Elucidating potentials and challenges of Sentinel-2 and EnMAP for mapping urban areas

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Background

Motivation

- Maps on different impervious, pervious and vegetation cover types important for urban environmental research.
- Recent/forthcoming Earth observation missions Sentinel-2 and EnMAP create new opportunities for urban mapping.

Objectives

- Sub-pixel fraction mapping of vegetation-impervious-soil (VIS) cover types using real Sentinel-2 images, simulated EnMAP data and Support Vector Regression.
- Validation of maps to reveal potentials and challenges of Sentinel-2 and EnMAP for urban mapping.
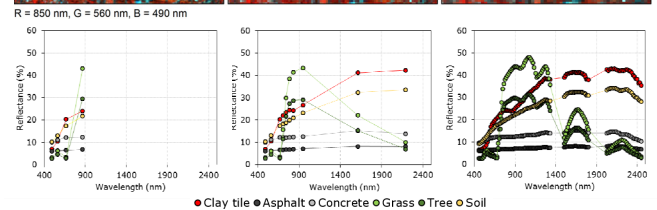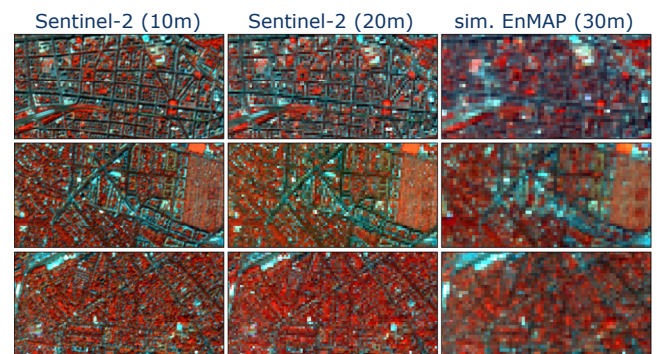
Data Analysis

Study area & data
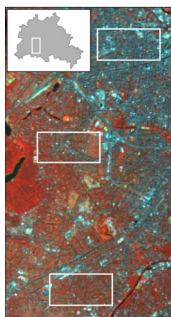
- Berlin, Germany.
- Subset of the urban-gradient to capture a variety of land cover and land use patterns.

Image	Date	GSD	No. bands
Sentinel-2 (10 m)	2015/08/23	10 m	4 (only 10 m bands)
Sentinel-2 (20 m)	2015/08/23	20 m	9 (10 & 20 m bands)
sim. EnMAP*	2009/08/20	30 m	111

All images processed to Level-2 reflectance products.
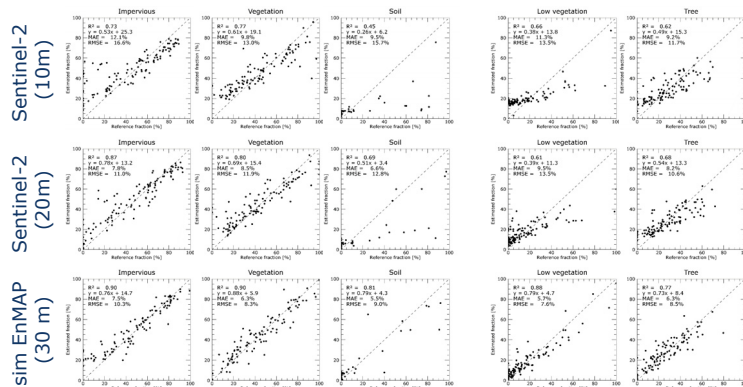*111 band HyMap data spatially simulated to EnMAP characteristics.

Mapping approach

- Sub-pixel mapping with Support Vector Regression.
- Model training with pixel-based reference land cover fractions.
- Validation based on urban block mean land cover fractions.

Sentinel-2 (10m) · Sentinel-2 (20m) · sim. EnMAP (30m)

R = 850 nm, G = 560 nm, B = 490 nm

Clay tile · Asphalt · Concrete · Grass · Tree · Soil
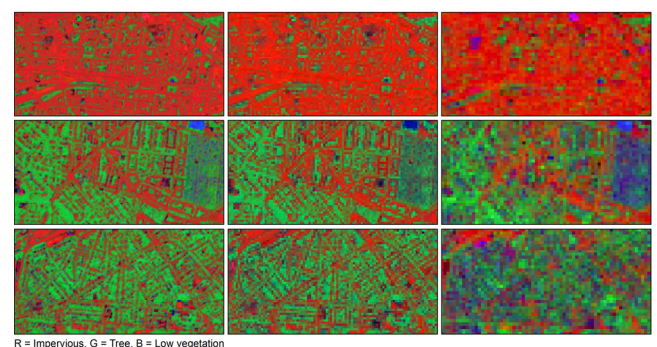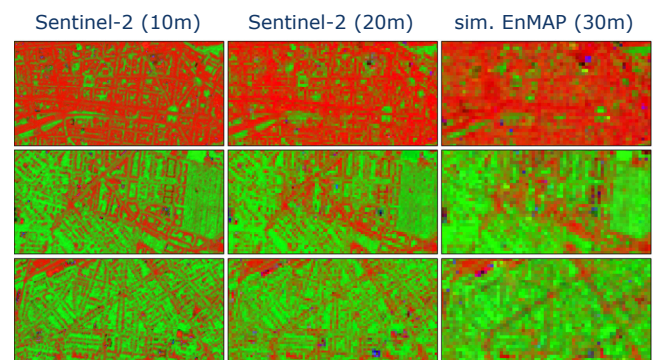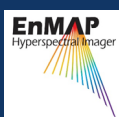
Results & Discussion

Validation

Findings

- VIS and extended VIS components accurately mapped with Sentinel-2 (20 m, 9 bands) and sim. EnMAP (30 m, 111 bands); Sentinel-2 (10 mm 4 bands) with reduced accuracies.
- Multi-sensor fusion promising to exploit the spatial and spectral advantages of Sentinel-2 and EnMAP.
- Sentinel-2 and EnMAP promising Earth observation missions to be used for urban mapping applications.

VIS & extended VIS fraction maps

Sentinel-2 (10m) · Sentinel-2 (20m) · sim. EnMAP (30m)

R = Impervious, G = Vegetation, B = Soil

R = Impervious, G = Tree, B = Low vegetation

Acknowledgements

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