AgriGeo:
Geoinformation solutions for agriculture based on Big Data analytics

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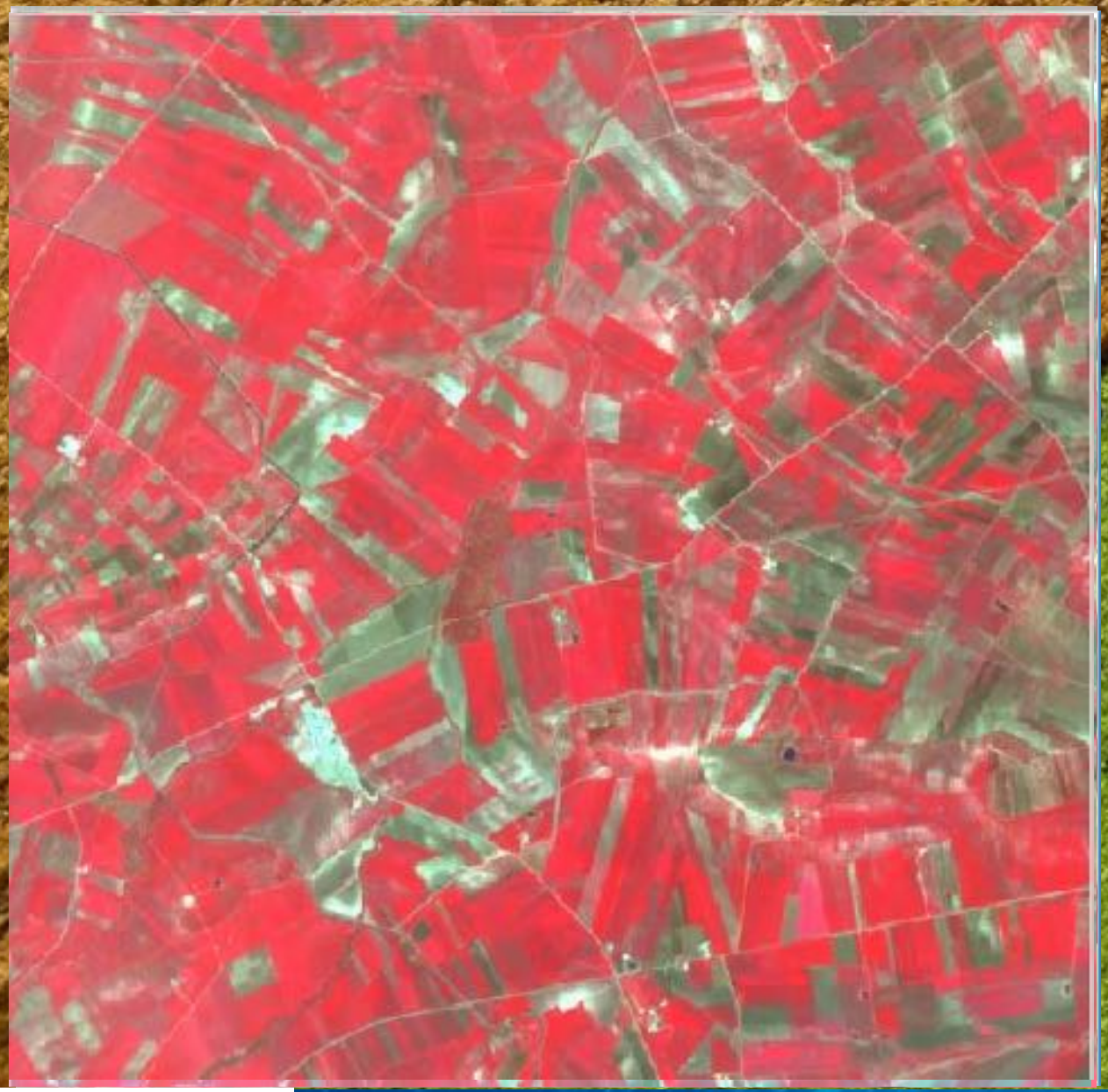


Progressive shift from **simple mapping** to **complex monitoring applications**.

High

Big data analysis

Information Products

Value Added Services

Data

Low

Level of Value Addition

AgriGeo

INFORMATION NOT ONLY IMAGE DATA

Turning data and images into information that can be browsed and analyzed

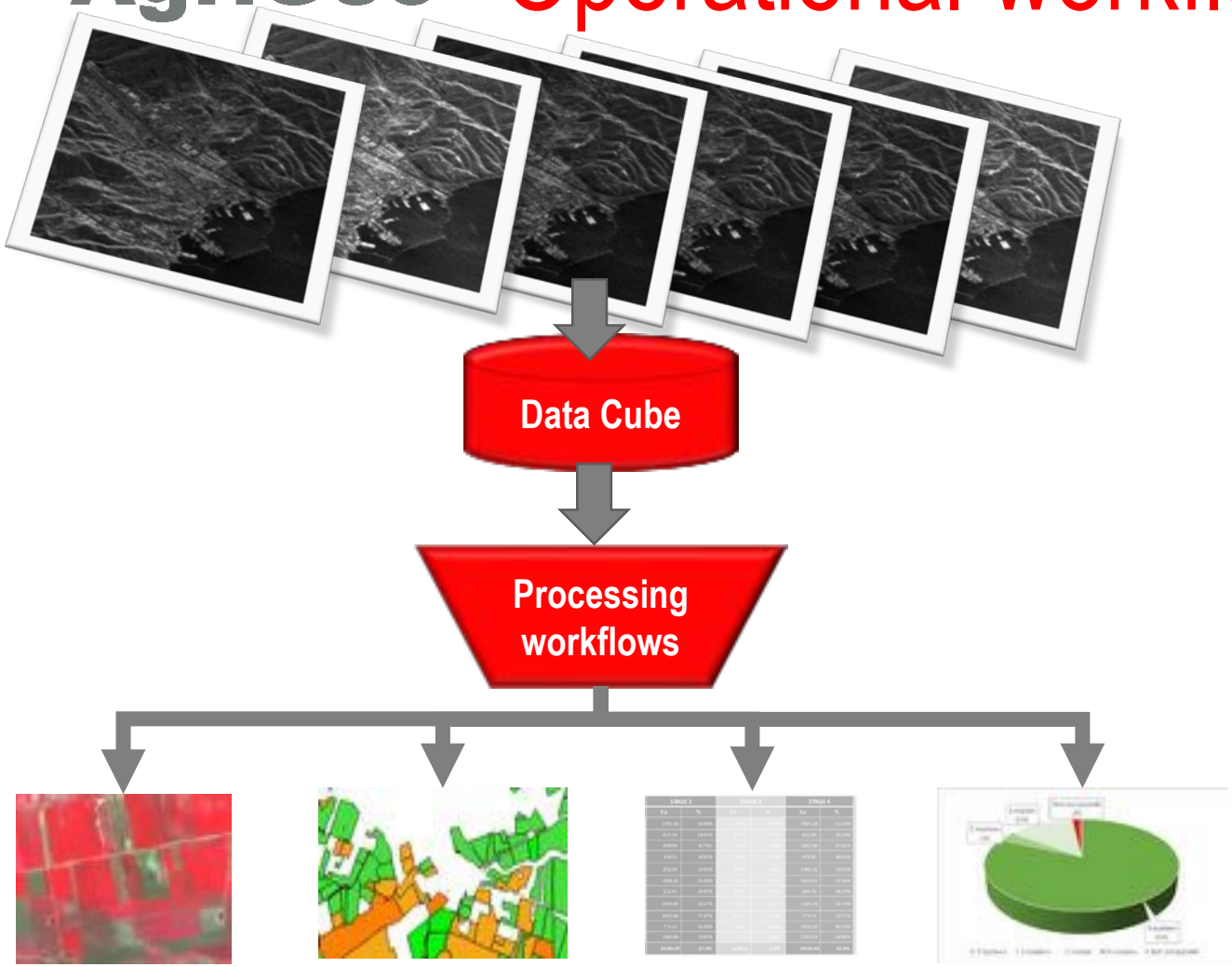
USER-DRIVEN

Solutions tailored on user requirements

FROM BIG DATA TO ANALYTICS

Generation of analytics from the processing of huge time series of different data

Operational workflows



- Services provided by AgriGEO strongly rely on the usage of satellite time series, organised in multi-source Data Cubes
- They are managed in a fully scalable environment, allowing a fast and efficient extraction of information for feeding ***vertical workflow pipelines***, often requiring near-real-time delivery performances.
- One main driver for the provision of these services is the availability of big data analysis techniques enabling the extraction of information and analytics from huge amounts of data

From mapping to information

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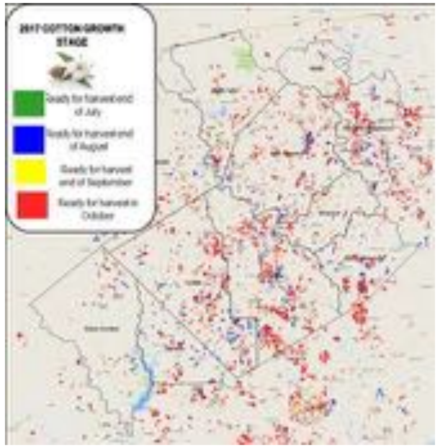

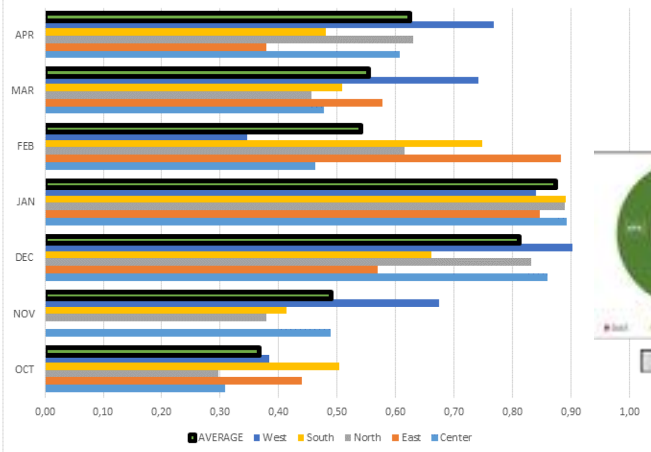

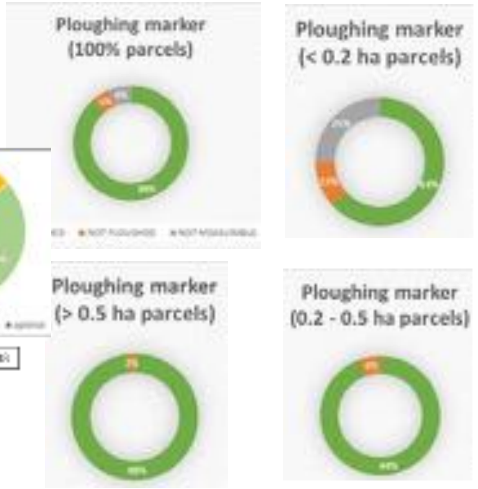

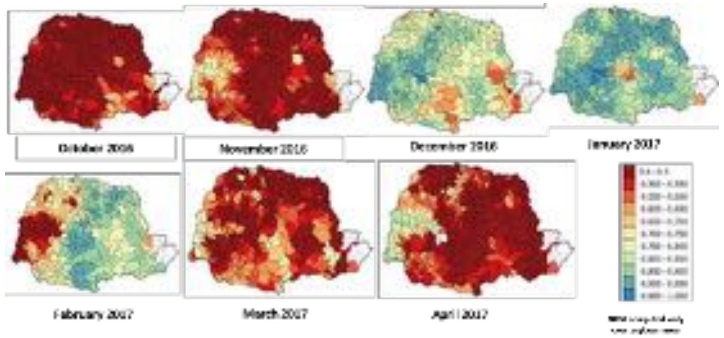

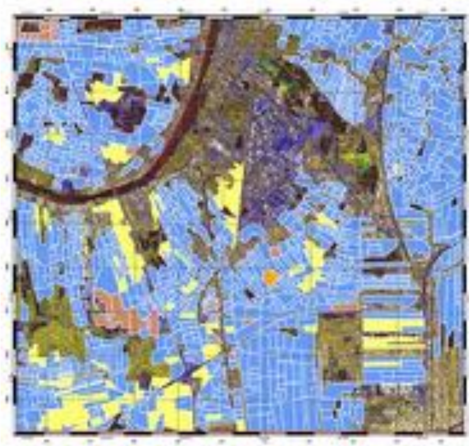

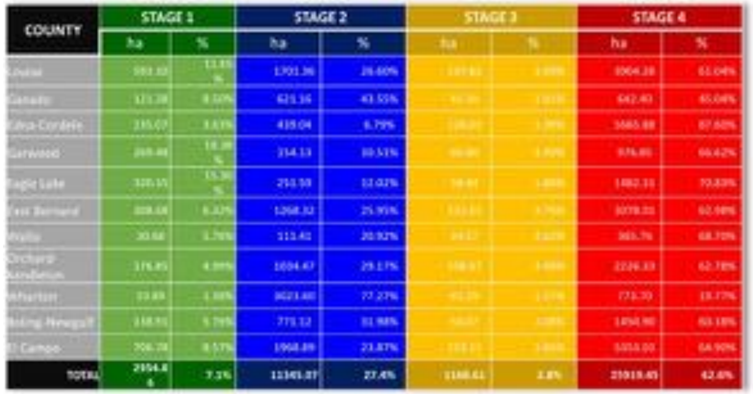

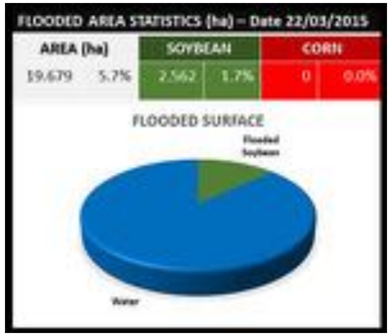

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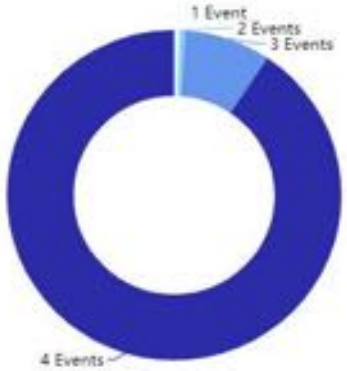
e-geos Grassland Mowing Viewer Powered by Mundi Web Services

Extent Viewer Dashboard Insights

Infographic

Number of mowing events



Find address or place

Parcel ID: 1624456

NDVI | Coherence (VH) | Coherence (VV) | Mowing Events (Start) | All

JS chart by amCharts

Coherence (VH)

0.7
0.6
0.5
0.4
0.3
0.2
0.1

11/3/2017 4/4/2017 28/4/2017 22/5/2017 17/6/2017 12/7/2017 10/8/2017 3/9/2017 27/9/2017 21/10/2017

Date

Tjerkwerd

5.498 53.059 Degrees

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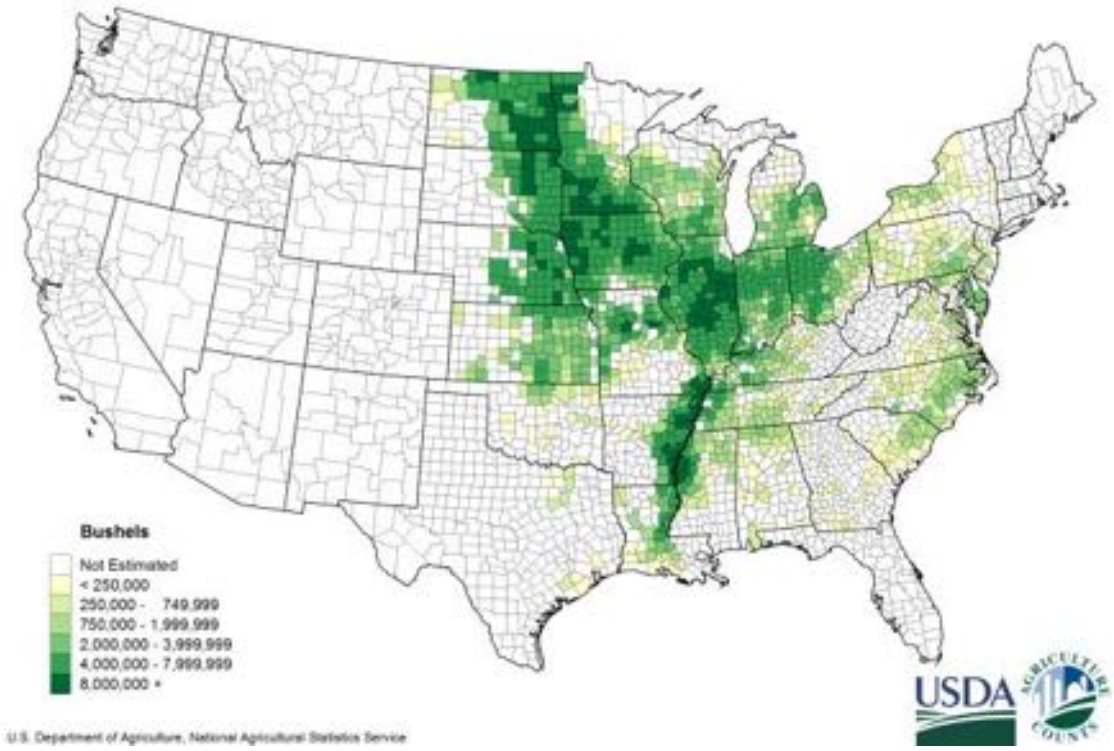
Acreage statistics composite model

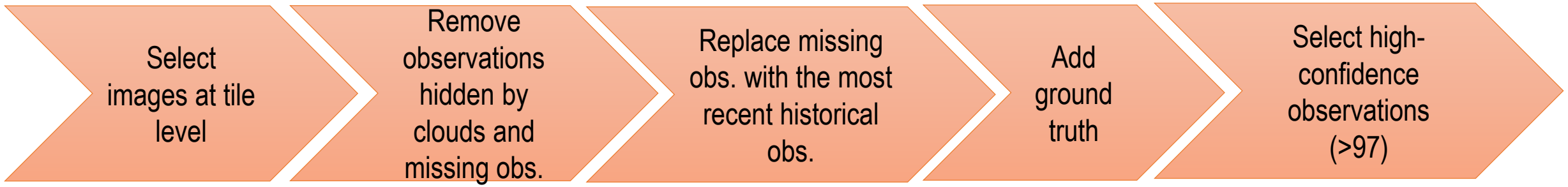
The approach exploits multiple data sources and creates a composite model:

- Random Forest model based on optical data
- Bayesian model based on USDA historical series

The model has been developed on different test area, therefore considering differences in climate and growing crops.



The RF model



- Images can be seen as a multidimensional matrices where each value (i,j) represents a set of spectral bands.
- USDA classification is used as ground truth to train ML models.
- An extensive tuning procedure was applied to fit the best set of hyperparameters at single test area level.
- Class labels were grouped to train a set of binary models, final prediction was assigned according to the highest probability label.

Sentinel-2 May 30, 2018

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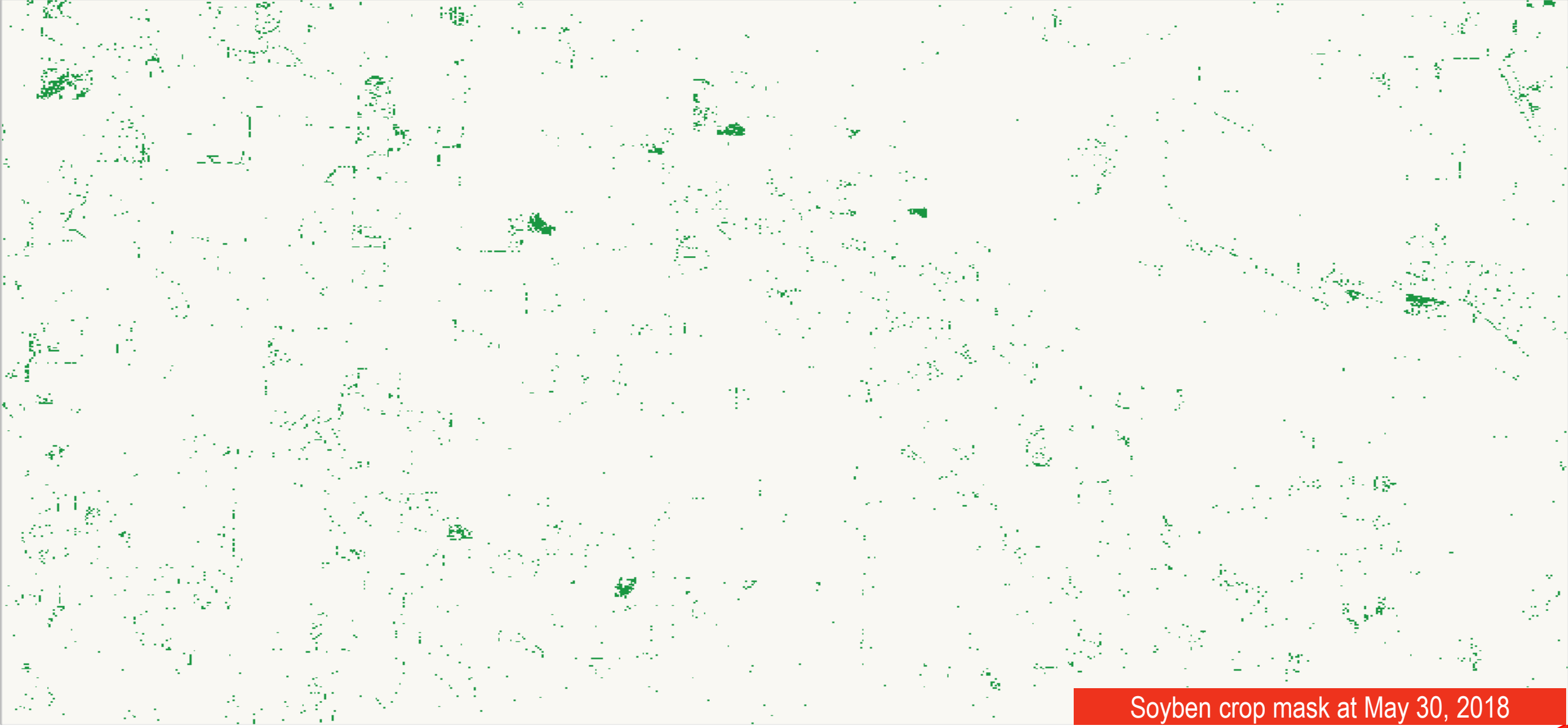

Soyben crop mask at May 30, 2018

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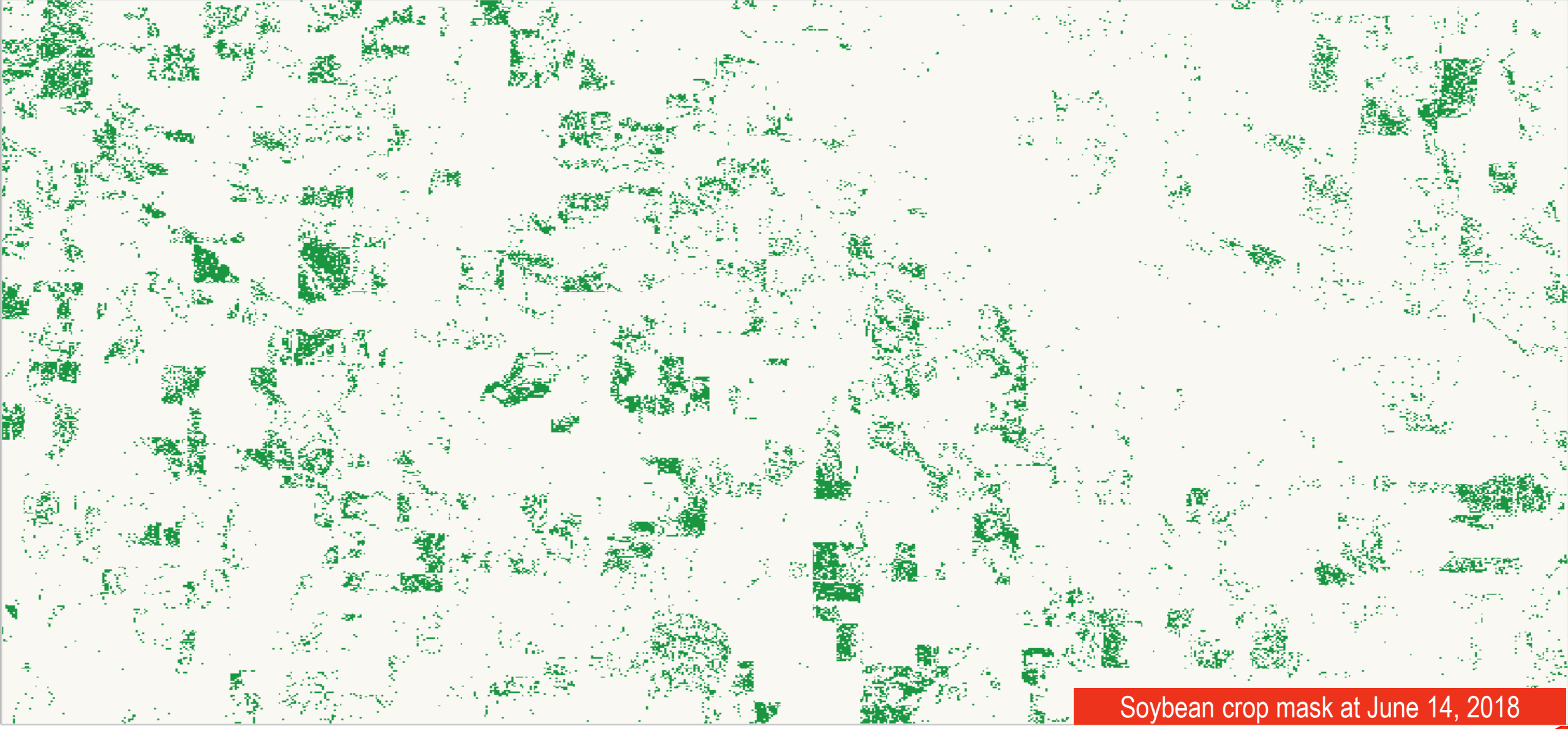

Soybean crop mask at June 14, 2018

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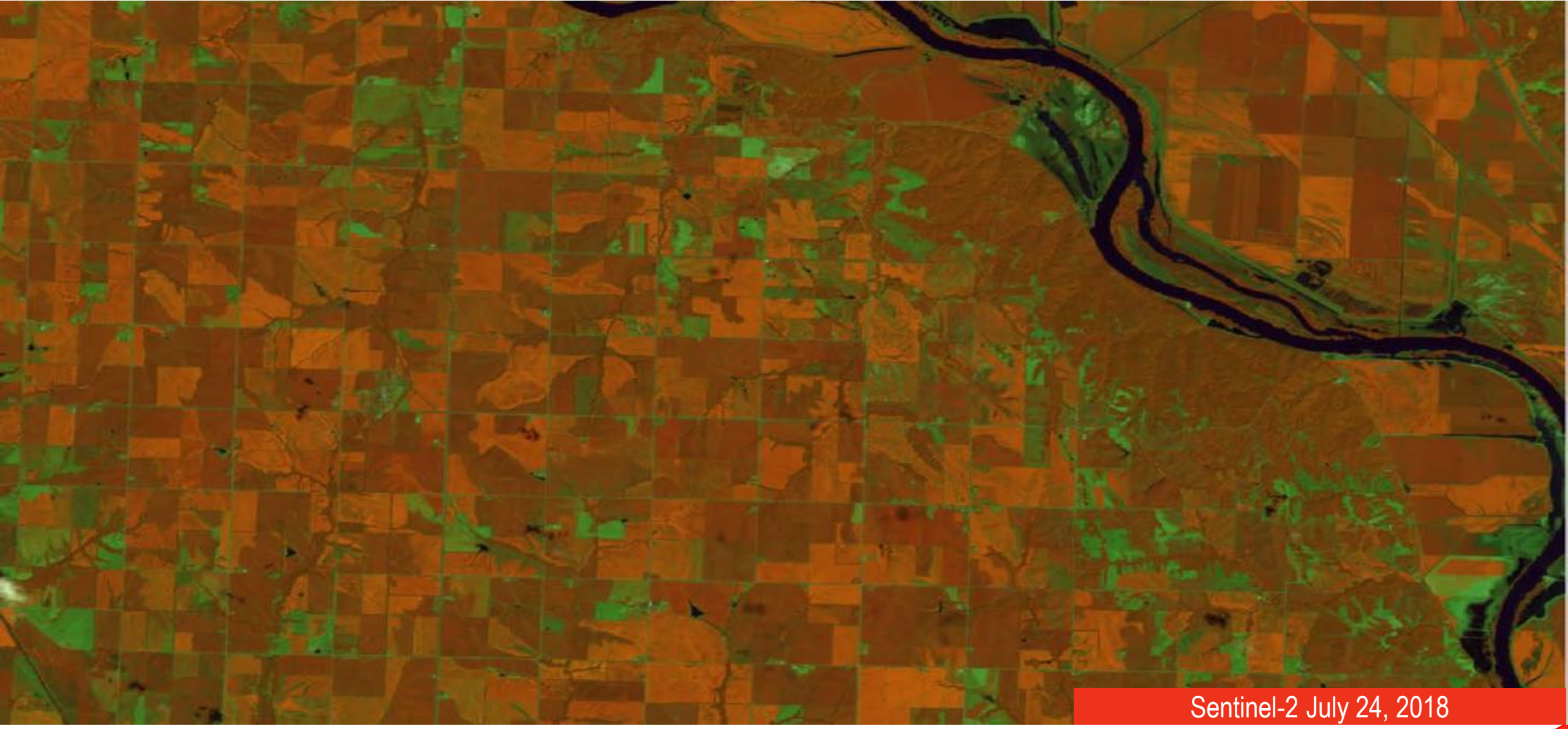

Sentinel-2 July 24, 2018

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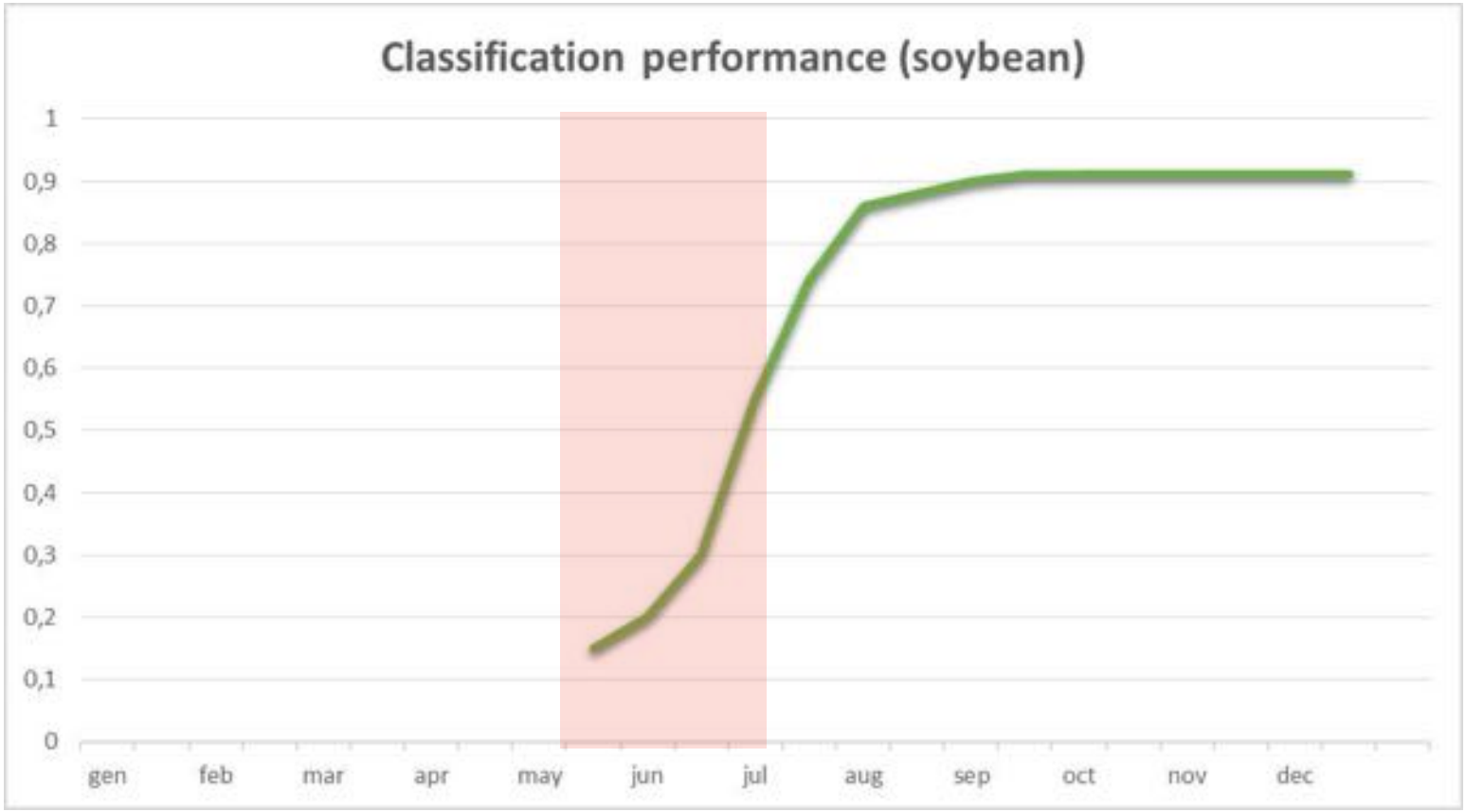
Classification performance (soybean)
1
0,9
0,8
0,7
0,6
0,5
0,4
0,3
0,2
0,1
0
gen
feb
mar
apr
may
jun
jul
aug
sep
oct
nov
dec

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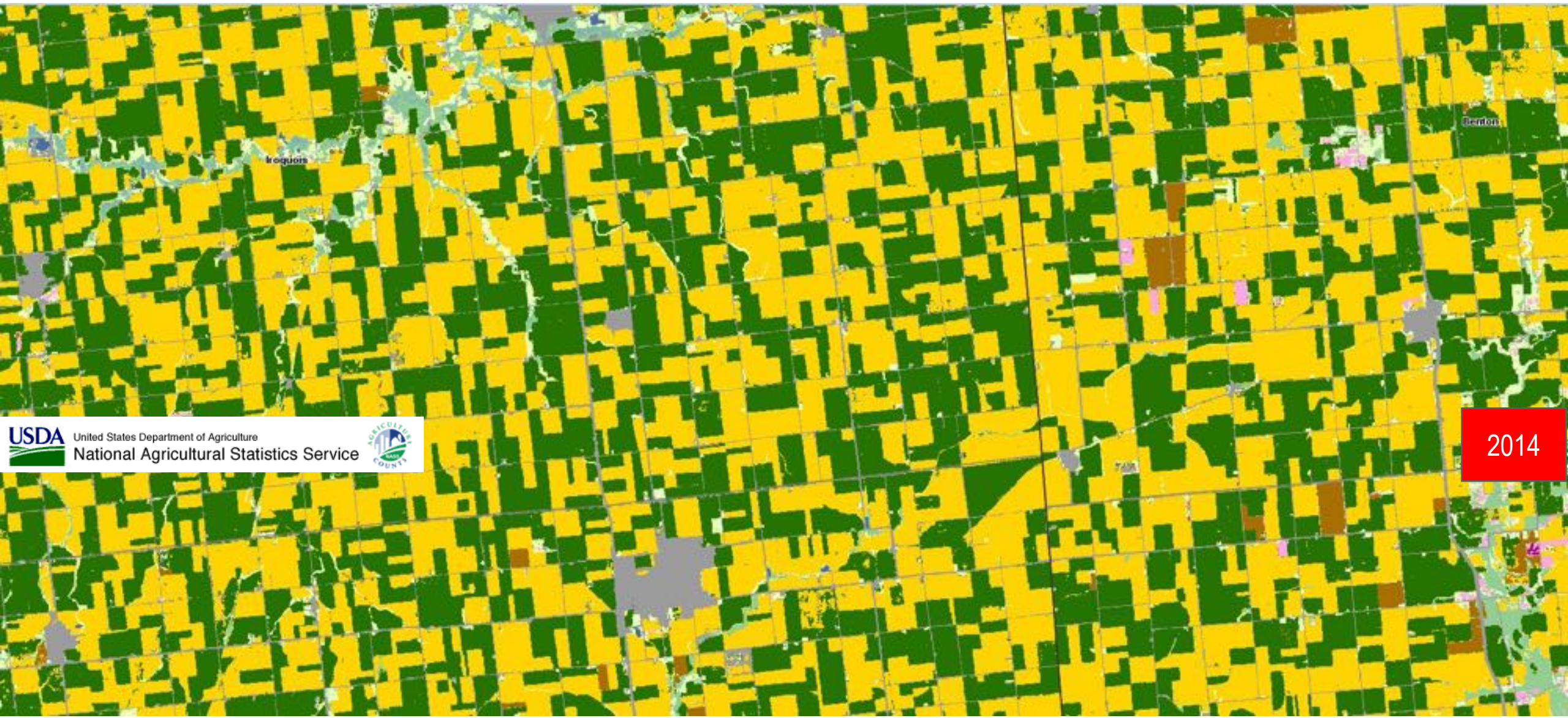

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USDA United States Department of Agriculture
National Agricultural Statistics Service

2013

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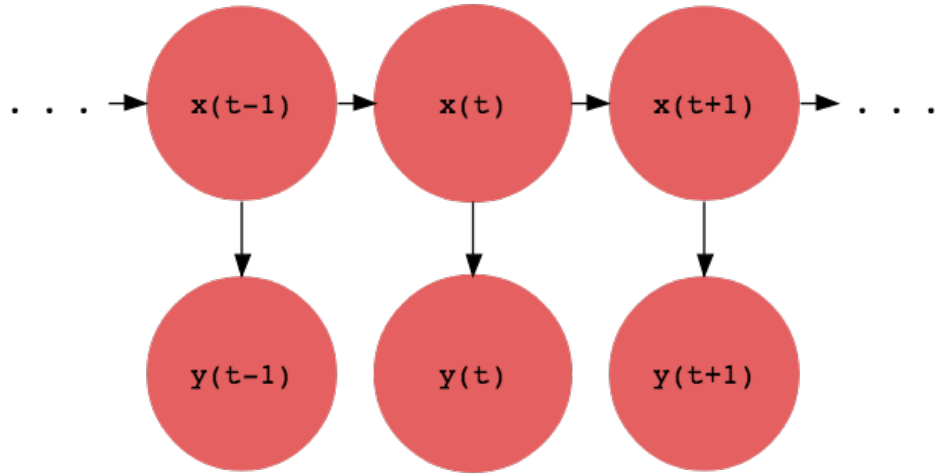
The Bayesian model

The Bayesian model considers 10 years of historical data and estimates periodic crop variation at test area level.

The model comprises a pattern based component to account for longer sequences variation.



Sentinel-2, May 30, 2018

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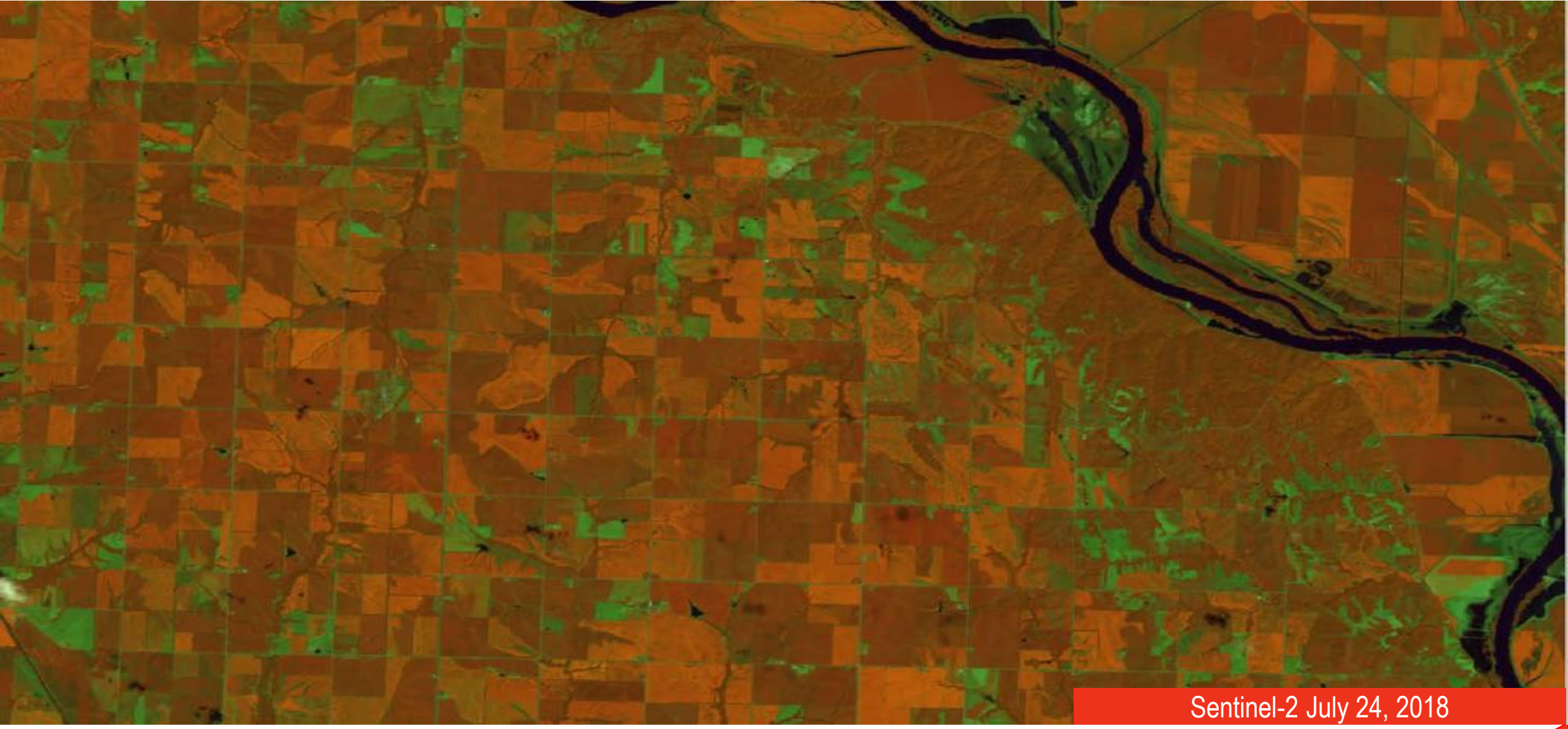

Sentinel-2 July 24, 2018

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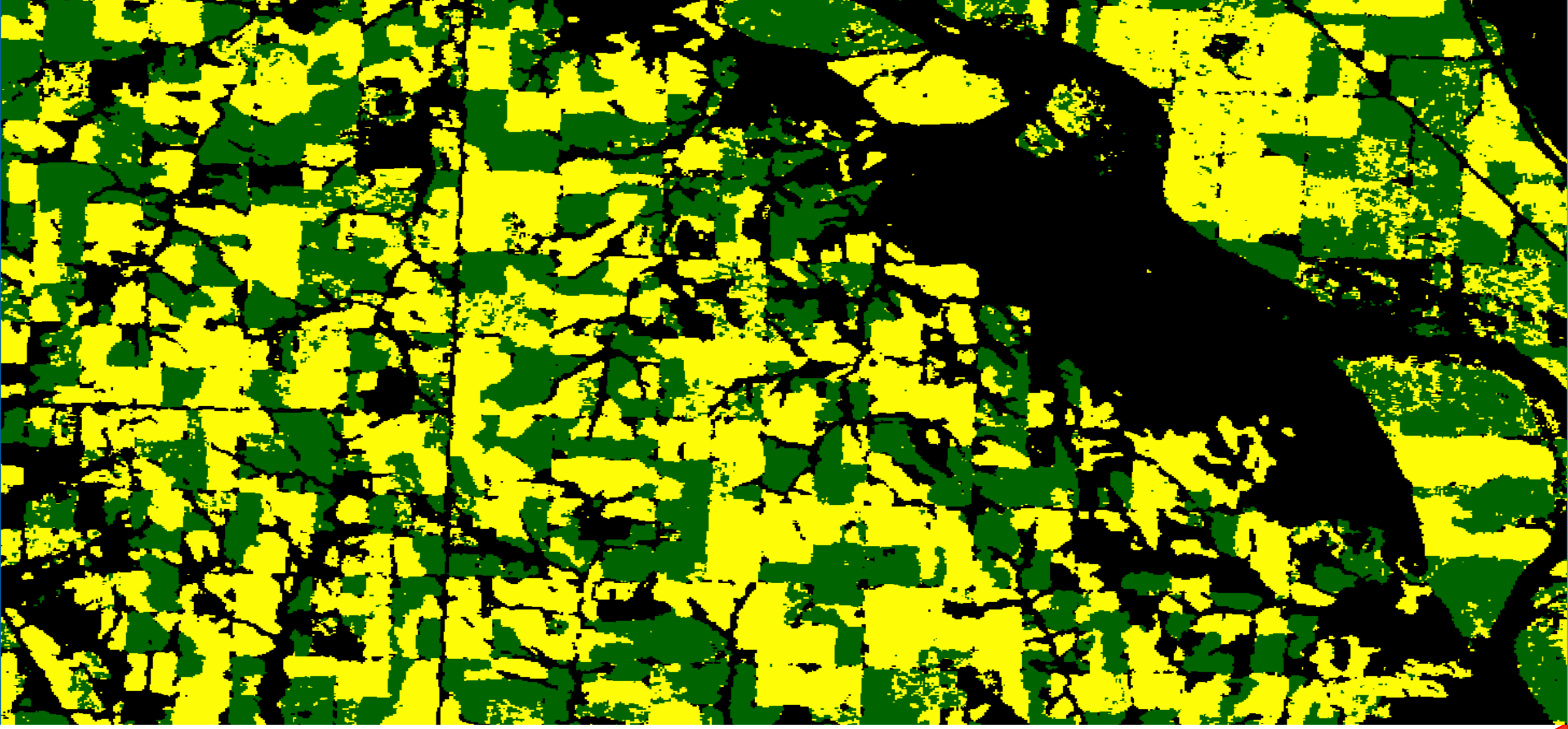

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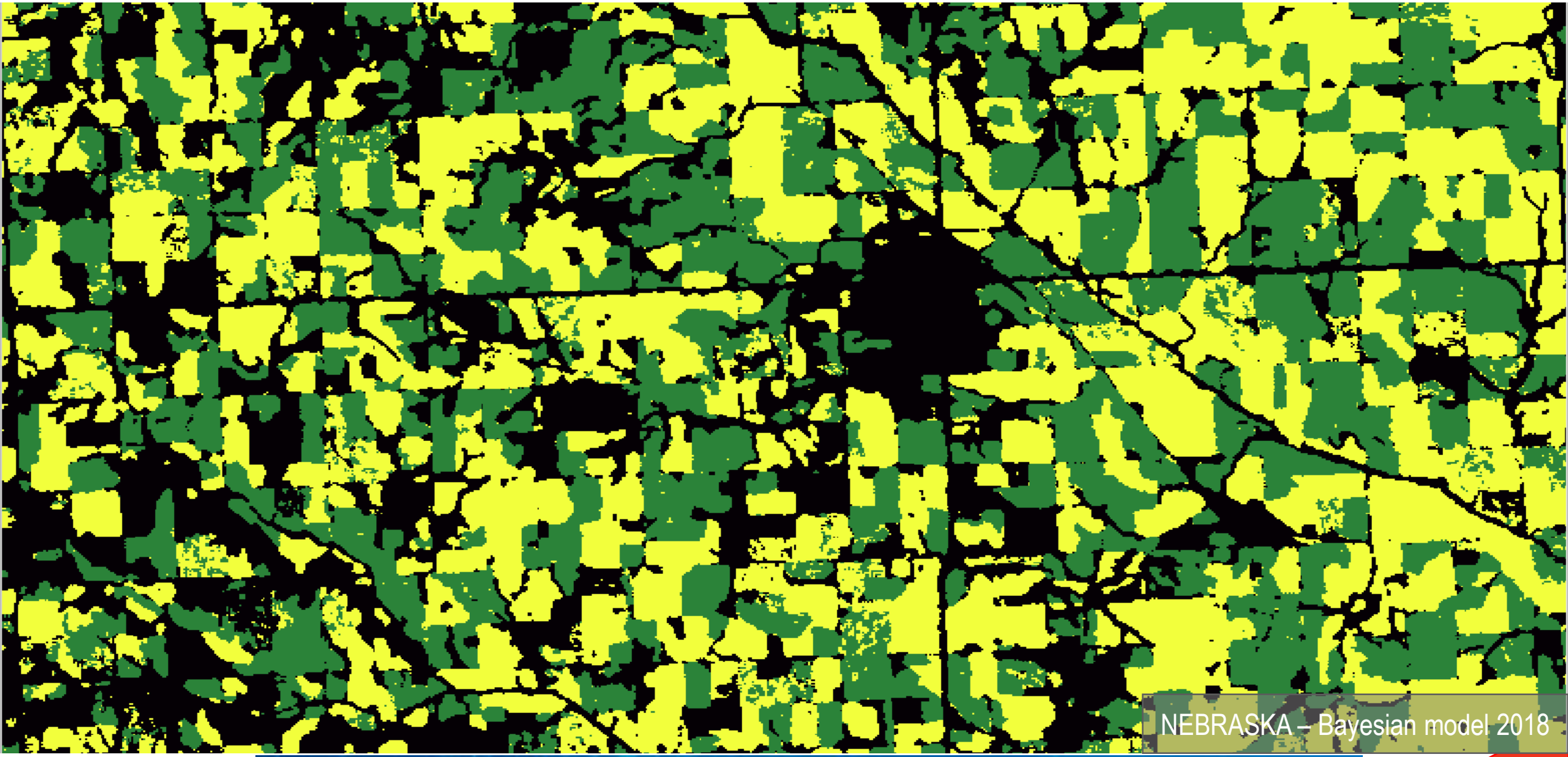

NEBRASKA – Bayesian model 2018

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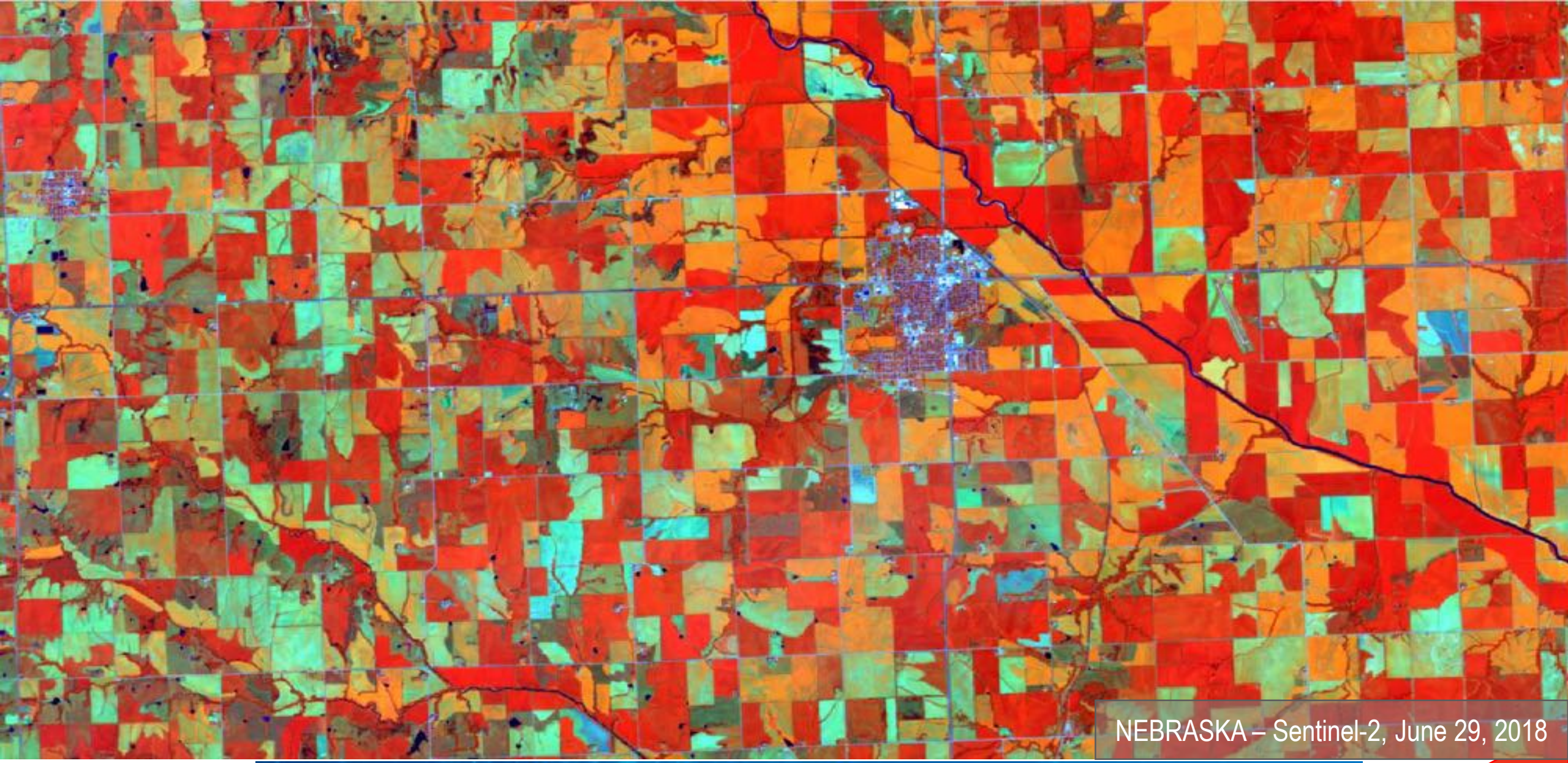

NEBRASKA – Sentinel-2, June 29, 2018

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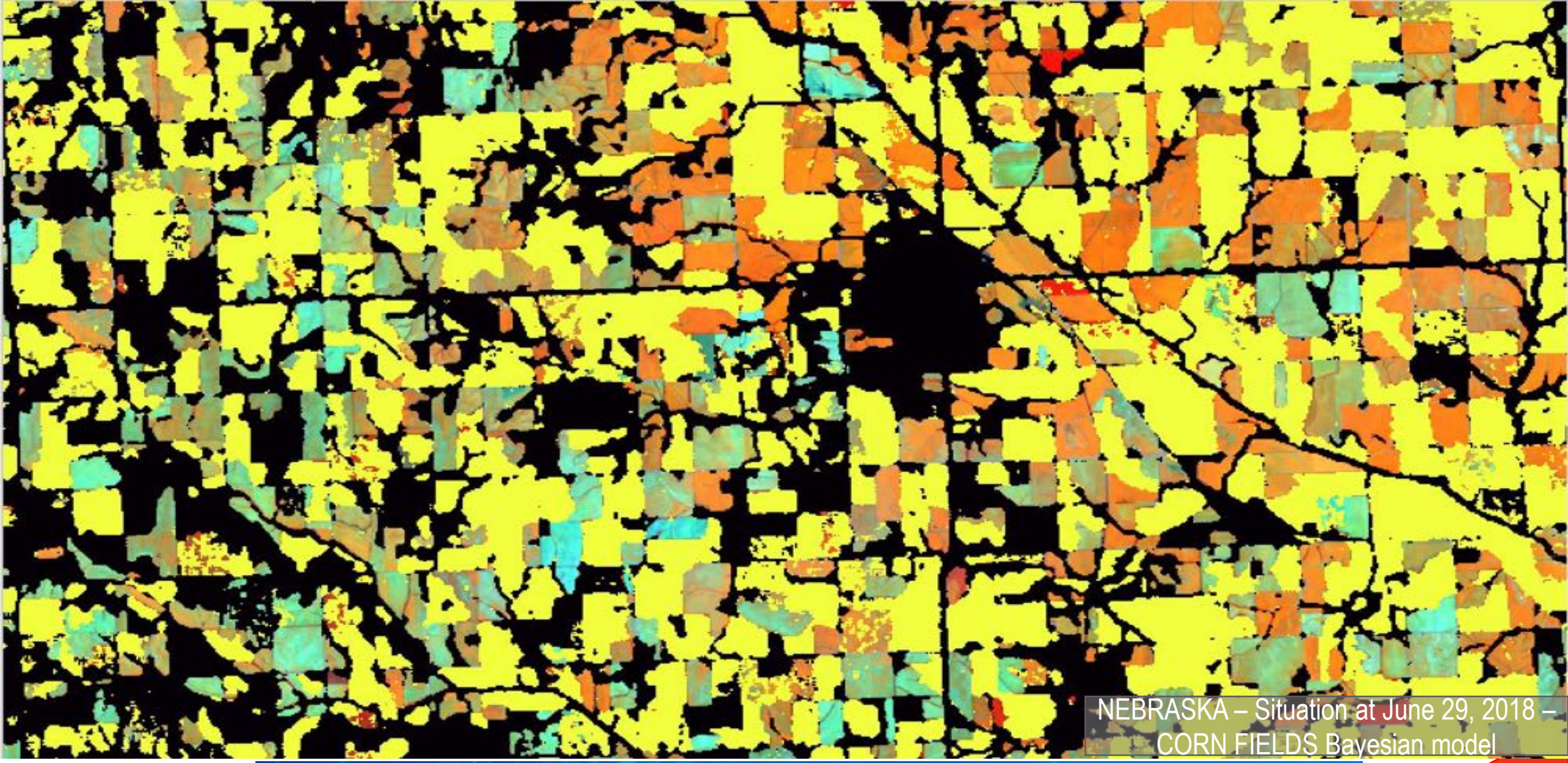

NEBRASKA – Situation at June 29, 2018 –
CORN FIELDS Bayesian model

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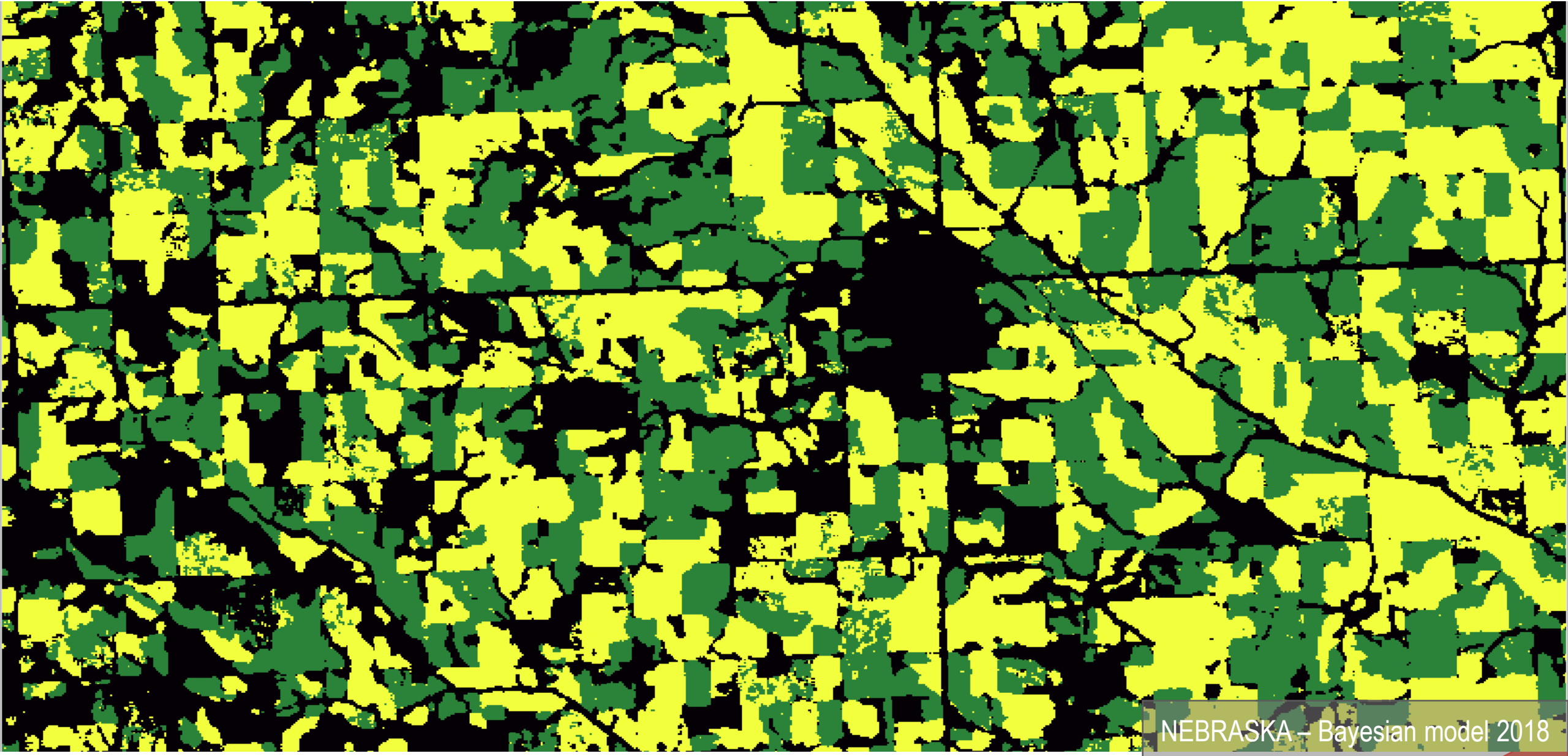

NEBRASKA – Bayesian model 2018

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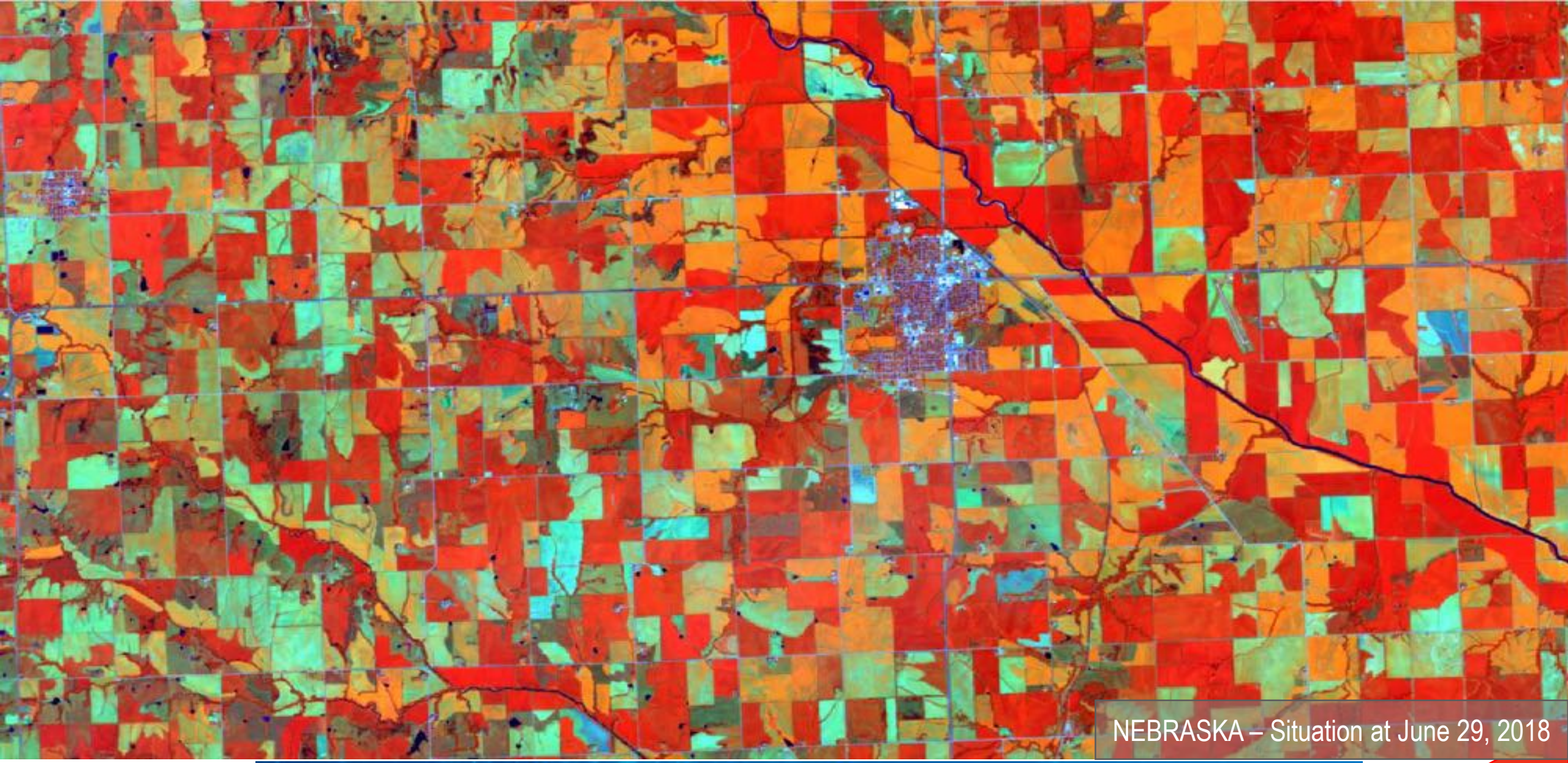

NEBRASKA – Situation at June 29, 2018

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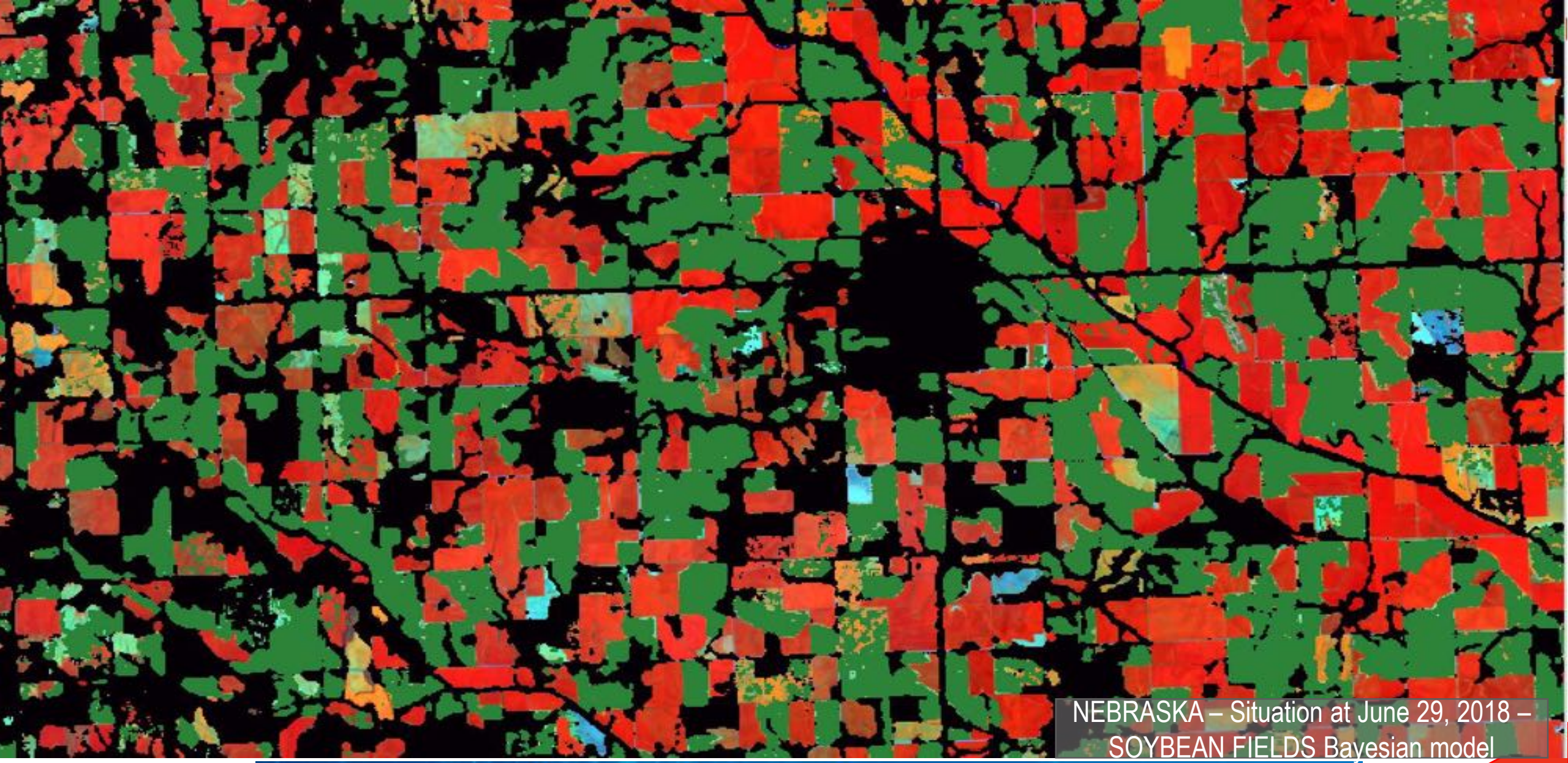

NEBRASKA – Situation at June 29, 2018 –
SOYBEAN FIELDS Bayesian model

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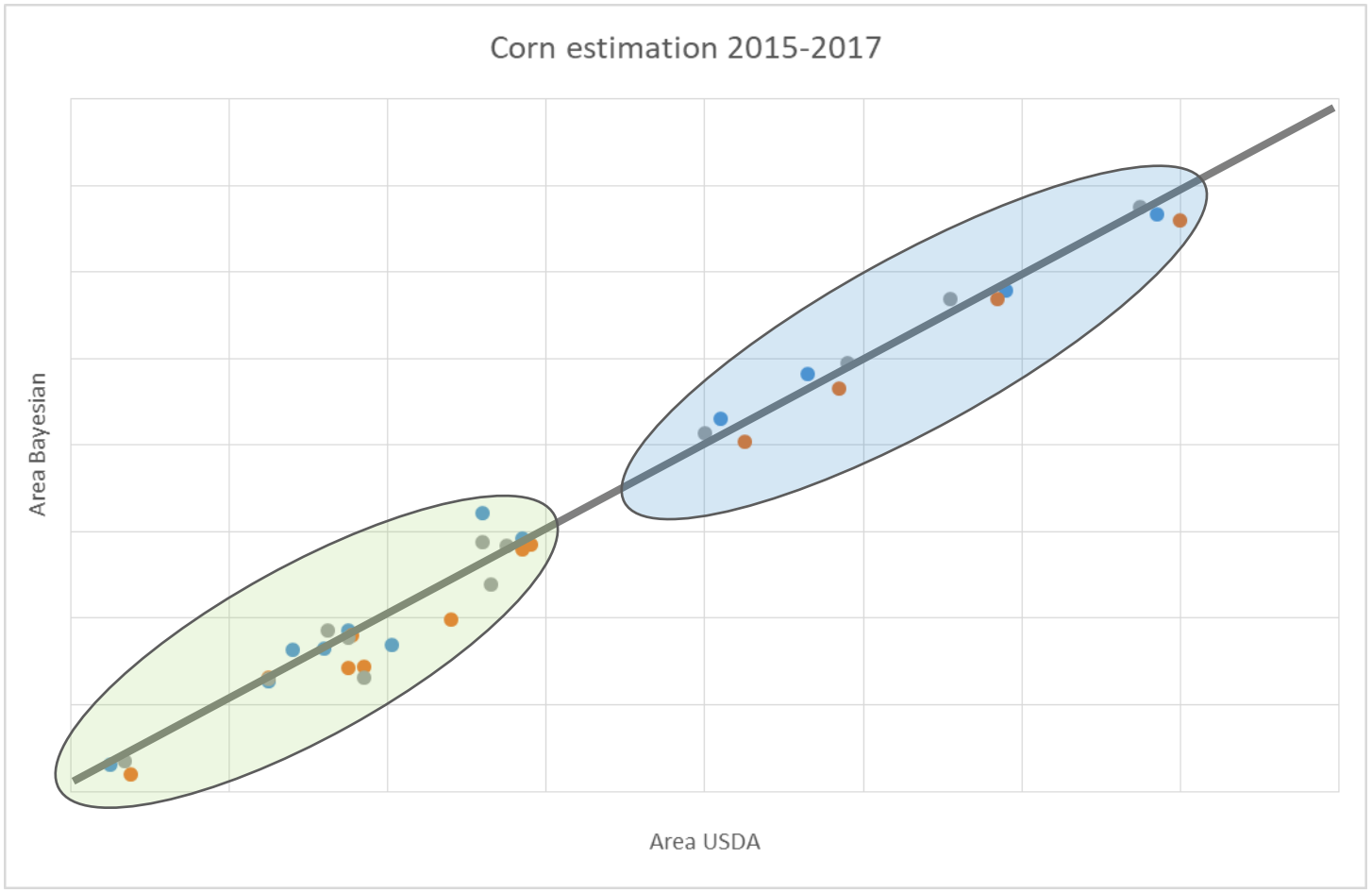

- Average difference between predicted and reference value:
- For larger acreage : 3.2%
- For smaller acreage : 11.5%

Summary

- Satellite time series are a powerful enabler for EO services dedicated to agriculture
- By leveraging on these time series, e-Geos is adopting its Agrigeo platform for products generation and services provision, also carrying out research activities for enlarging and improving service portfolio.
- Together with Politecnico of Milano has been analized the computation of crop acreage over adminstrative units, with focus on its continuous update during the growing season
- A promising solution is based on the integration of a bayesian model for the provision of crop acreage in the very early stage, with an RF model for later stages

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