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Hyperspectral Unmixing

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Overview

1. Research goal

Comparison of vegetation class fraction maps based on hyperspectral and multi-temporal multi-spectral imagery

2. Methods Study Area

- North of Santa Rosa, California (USA)
- Extend: approx. 72 km x 15 km
- Time frame hyperspectral (EnMAP): 07.06.2013
- Time frame Landsat: 02.01.2013 – 28.12.2013

Fig. 1: Overview of the study area
(Data provided by HU Berlin Earth Observation department, 2021 and Open Street Map, 2021)

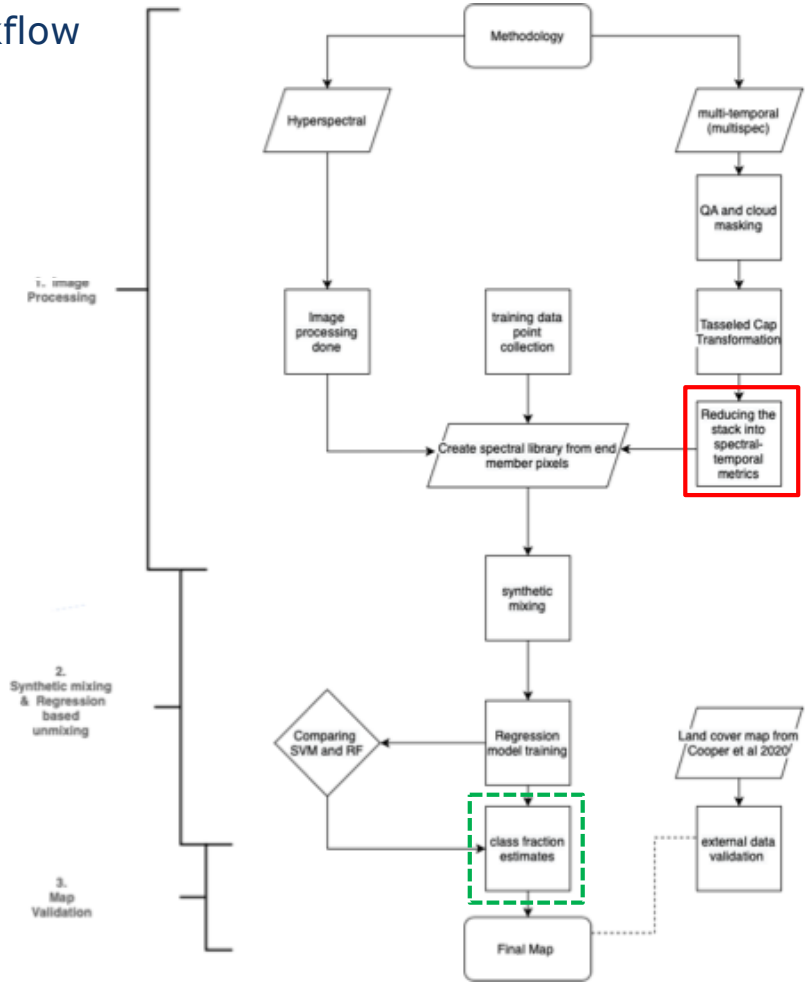
2. Methods Vegetation classes

- Land cover characterised by e. g. urban, water, forest, shrub- and grassland
- Agriculture dominated by viticulture (wine falls under class *shrub*)
- Vegetation classes based on hierarchical approach with four levels

Tab. 1: Hierarchical vegetation classes *ref. to* Cooper et al. (2020)

Level 1	Vegetation				Non-Vegetation
Level 2	Woody Vegetation			Non-woody Vegetation	Non-Vegetation
Level 3	Trees		Shrubs	Non-woody Vegetation	Non-Vegetation
Level 4	Needleleaf	Broadleaf	Shrubs	Non-woody Vegetation	Non-Vegetation

2. Methods Workflow



Calculation (RAM?) issue for STMs

with Python script by Leon Nill
(otherwise R and QGIS were applied)

Current step (first results on next slide)

Fig. 2: Workflow *V.5*

3. Results Non-Vegetation vs. Vegetation fraction

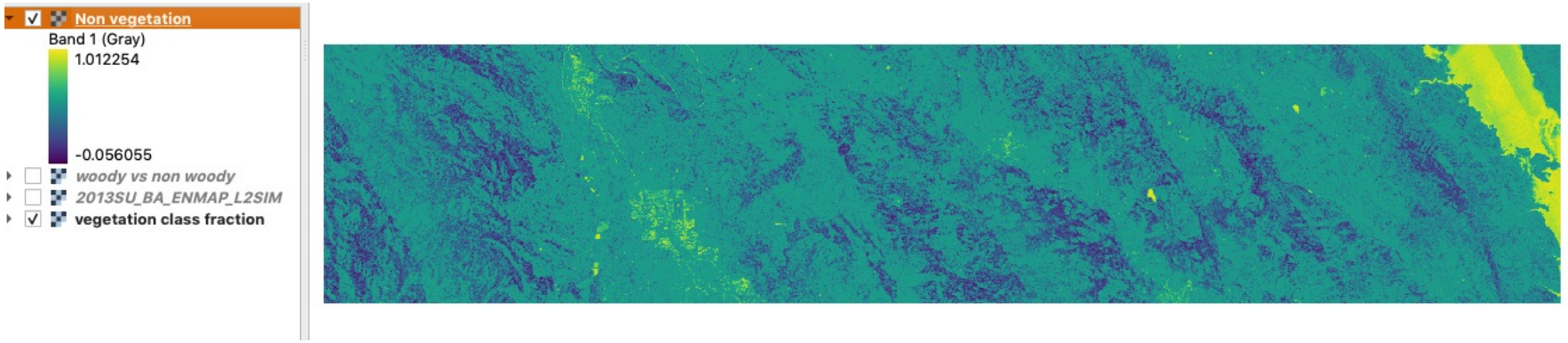


Fig. 3: Map 1 (Non-Vegetation vs. Vegetation)

3. Results Non-Woody vegetation fraction

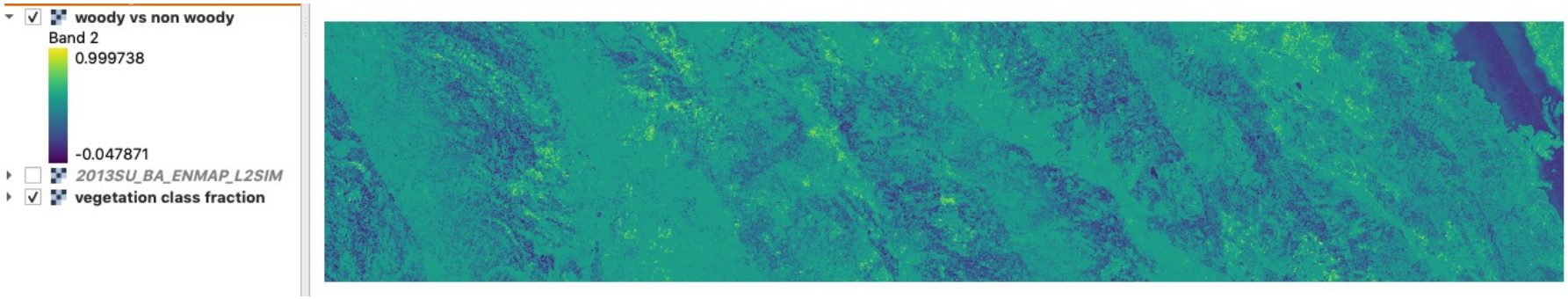
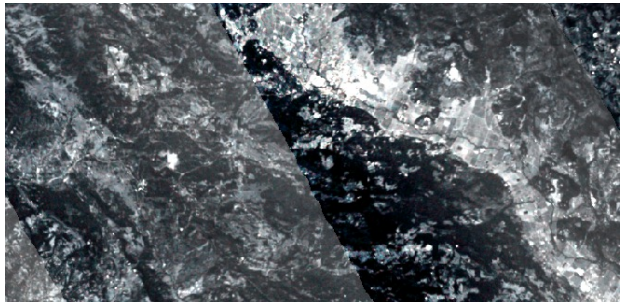


Fig. 4: Map 2 (Non-Woody)

3. Results Woody vegetation class fraction



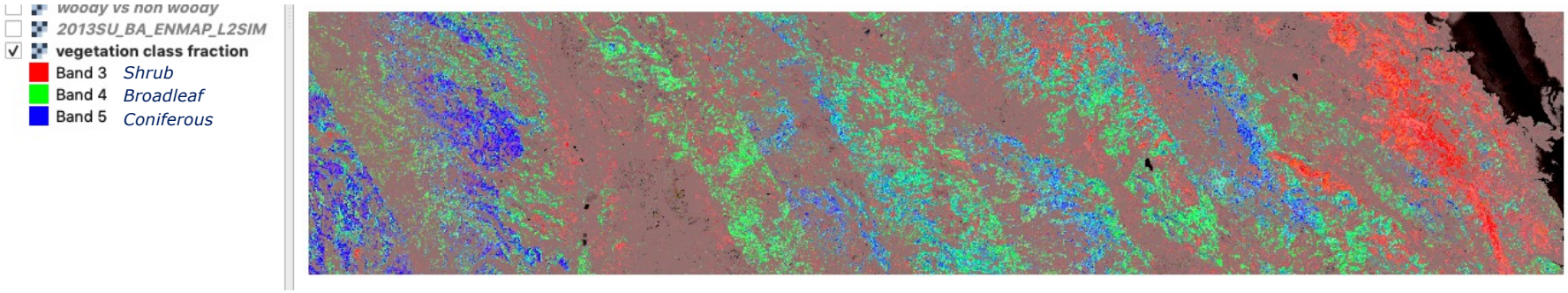


Fig. 5 **top:** Hyperspectral image
bottom: Map 1 (Woody vegetation class fraction)

4. Discussion

1. Use of hyperspectral imagery led to *seemingly* adequate fractional cover estimations across the study area

2. Endmembers affected by data artefacts from flight paths

3. Hyperspectral and multi-temporal multi-spectral imagery requires extensive computational resources…

Thank you for you_R attention!

Literature

- Cooper et al. (2020): Disentangling fractional vegetation cover: Regression-based unmixing of simulated spaceborne imaging spectroscopy data. Remote Sensing of Environment, 246. DOI: 10.1016/j.rse.2020.111856
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- Roberts et al. (2018): Hyperspectral vegetation indices. In: Hyperspectral indices and image classifications for agriculture and vegetation.

- *Referring as well to* California natural resources agency (2021) *for Cropping* (*e.g. vineyards, apple plantations, wheat etc.*). URL: https://data.cnra.ca.gov/dataset/crop-mapping-2014 [2021-06-19]