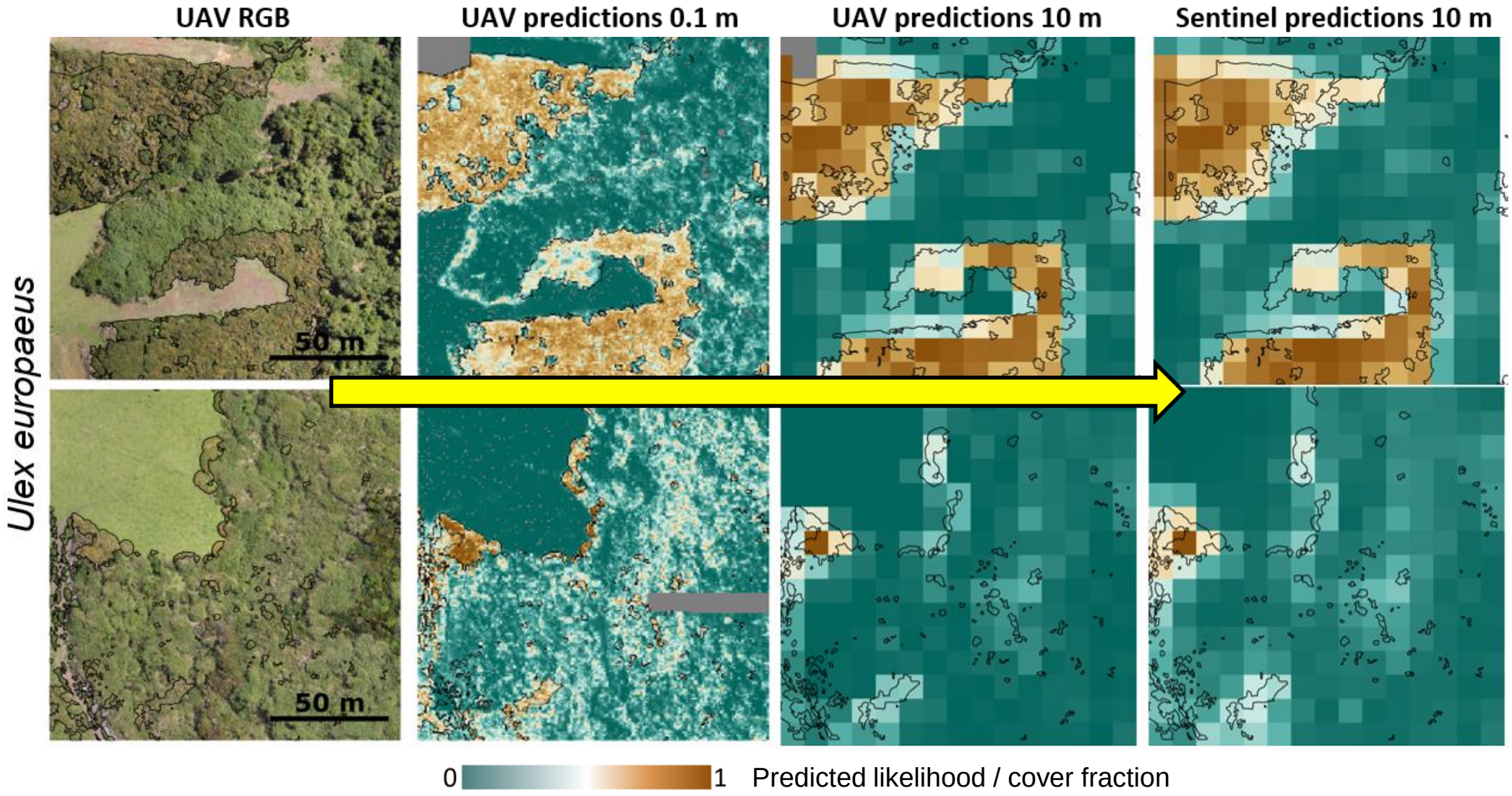
# UAV to Sentinel – *Pinus radiata*



# UAV to Sentinel – *Acacia dealbata*



# UAV to Sentinel – *Ulex europaeus*



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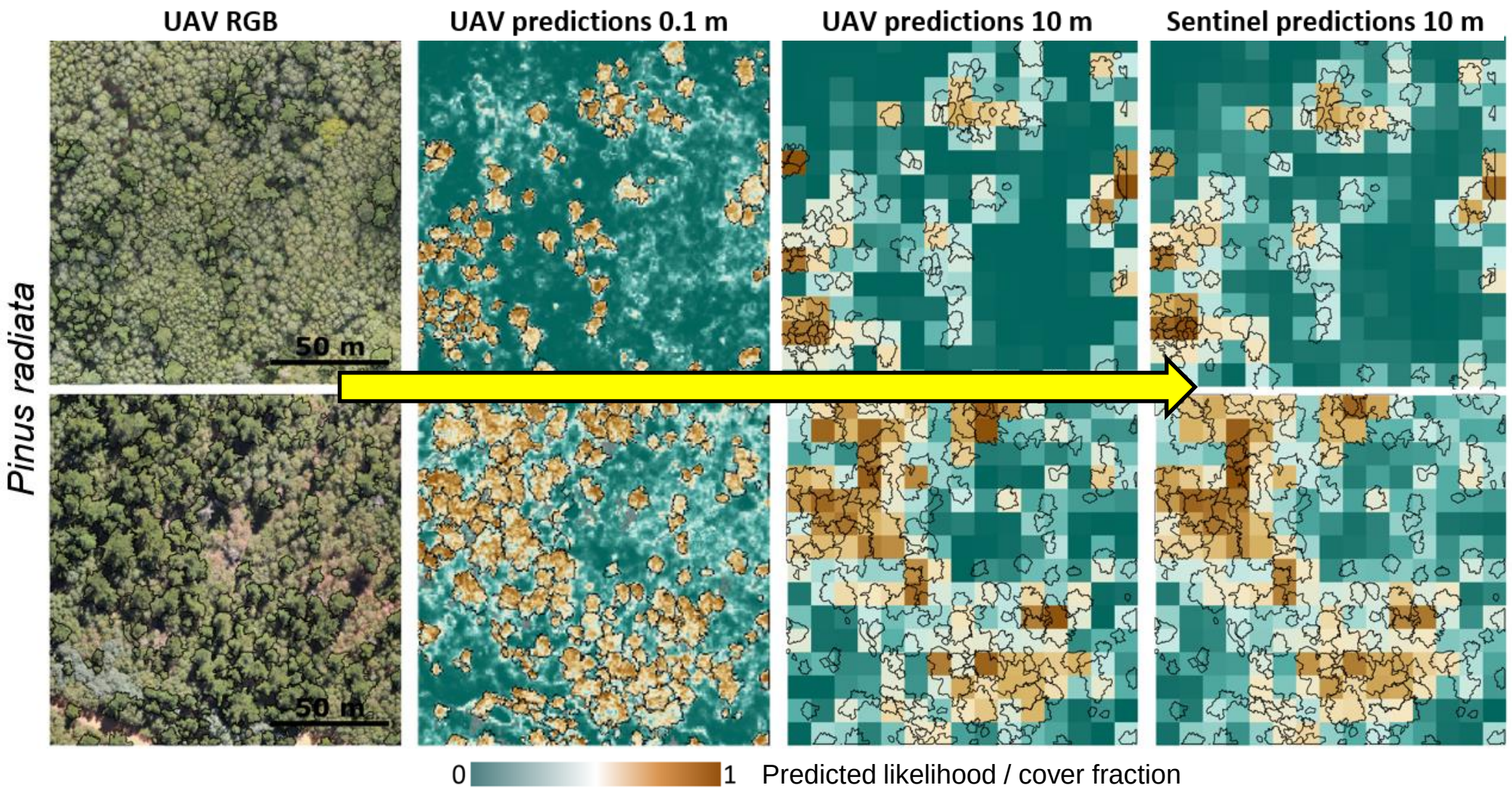
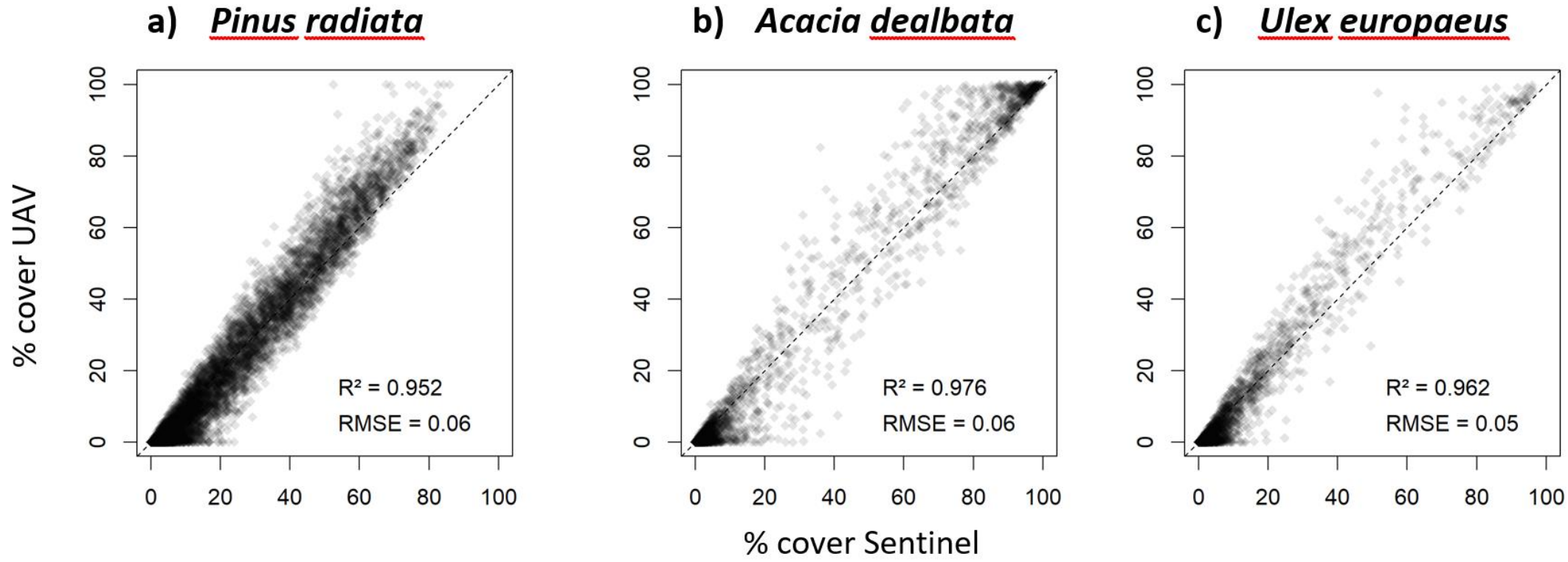


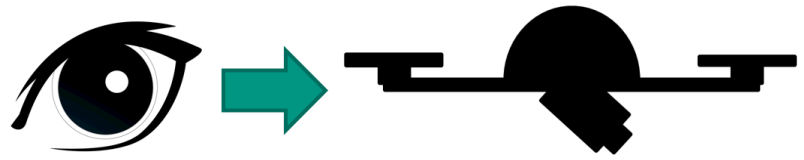
# UAV to Sentinel – statistical summary



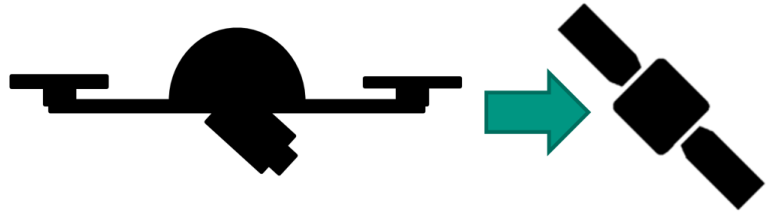

Variable importance Sentinel-1: 8-16%
Variable importance Sentinel-2: 84-92 %

# Conclusions & Outlook

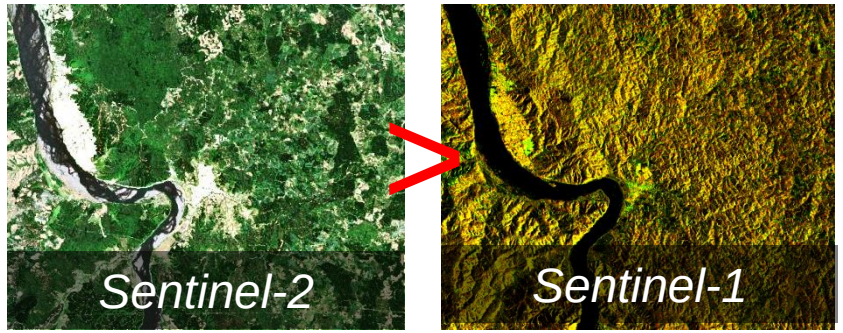
- Invasive species can be quite accurately mapped using UAVs when combining different predicors



- UAV-based estimates can be accurately up-scaled to the Sentinel scale



→Promising alternative to traditional field sampling!




- Sentinel-2 (Multispectral) was more important than Sentinel-1 (SAR) for up-scaling species cover

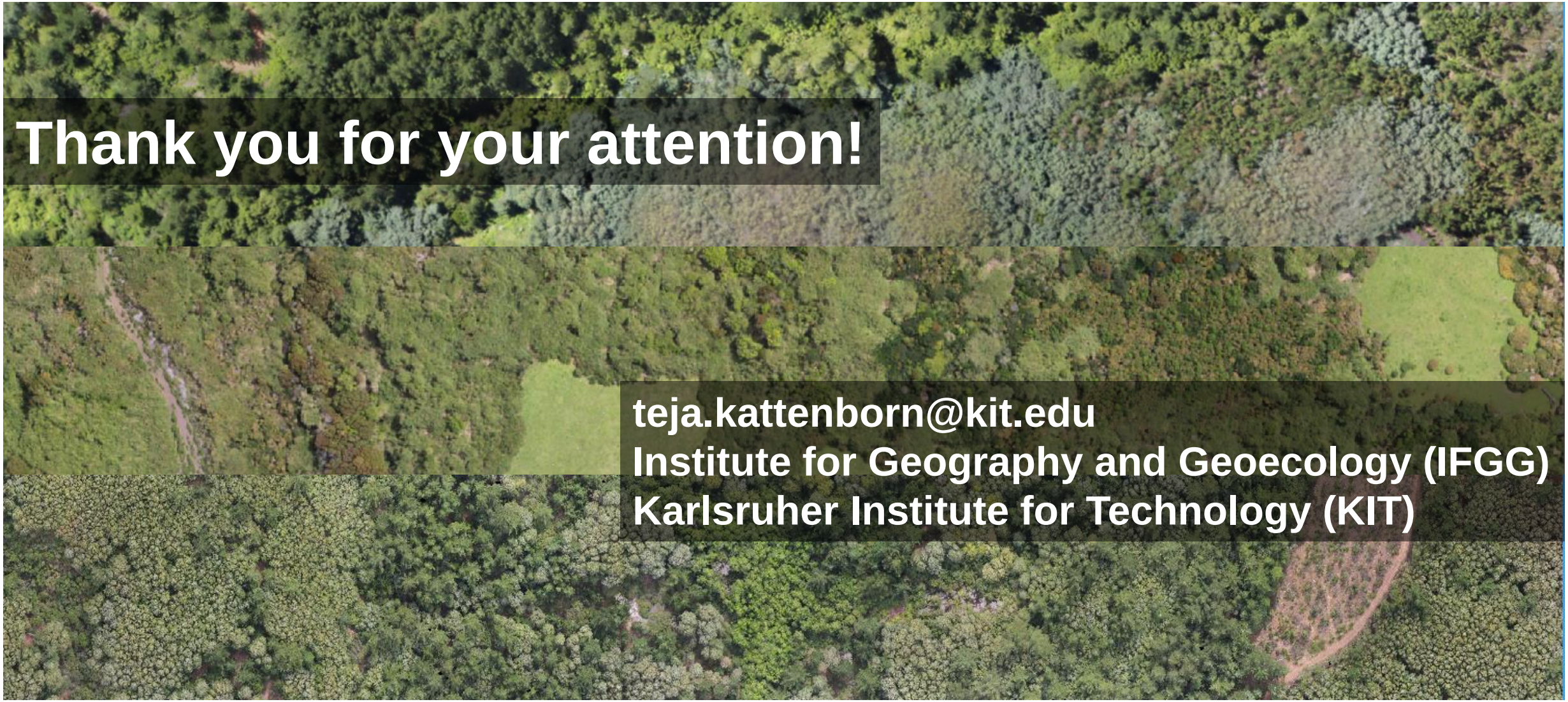
- Workflow is transferable to other sensors and endmembers

*Landsat?*

*Biodiversity assessments?*

*Tree species classifcation?*

*Habitat mapping?*



# Thank you for your attention!

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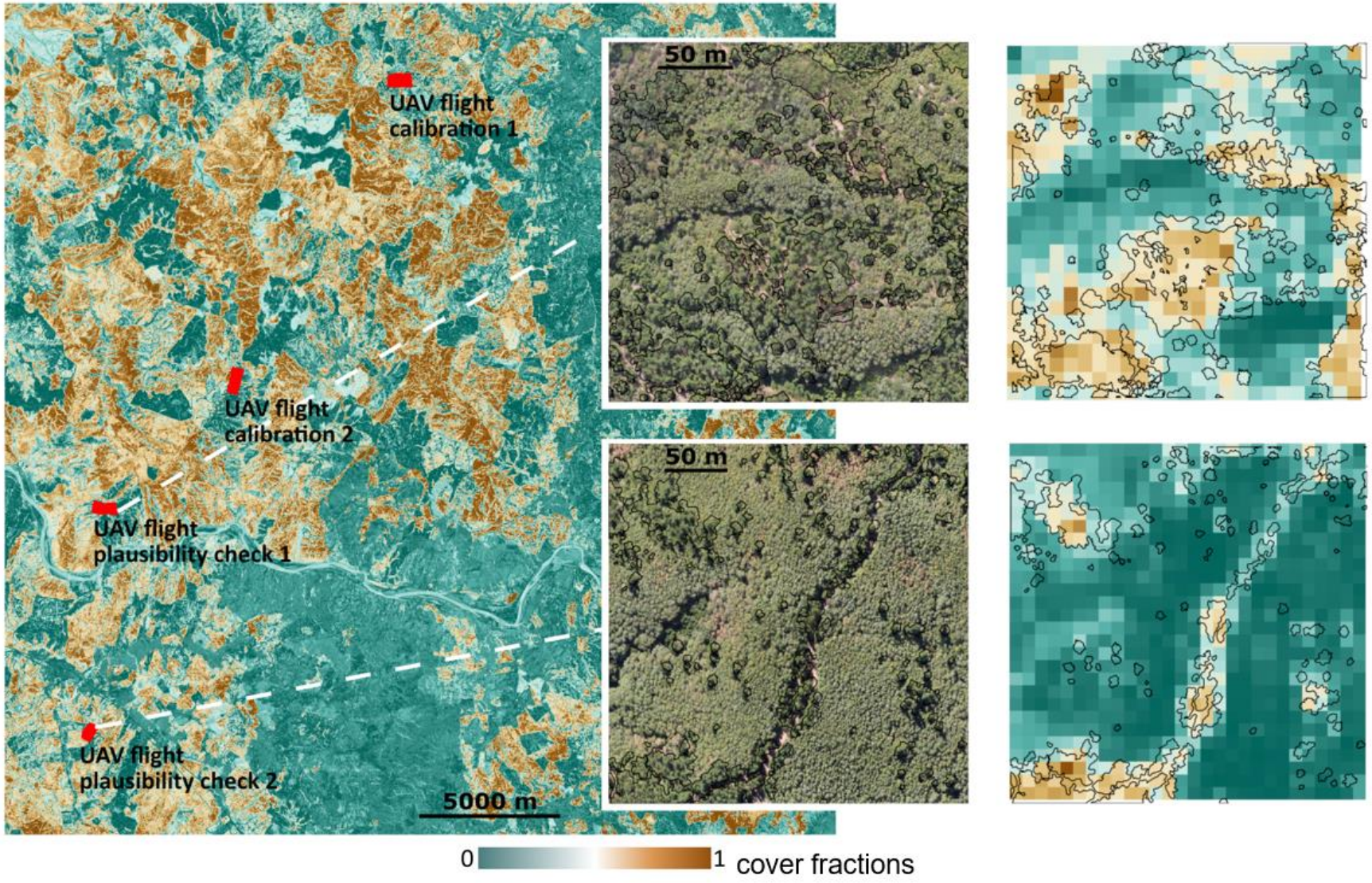
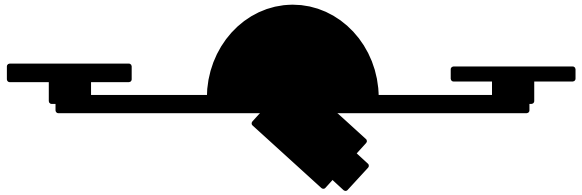
Karlsruher Institute for Technology (KIT)

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