Using multi-temporal RapidEye remote sensing data to map semi-natural grassland communities

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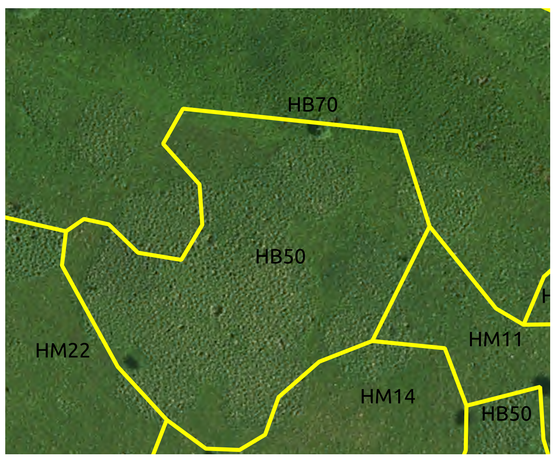
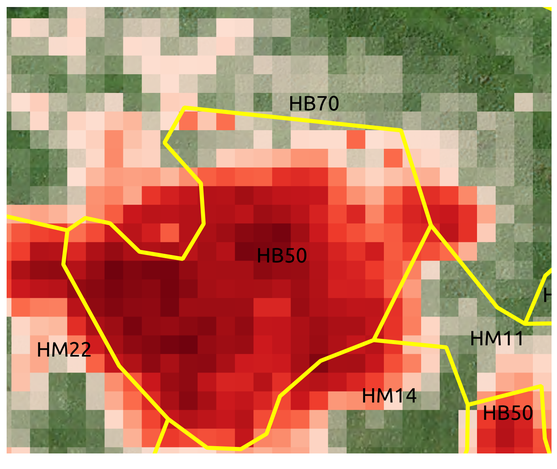
Introduction

Reference map



Spatial probability



Questions

- Can we map **semi-natural grasslands** at community level using **remote sensing**?
- How can we **reduce uncertainties** in the reference data?

Data&Methods

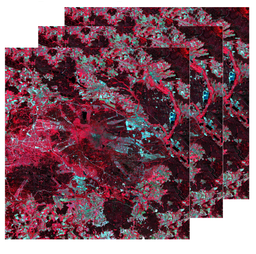
Study site

- Grafenwöhr military training area in Bavaria, Germany (223 km²)
- About 85% are part of the **Natura 2000** network and contain numerous rare and highly protected habitat types

Field mapping

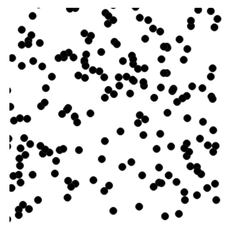
- Two sites (71 ha/140 ha)
- 10/11 grassland communities

RapidEye data



- 2014 – 2017
- 16 images per site
- March - October

Random sampling



- 15% of available pixels
- 100 repetitions
- **Outlier removal**

Outlier removal: Random Forest proximity measure

The proximity of two training samples is related to the ratio between the number of trees in which both samples share the same terminal node and the total number of trees in the forest (threshold was set to 10).

Results

Species-rich pasture-like lowland hay meadow, *Trifolium repens* > 10%

Eutrophic wet grasslands, *Cyperaceae* > 50%

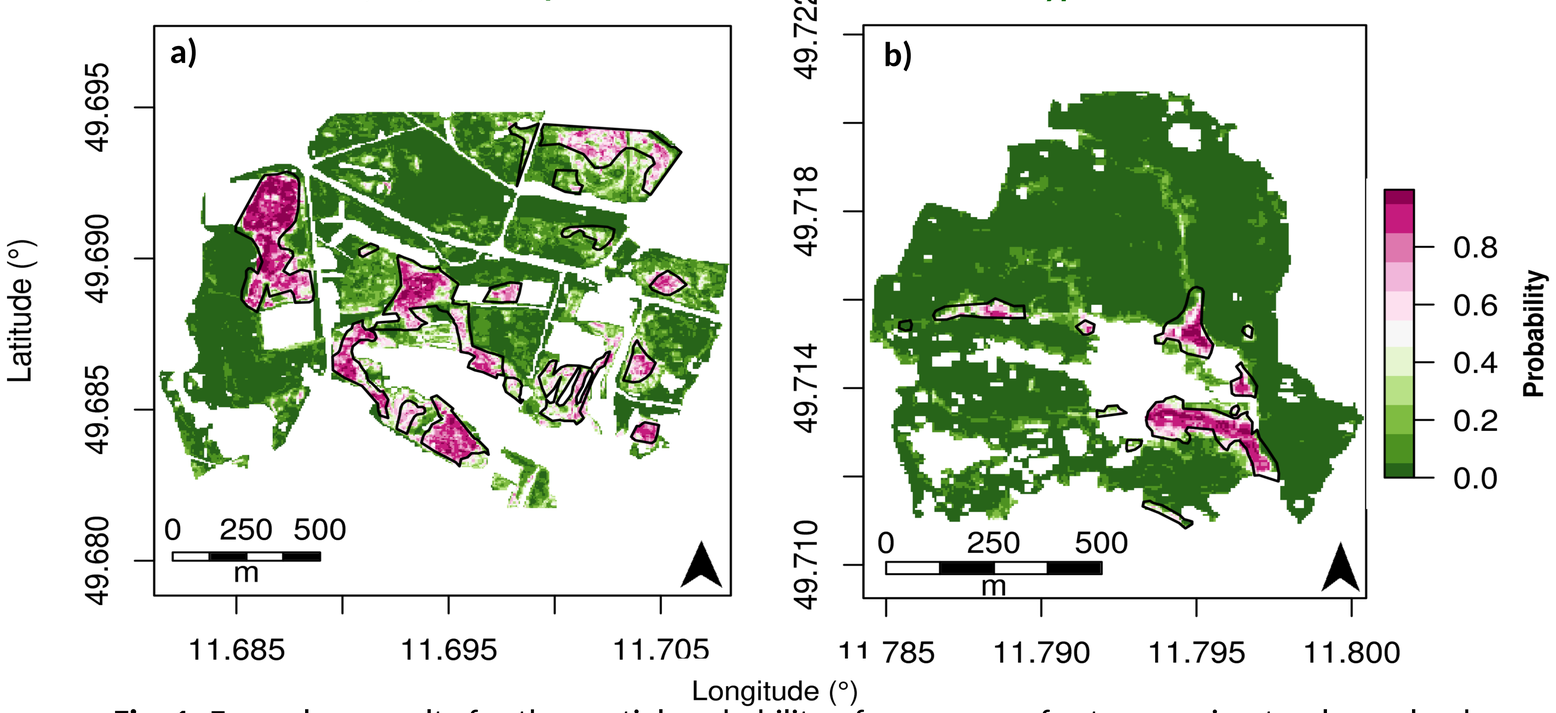


Fig. 1: Exemplary results for the spatial probability of occurrence for two semi-natural grassland communities for the two study sites (a,b). The field mapping results are drawn as black polygons.

- **Field mapping** was a **labour-intensive** and time-consuming task
- Good **spatial agreement between field mapping and predicted probability** of occurrence for the respective semi-natural grassland community (Fig. 1)
- The **spatial distribution of outliers** (Fig. 2) highlights areas with **uncertainties** in the field mapping
- Overall accuracy ranged from **77.5%** (Kappa = 0.73) to **86.5%** (Kappa = 0.84)

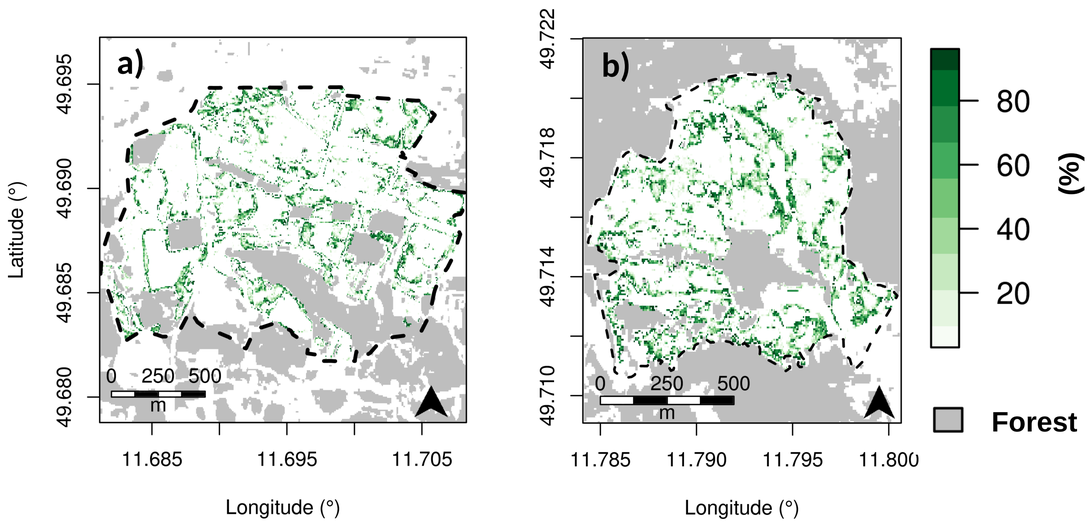


Fig. 2: Proportion of times each pixel was identified as an outlier in 100 training data iterations, results of both study sites (a, b).

Conclusion

- Multi-annual, multi-seasonal remote sensing data can be **successfully** applied to monitor semi-natural grassland vegetation types at a **fine scale**.
- **Training data** can **automatically** be derived in an objective way using the **Random Forest proximity** measure.

→ **Reduction of uncertainties**

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Link to the corresponding publication

We acknowledge the DLR for the delivery of RapidEye images as part of the RapidEye Science Archive (RESA) – proposal 00226.

The project was supported by funds of German government's Special Purpose Fund held at Landwirtschaftliche Rentenbank.