Multi-sensor assessment of cover cropping detection using HLS, MODIS, and PlanetScope data

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Objectives

(1) Selecting a suitable satellite sensor for detecting field-level cover crops including Harmonized Landsat-8 and Sentinel-2 (HLS), MODIS, and PlantScope

(2) Taking advantages of unprecedented densely collected cover crop measurements to evaluate cover crop mapping accuracies and uncertainties

(3) Analyzing potential factors that influencing cover crop detection results including cover crop adoption rates, cover crop field size, and cover crop species

Usage of NoR cloud service

The cloud and cloud shadow pixels for Sentinel-2 data identified in the quality assurance (QA) layers of HLS version 1.4 are not very corrected. In our work, we disregarded QA flags of Sentinel-2 data in the HLS products and obtained the cloud masks of Sentinel-2 data from Sentinel Hub (https://www.sentinel-hub.com). Specifically, Sentinel Hub's cloud detector for Sentinel-2 imagery were used to determine cloud and cloud shadow pixels for each Sentinel-2 images. The NoR cloud service helped us to obtain high-quality Sentinel-2 cloud masks, and further generate high-quality HLS time series for cover crop mapping, which laid a solid foundation for satellite data processing and analysis in our project.

Project highlights

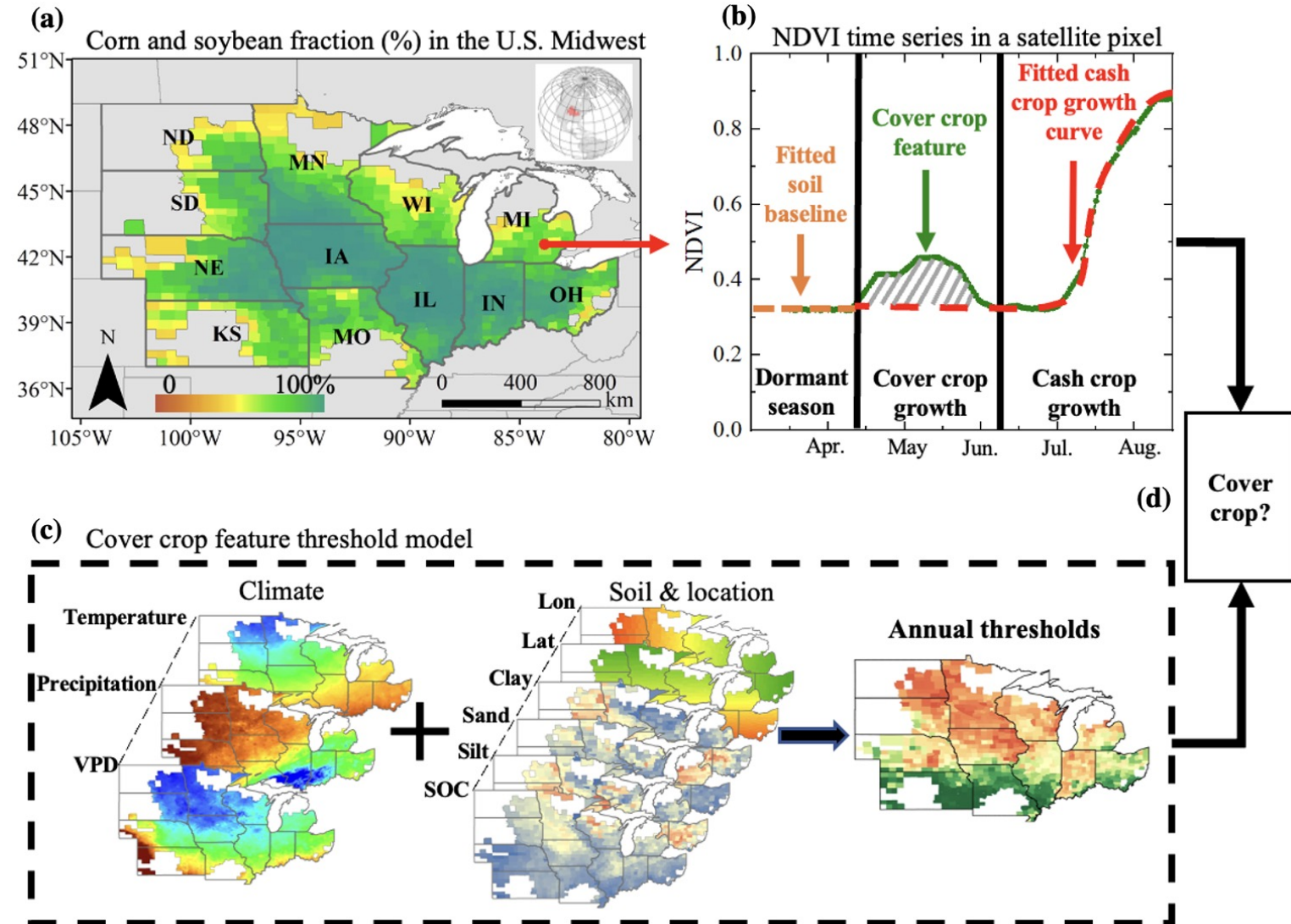Densely collected field measurements were involved for regional-scale cover crop mapping.
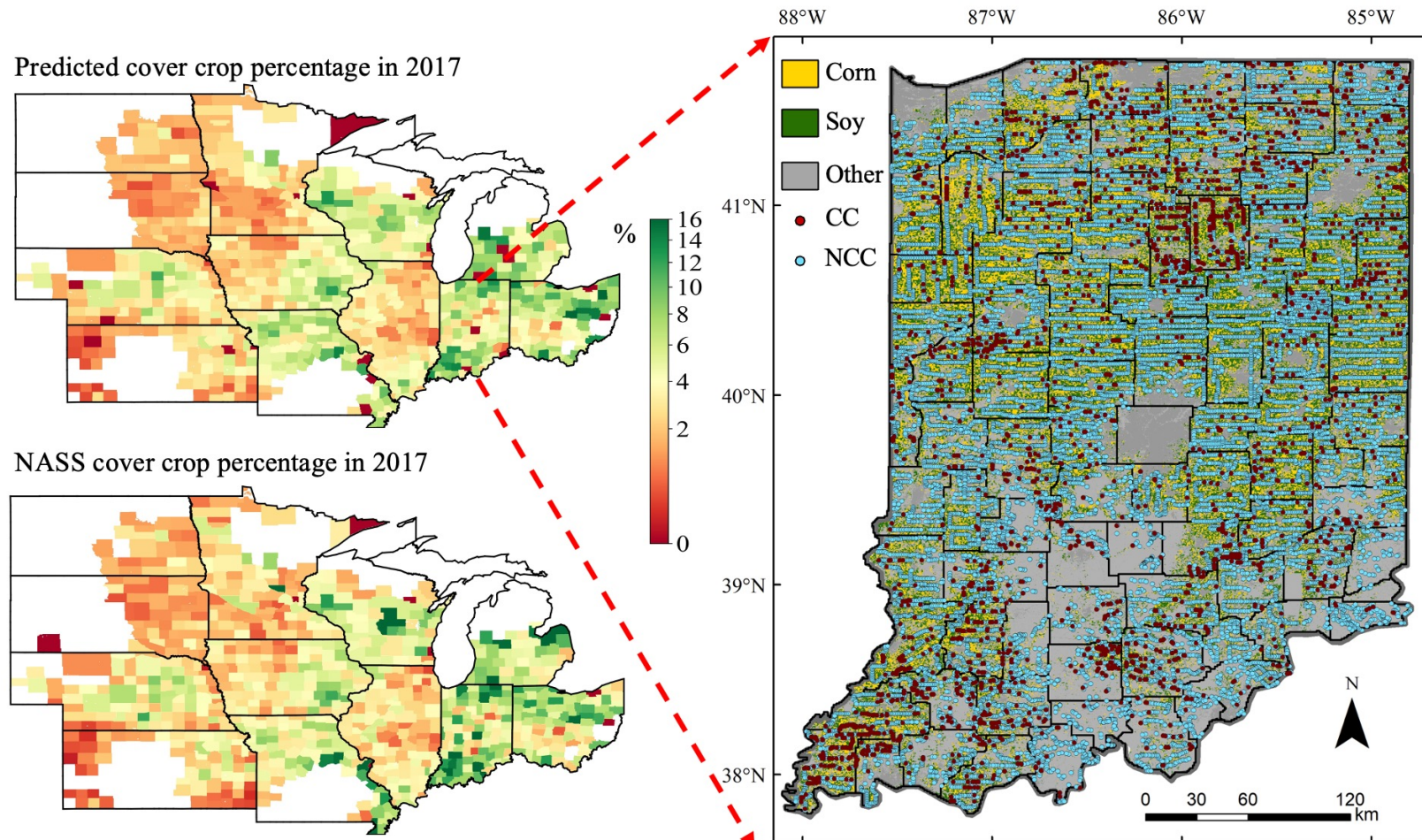
Project highlights

Cover crop signals were detectable from satellite sensors using NDVI time series in the non-growing season.

Thresholds for cover crop signals were modelled using environmental variables
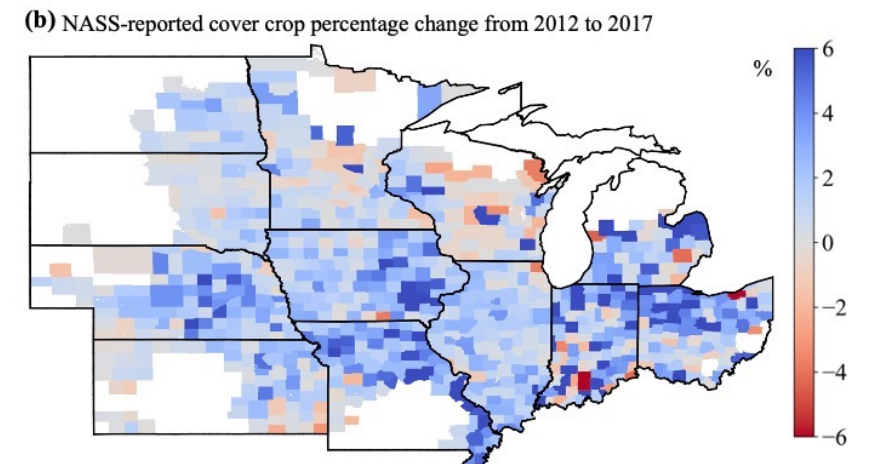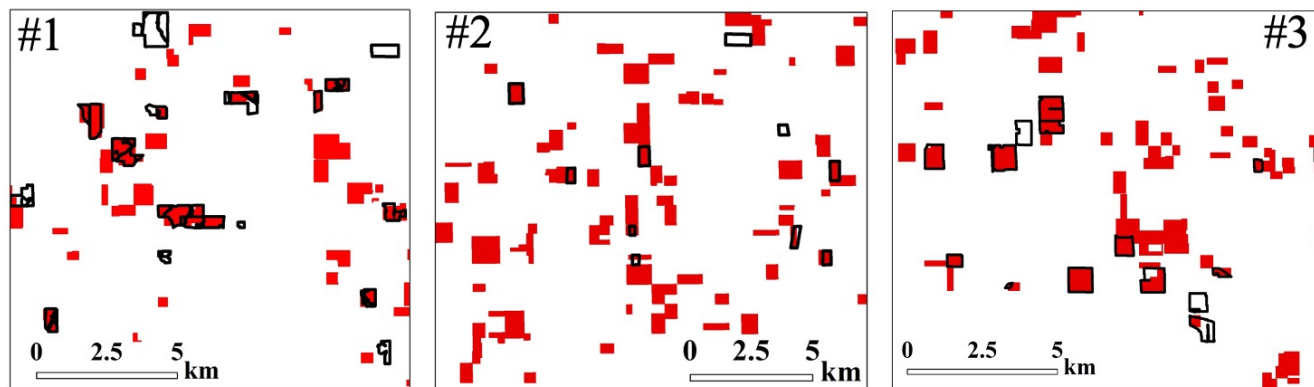

(a) Corn and soybean fraction (%) in the U.S. Midwest

(b) NDVI time series in a satellite pixel

(c) Cover crop feature threshold model

(d) Cover crop?

Project highlights

Cover crops could be accurately detected using satellite remote sensing at field and state scales.

(a) Satellite-predicted cover crop percentage

NASS-reported cover crop percentage
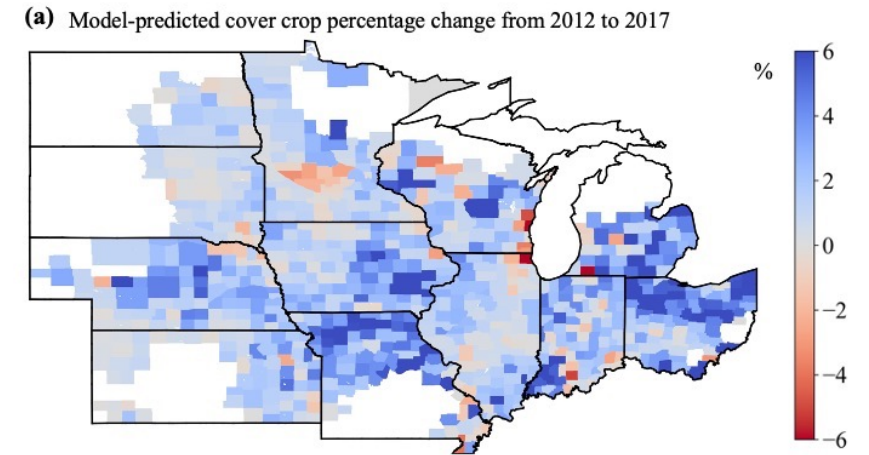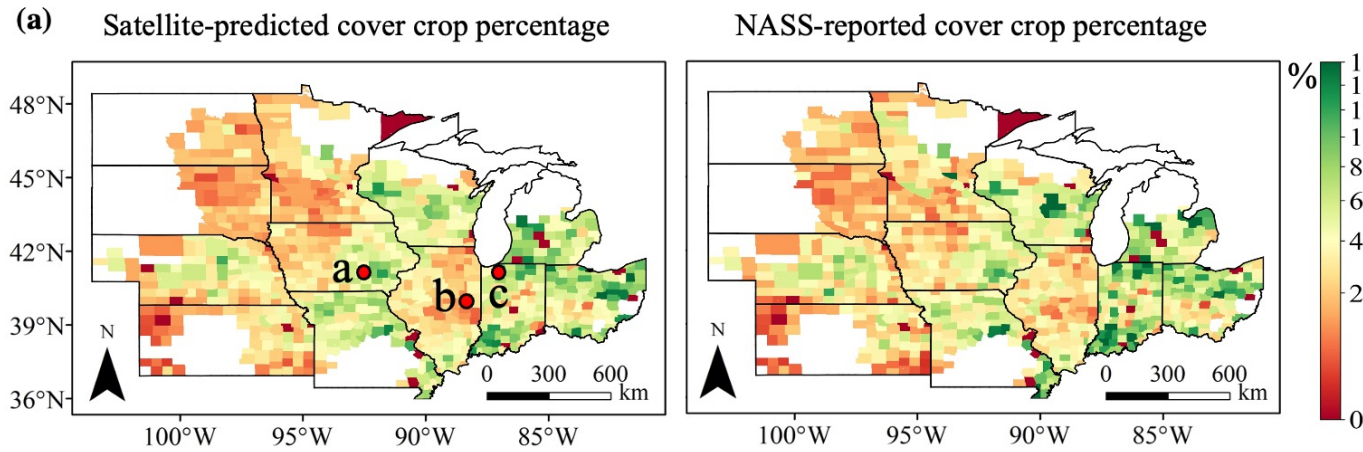
(b) Comparisons between satellite-detected cover crop fields and ground truth cover crop fields

Predicted **Ground truth**

(a) Model-predicted cover crop percentage change from 2012 to 2017

(b) NASS-reported cover crop percentage change from 2012 to 2017

Potential publication

Zhou, Q.; Guan, K.; Wang, S; Jiang, C.; Peng, B.; Stroebel, S.; Hipple, S.; Huang, Y. Multi-sensor assessment of cover cropping detection using Harmonized Landsat-8 and Sentinel-2, MODIS, and PlanetScope: spatial, temporal, and radiometric considerations. *In preparation*.