# Moving Multi-Source Land Imaging of Seasonal Dynamics in Land Surface to Production


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NASA LCLUC Team Meeting 2020


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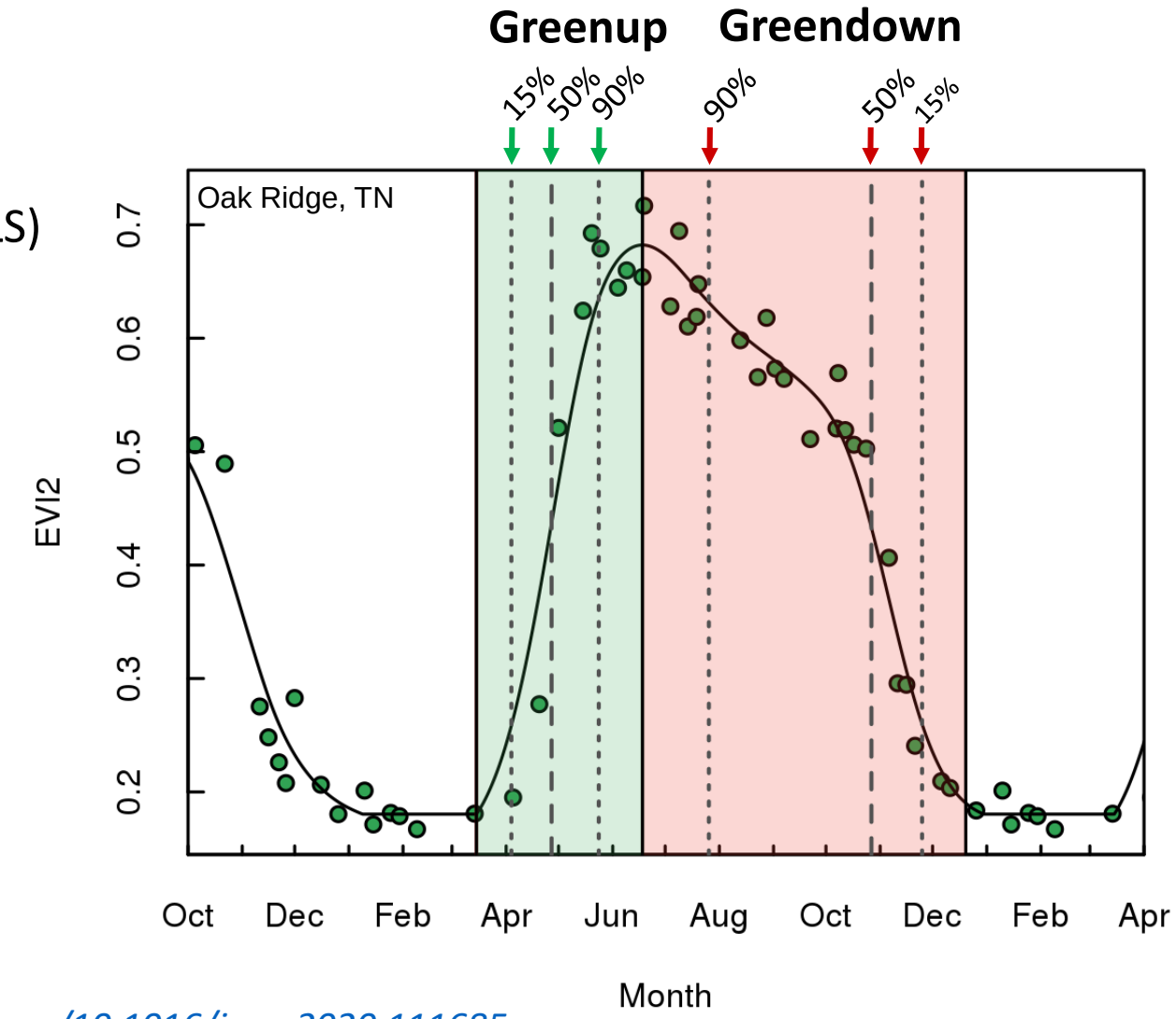
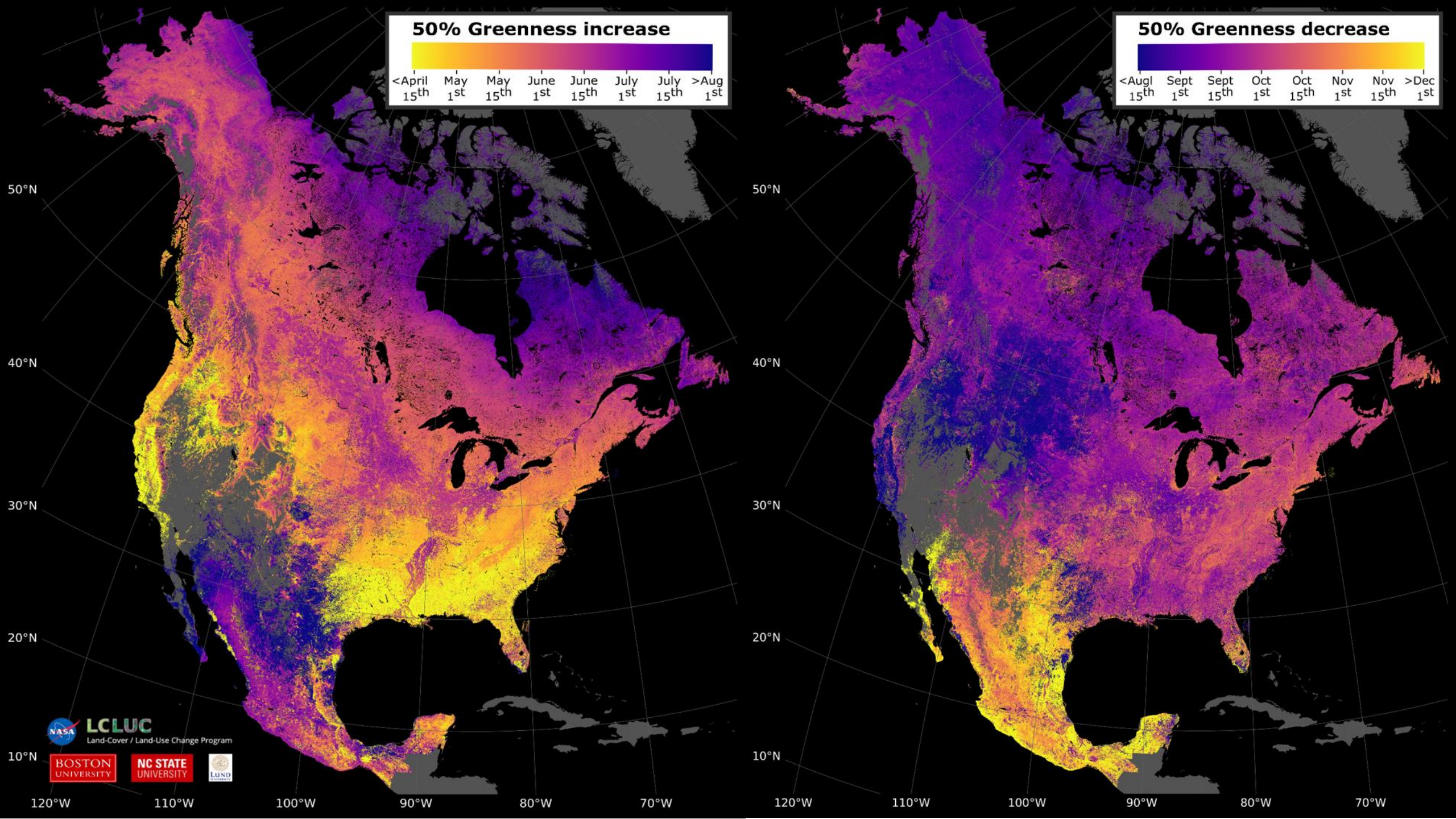
# MuSLI Land Surface Phenology

- North America
- Based on Harmonized Landsat 8 – Sentinel 2 (HLS)
- Fit smoothing splines on an annual basis
- Detect time-series peaks
- Determine greenup and greendown periods by identifying time-series troughs
- Identify phenology dates during greenup and greendown
- *Same method used for MODIS (MCD12Q2)*




*Bolton et al. (2020), Remote Sensing of Environment, https://doi.org/10.1016/j.rse.2020.111685.*


50% Greenness increase
<April 15th
May 1st
May 15th
June 1st
June 15th
July 1st
July 15th
>Aug 1st
50% Greenness decrease
<Augl 15th
Sept 1st
Sept 15th
Oct 1st
Oct 15th
Nov 1st
Nov 15th
>Dec 1st
50°N
40°N
30°N
20°N
10°N
120°W
110°W
100°W
90°W
80°W
70°W
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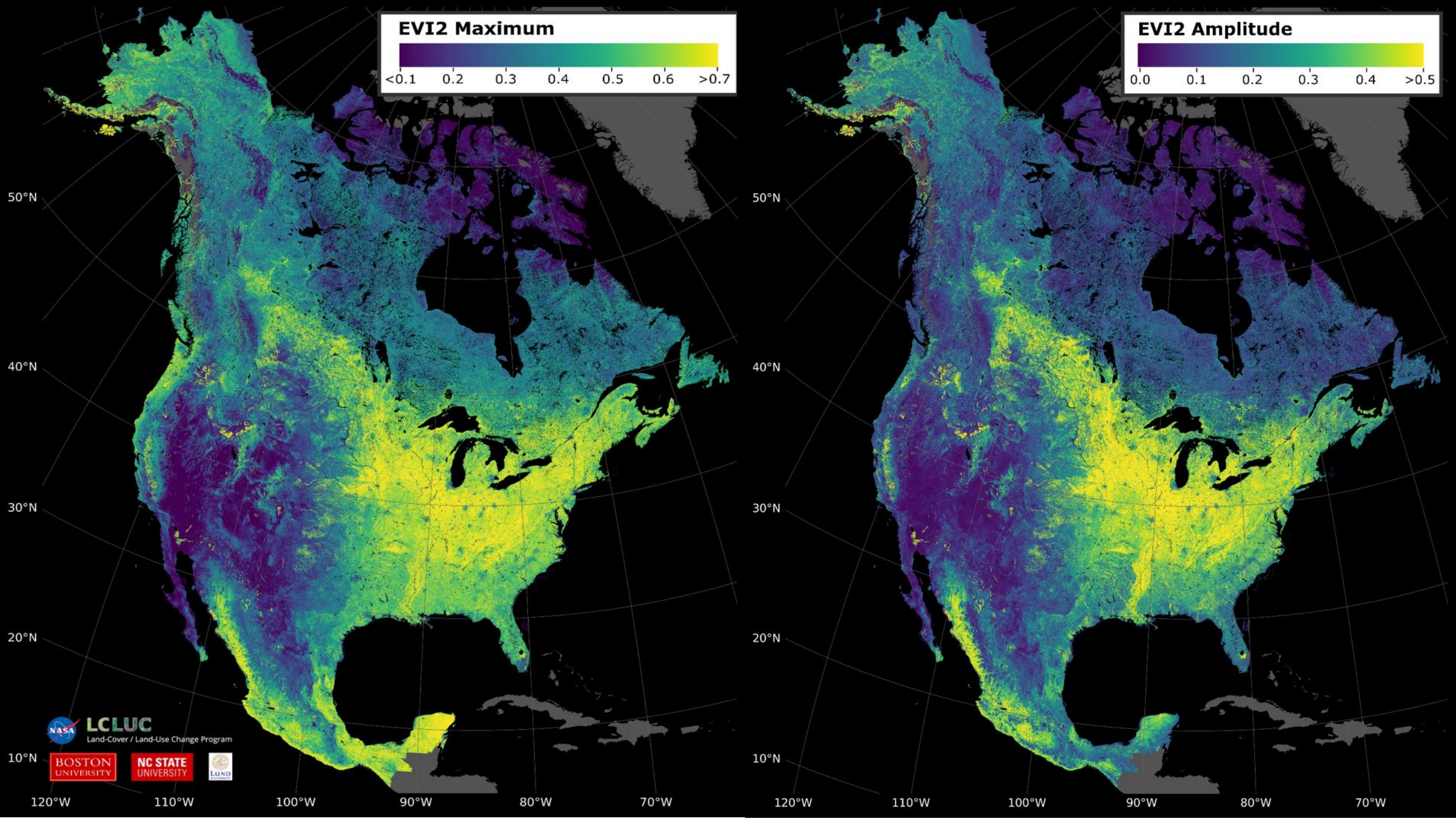
EVI2 Maximum
<0.1
0.2
0.3
0.4
0.5
0.6
>0.7
EVI2 Amplitude
0.0
0.1
0.2
0.3
0.4
>0.5
50°N
40°N
30°N
20°N
10°N
120°W
110°W
100°W
90°W
80°W
70°W
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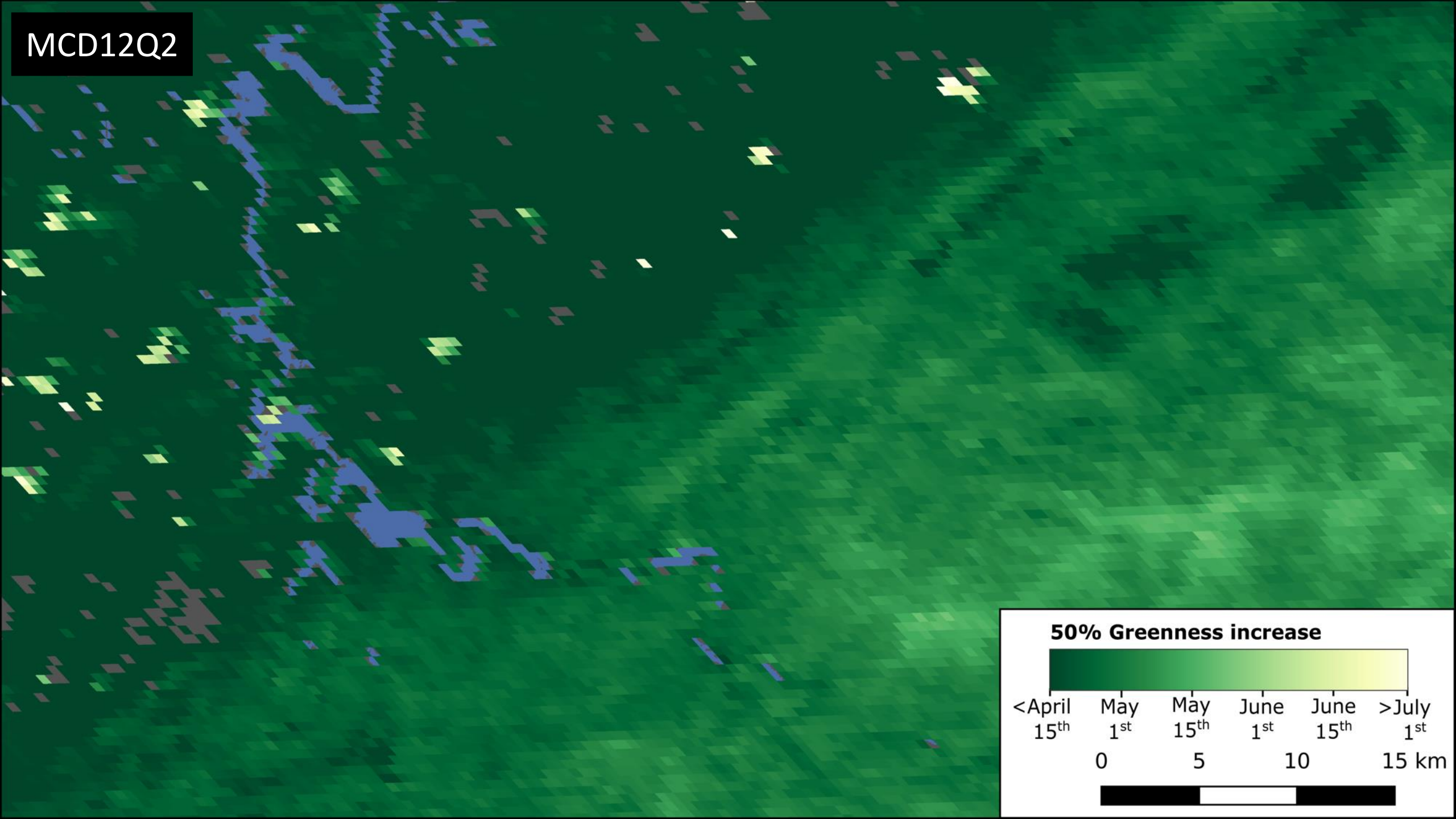
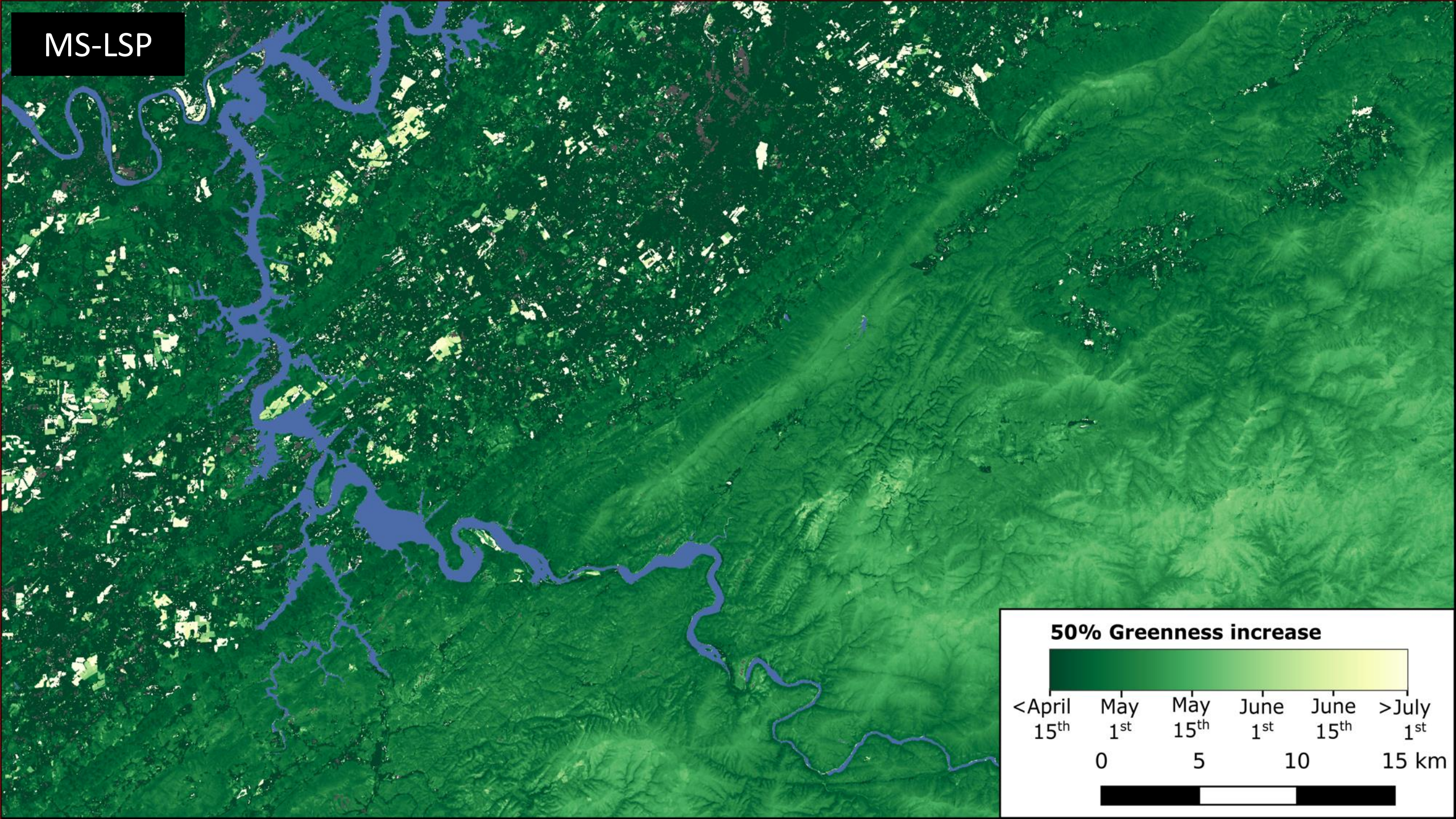
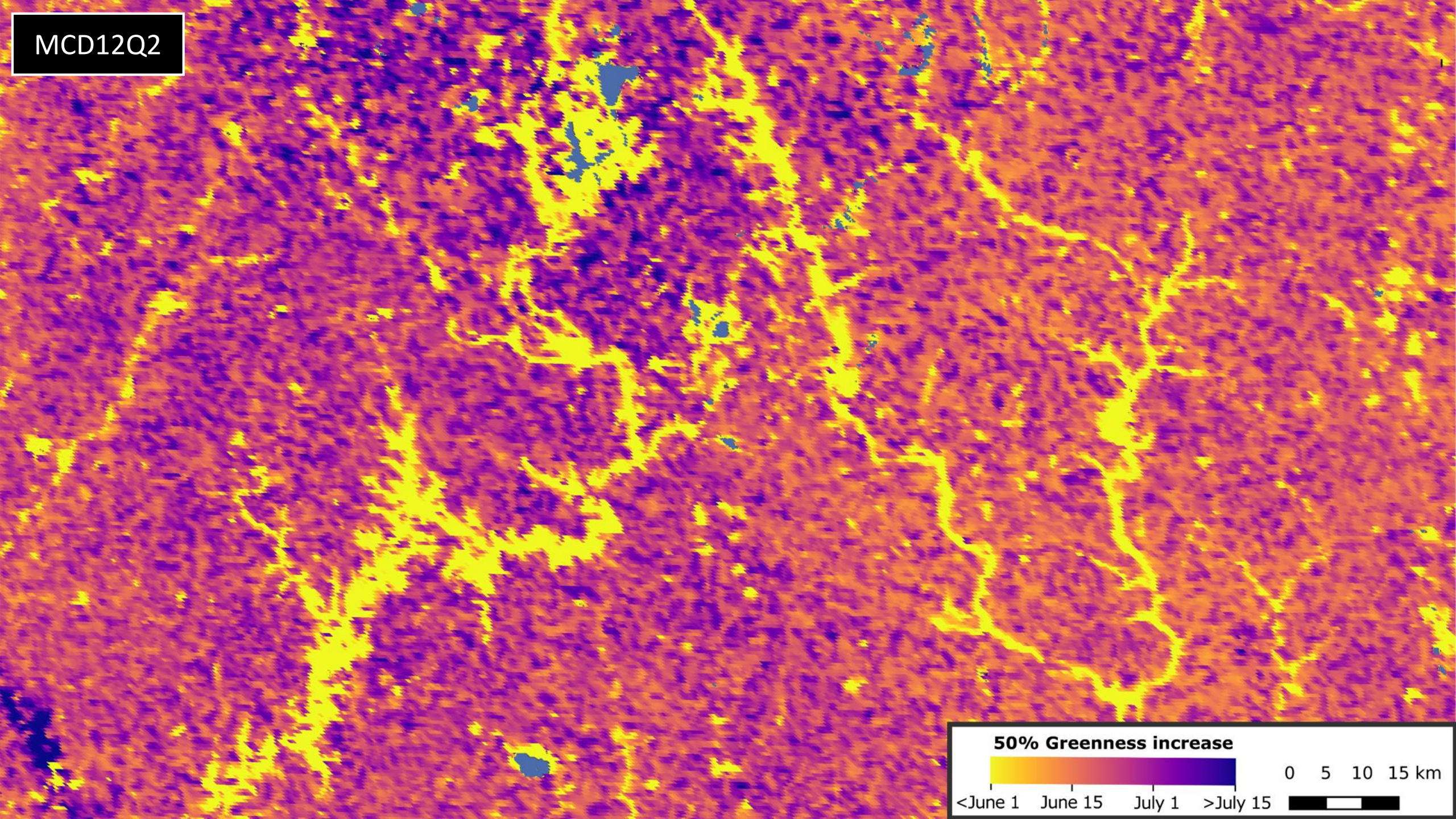
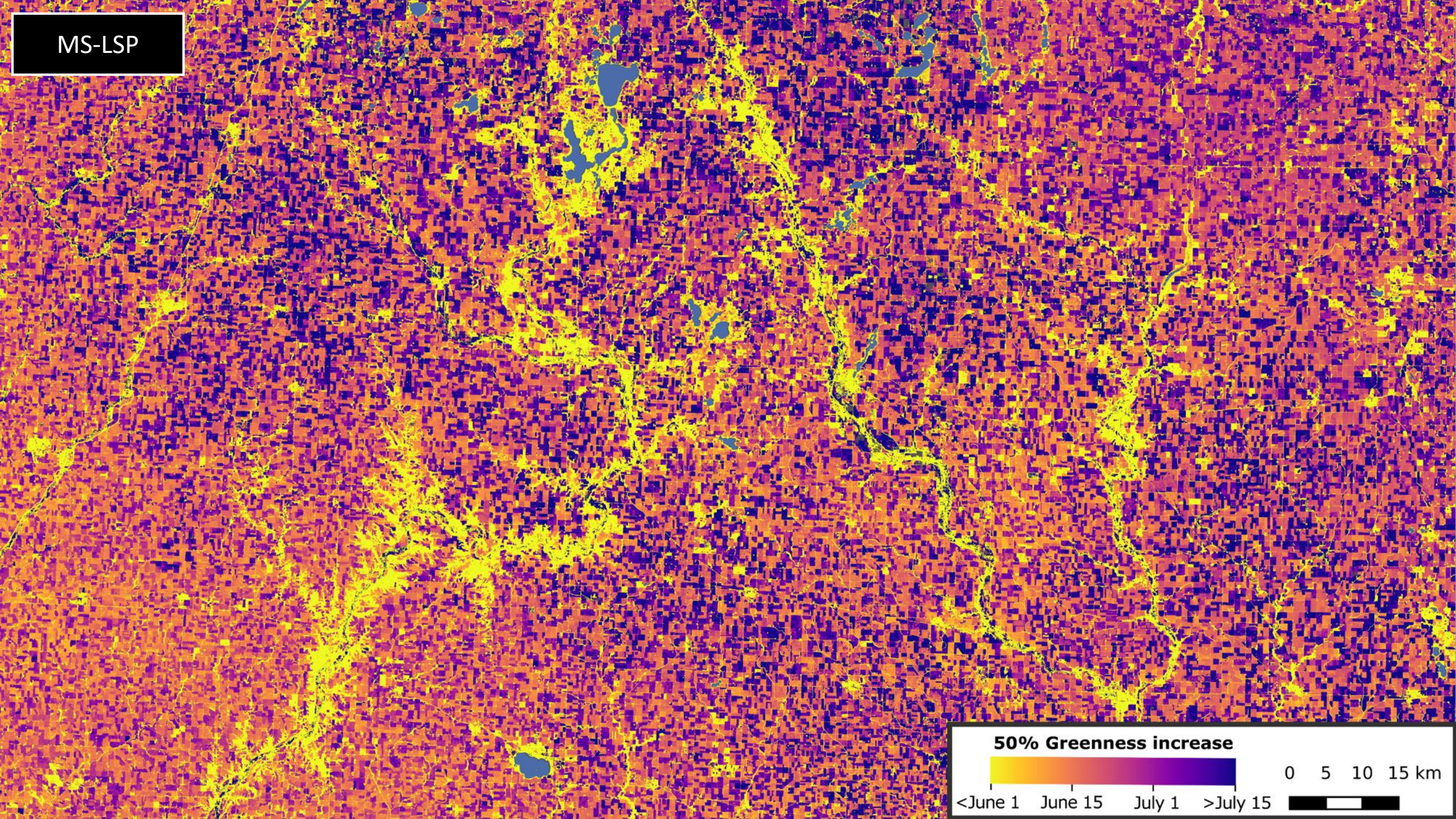
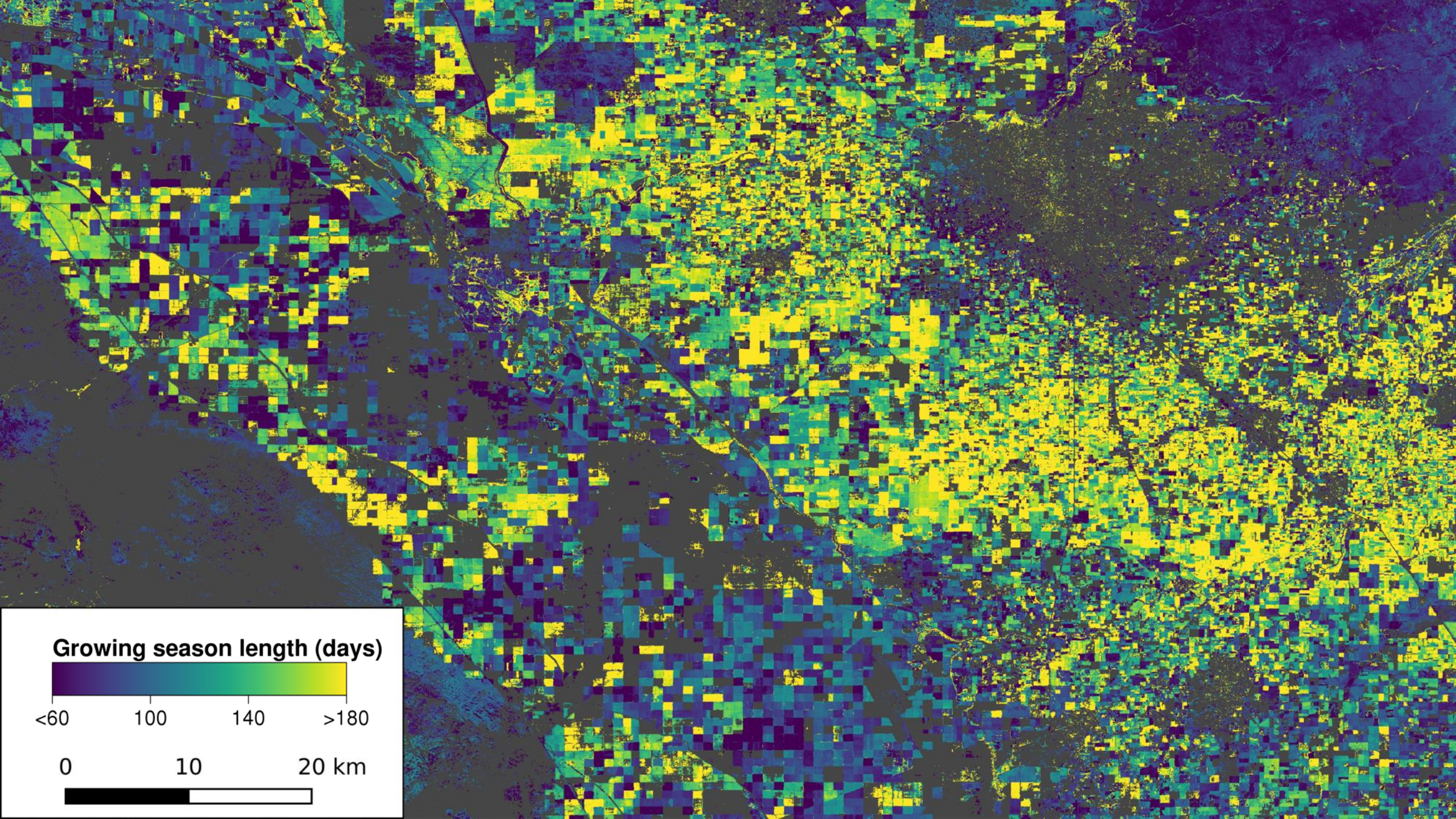
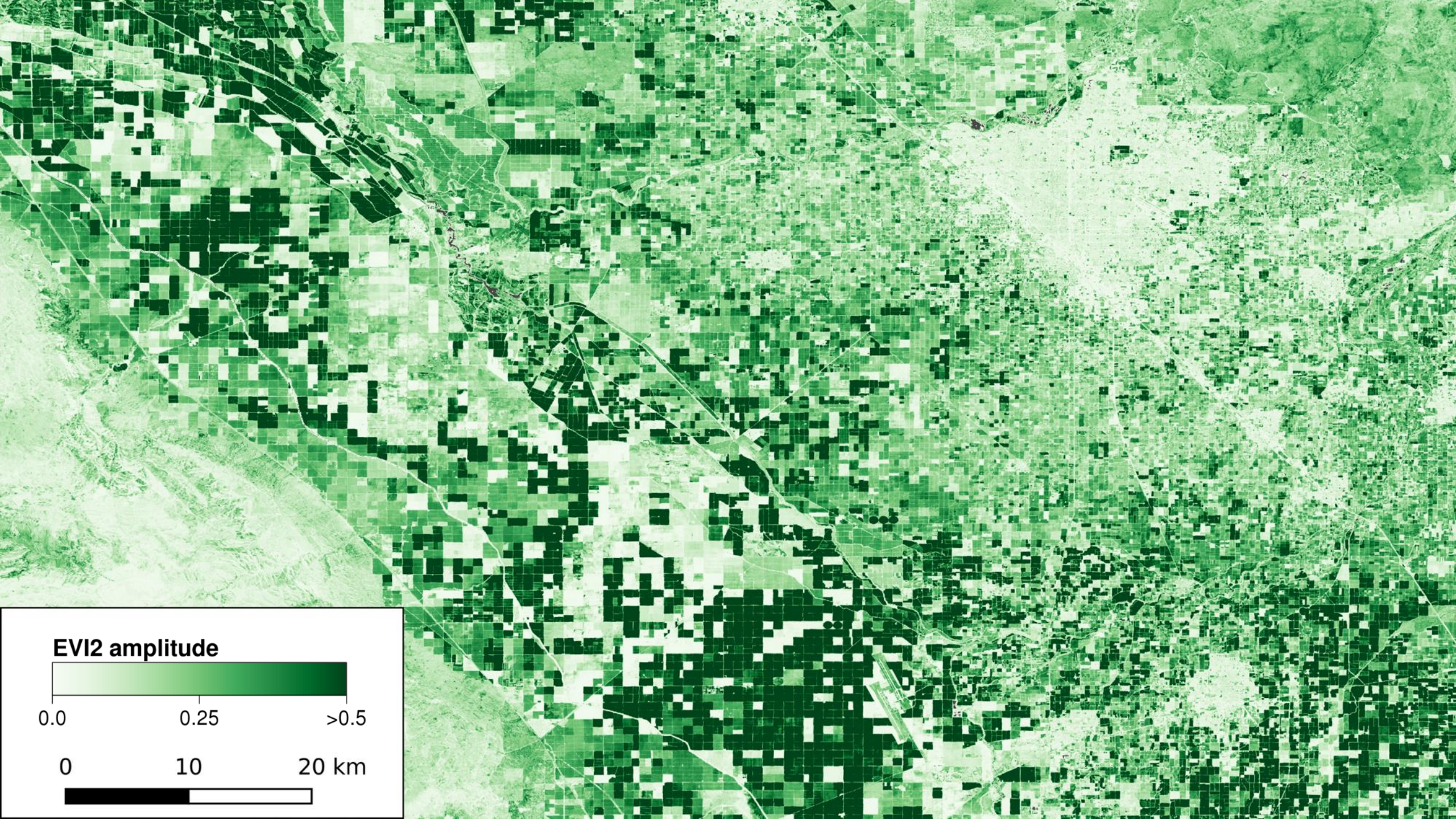

MCD12Q2
50% Greenness increase
<April 15th
May 1st
May 15th
June 1st
June 15th
>July 1st
0
5
10
15 km

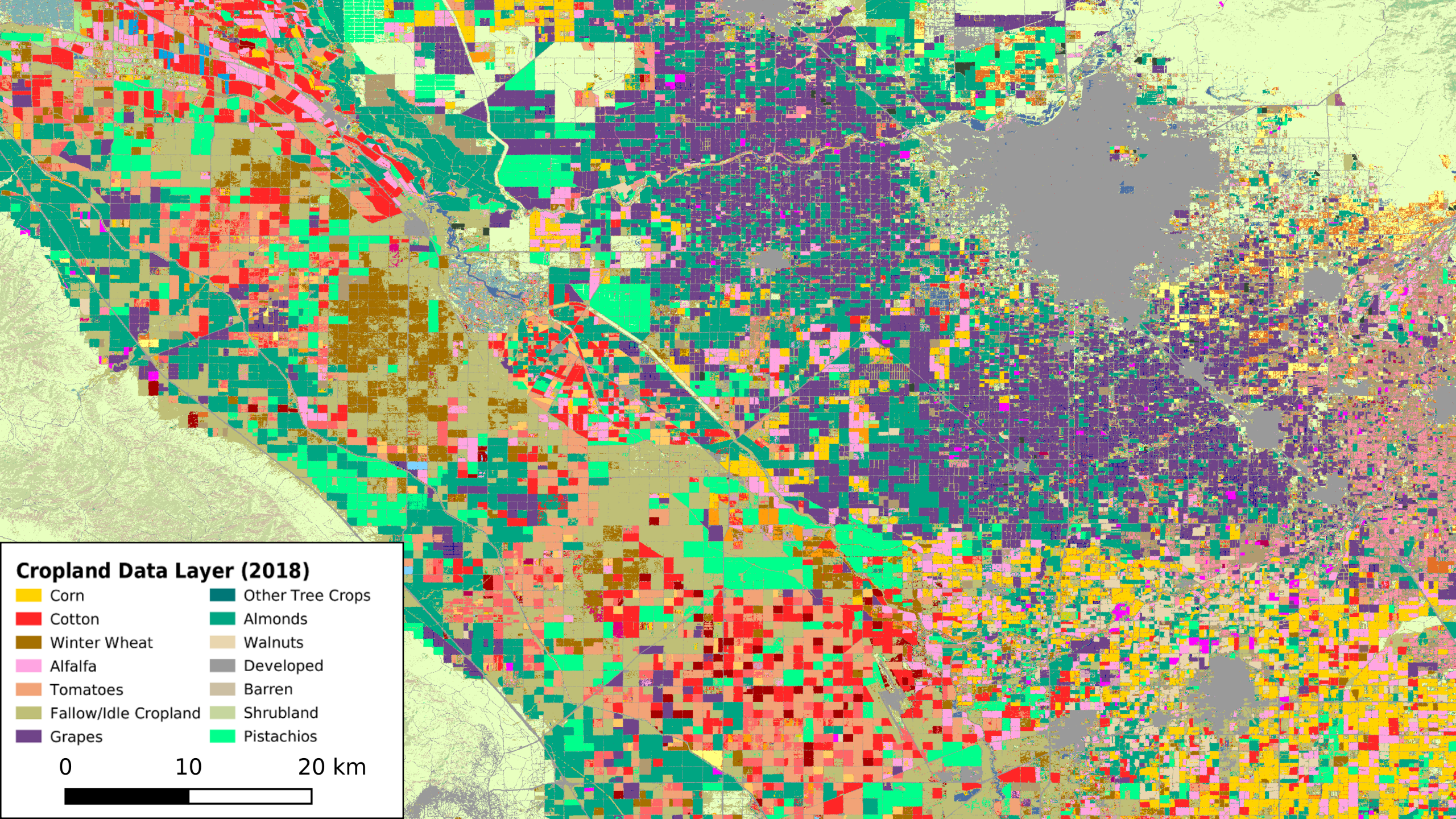

MS-LSP
50% Greenness increase
<April 15th
May 1st
May 15th
June 1st
June 15th
>July 1st
0
5
10
15 km


MCD12Q2
50% Greenness increase
<June 1
June 15
July 1
>July 15
0 5 10 15 km

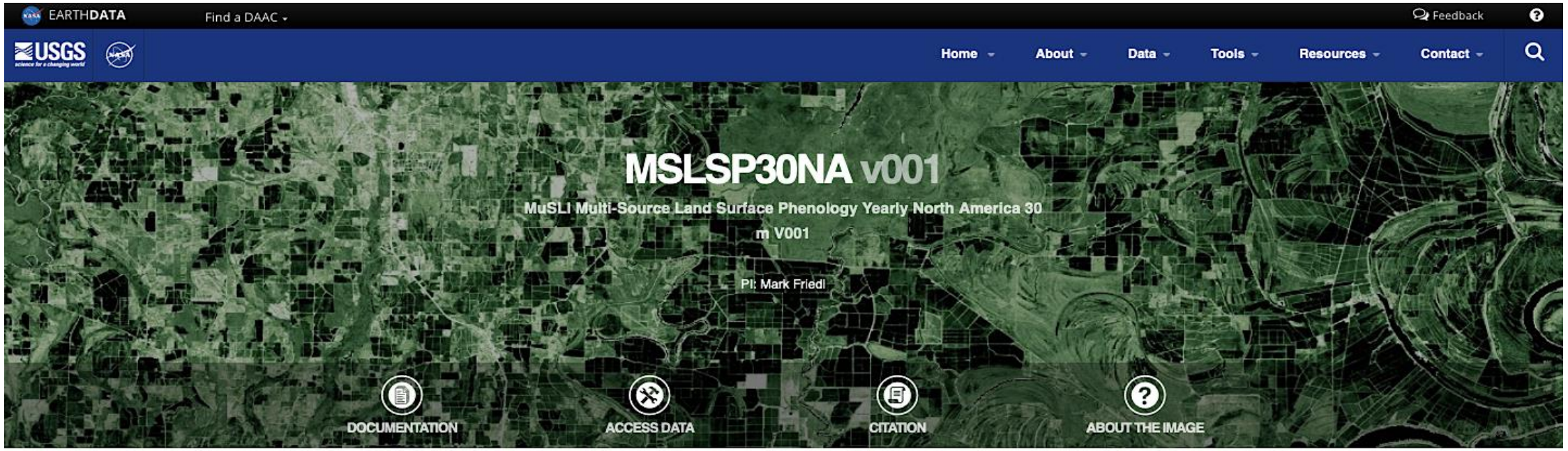

MS-LSP
50% Greenness increase
<June 1
June 15
July 1
>July 15
0 5 10 15 km


Growing season length (days)
<60
100
140
>180
0
10
20 km


EVI2 amplitude
0.0
0.25
>0.5
0
10
20 km


Cropland Data Layer (2018)
Corn
Cotton
Winter Wheat
Alfalfa
Tomatoes
Fallow/Idle Cropland
Grapes
Other Tree Crops
Almonds
Walnuts
Developed
Barren
Shrubland
Pistachios
0
10
20 km

# V001 Product Available on DAAC




Homepage / Data / Search Data Catalog / **MSLSP30NAv001**

## Description

NASA's Multi-Source Land Imaging (MuSLI) Land Surface Phenology (LSP) Yearly North America 30 meter (m) Version 1 product (MSLSP) provides a Land Surface Phenology product for North America derived from Harmonized Landsat Sentinel-2 (HLS) data. Data from the combined Landsat 8 Operational Land Imager (OLI) and Sentinel 2A and 2B Multispectral Instrument (MSI) provide the user community with dates of phenophase transitions, including the timing of greenup, maturity, senescence, and dormancy. MSLSP30NA is aligned with the Military Grid Reference System (MGRS) at 30 m spatial resolution. These datasets are useful for a wide range of applications, including ecosystem and agro-ecosystem modeling, monitoring the response of terrestrial ecosystems to climate variability and extreme events.

# Ongoing Work: (1) In Season Anomalies

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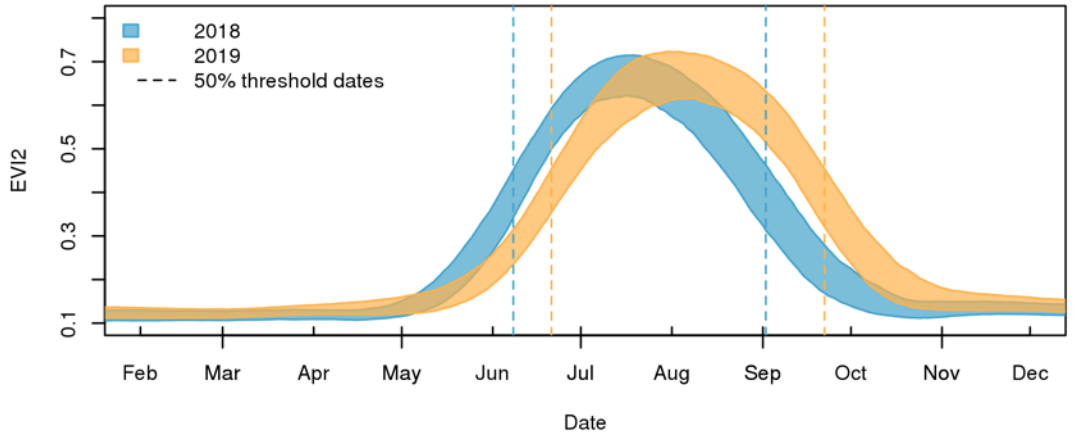
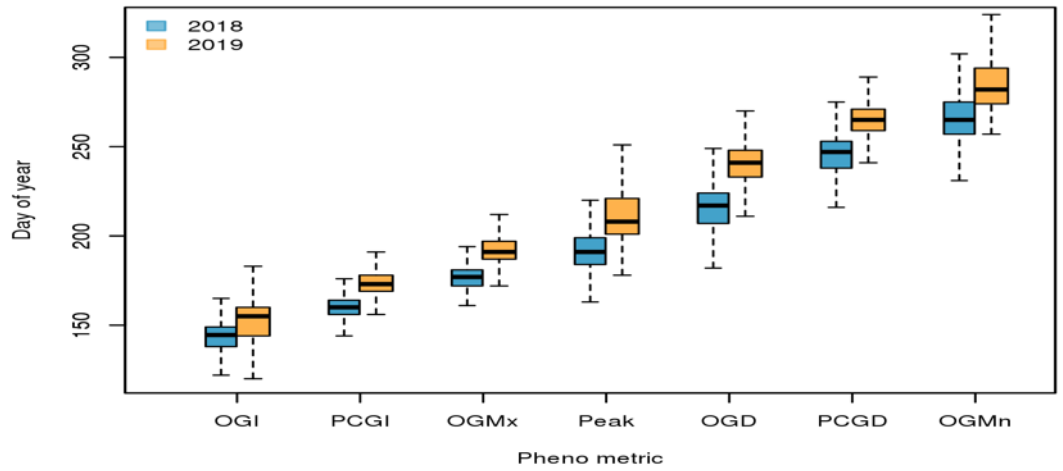
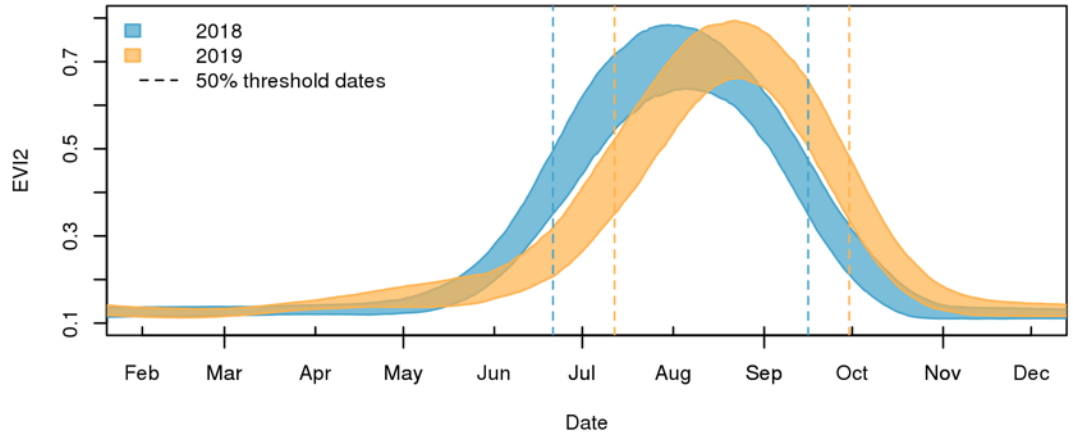
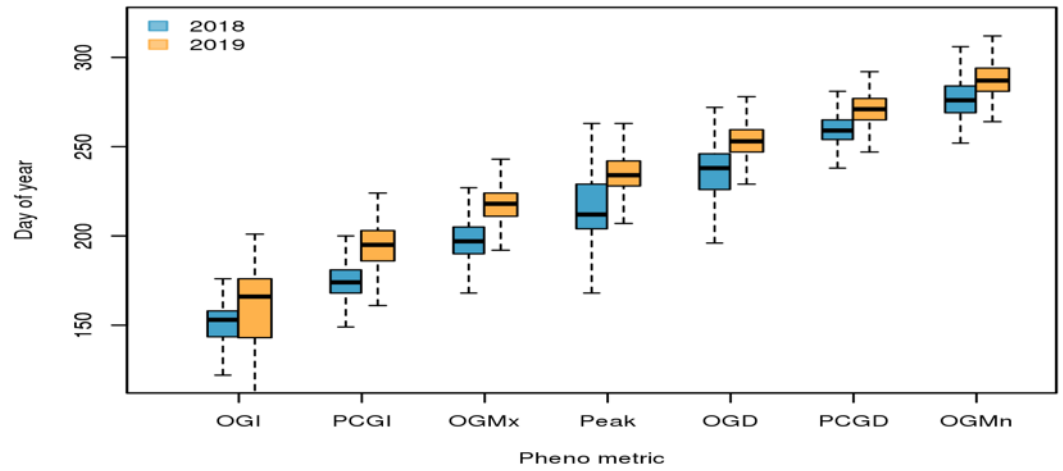
Corn




Soy



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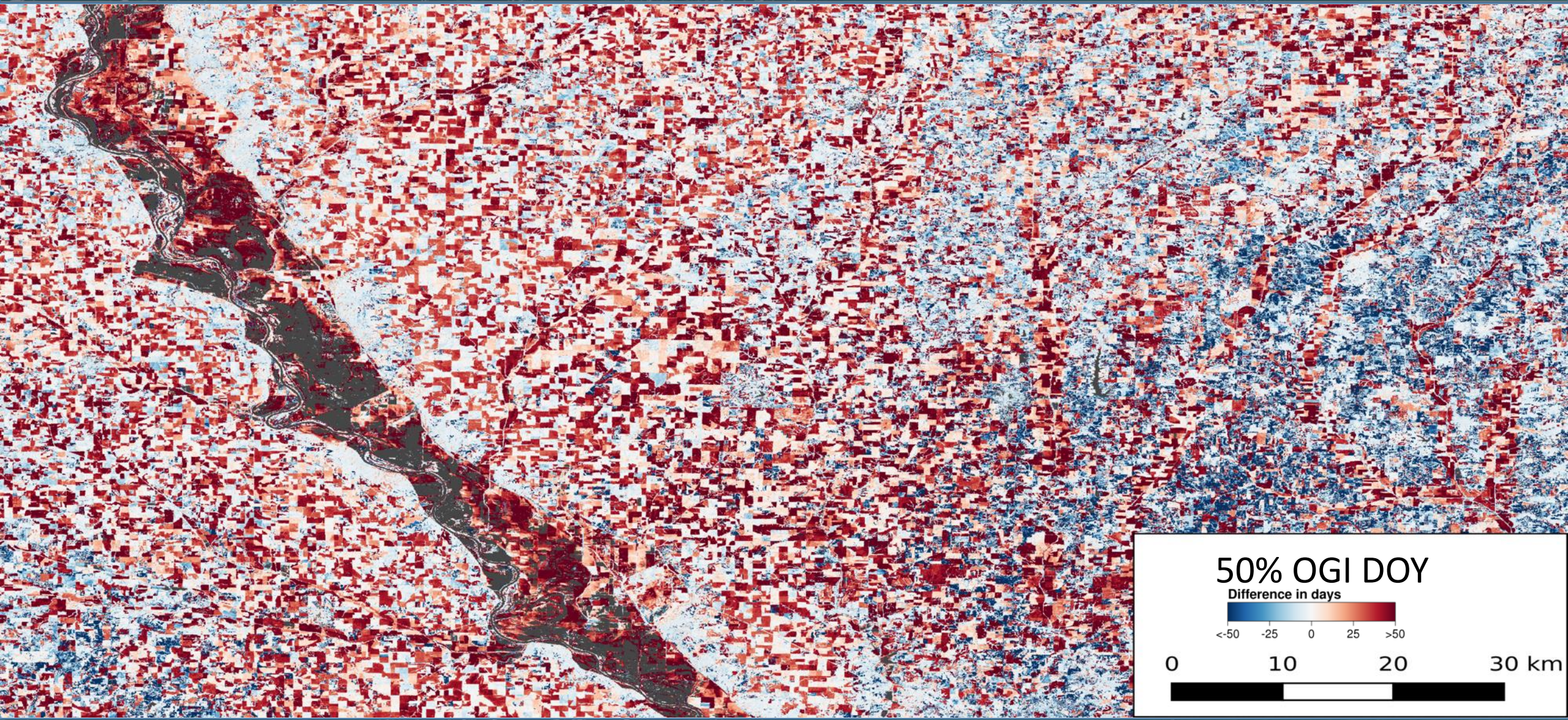
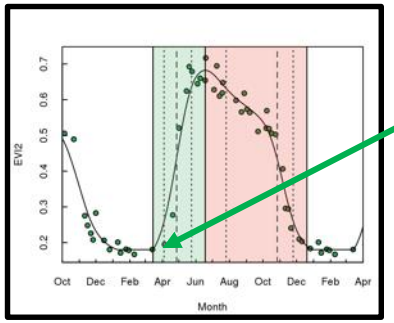
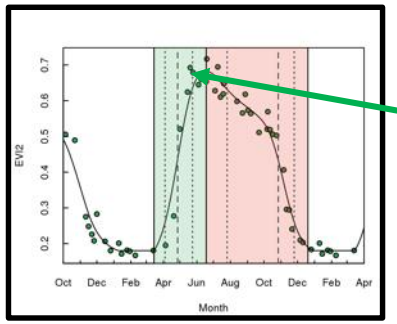


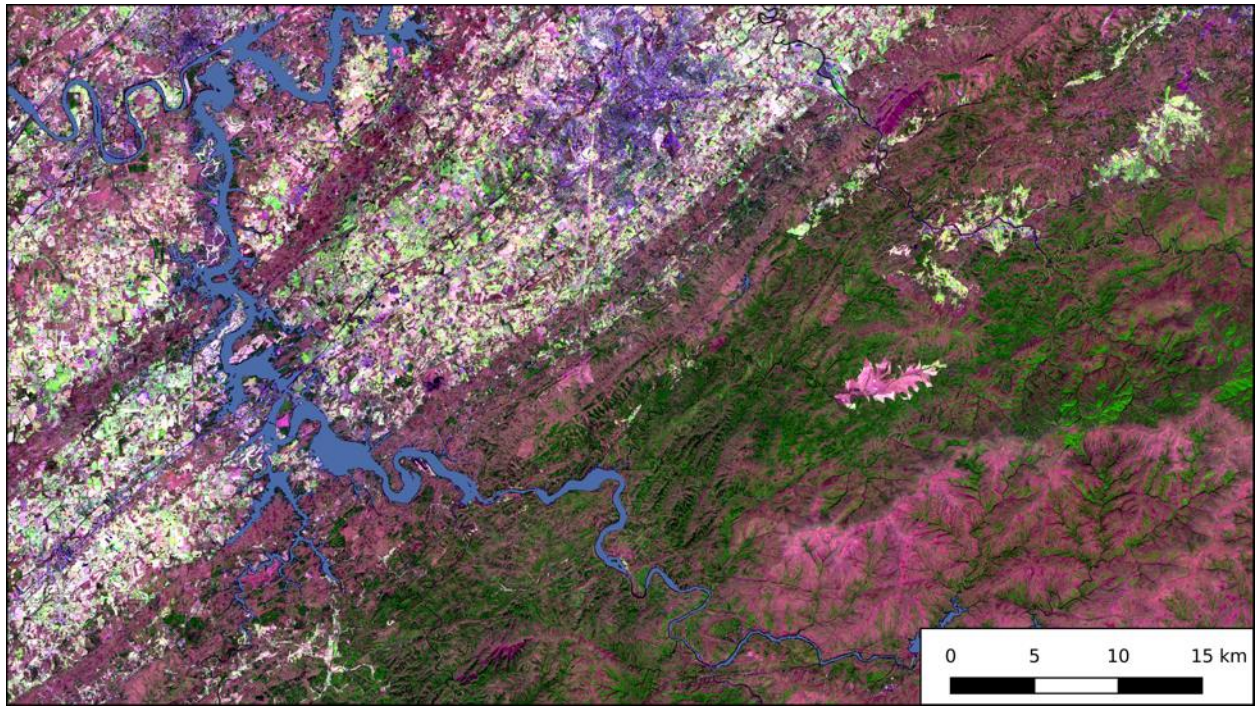
# Ongoing Work: (2) Synthetic Imagery



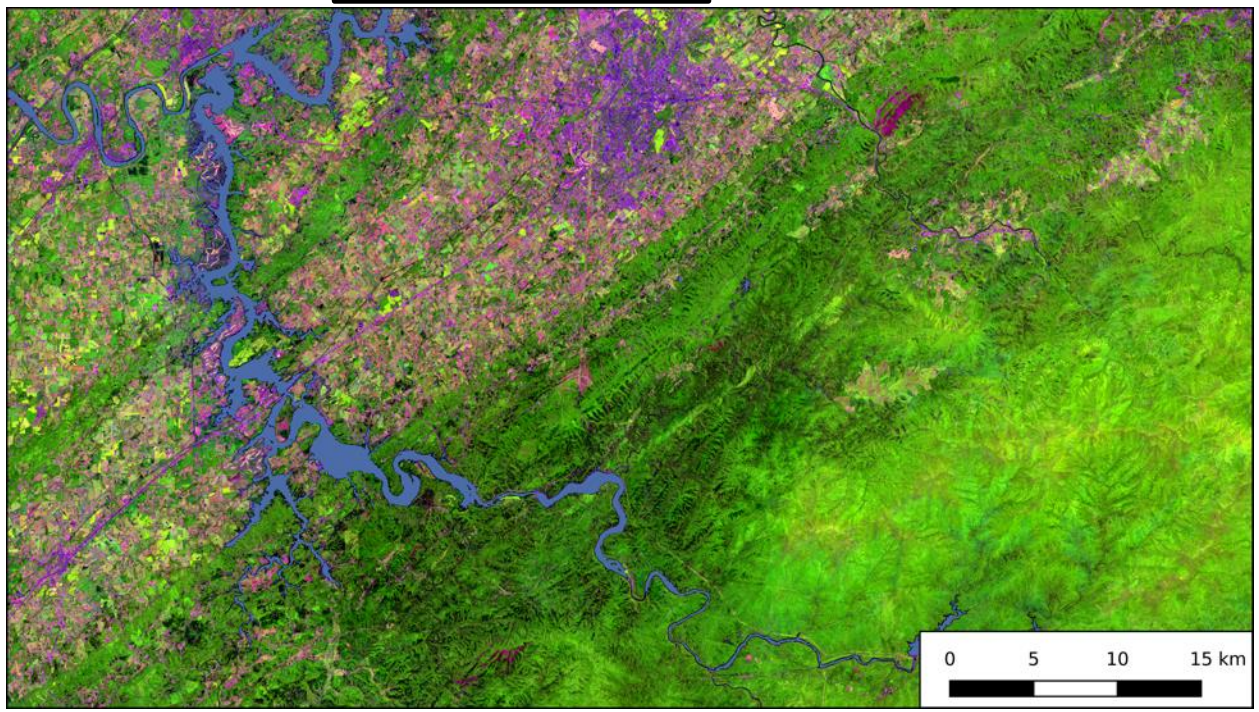

15% Greenup




90% Greenup




*SWIR NIR Red*



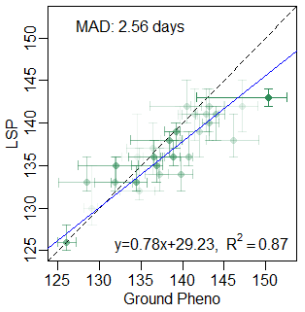

*SWIR NIR Red*

# Ongoing Work: (3) Bayesian LSP (Gao & Gray)

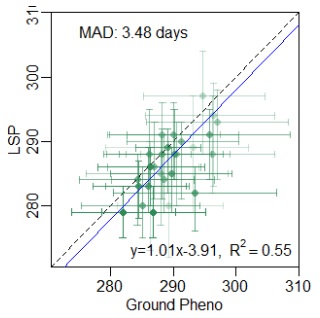
## Long-term 30 m LSP detection with uncertainty from Landsat

In the Bayesian hierarchical framework, we add two constraints to the double-logistic model with "greendown" parameter:

1. Constant variance for all years to reduce model variance.
2. Hyper-parameter random & fixed effects to borrow information from other years.

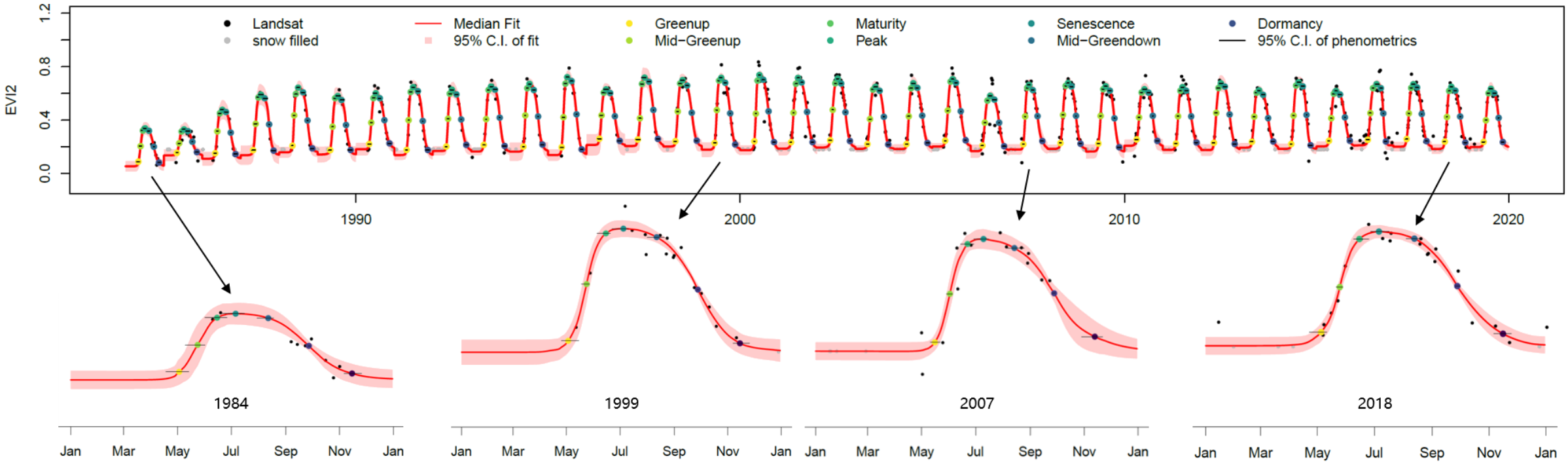



Mid-Greenup



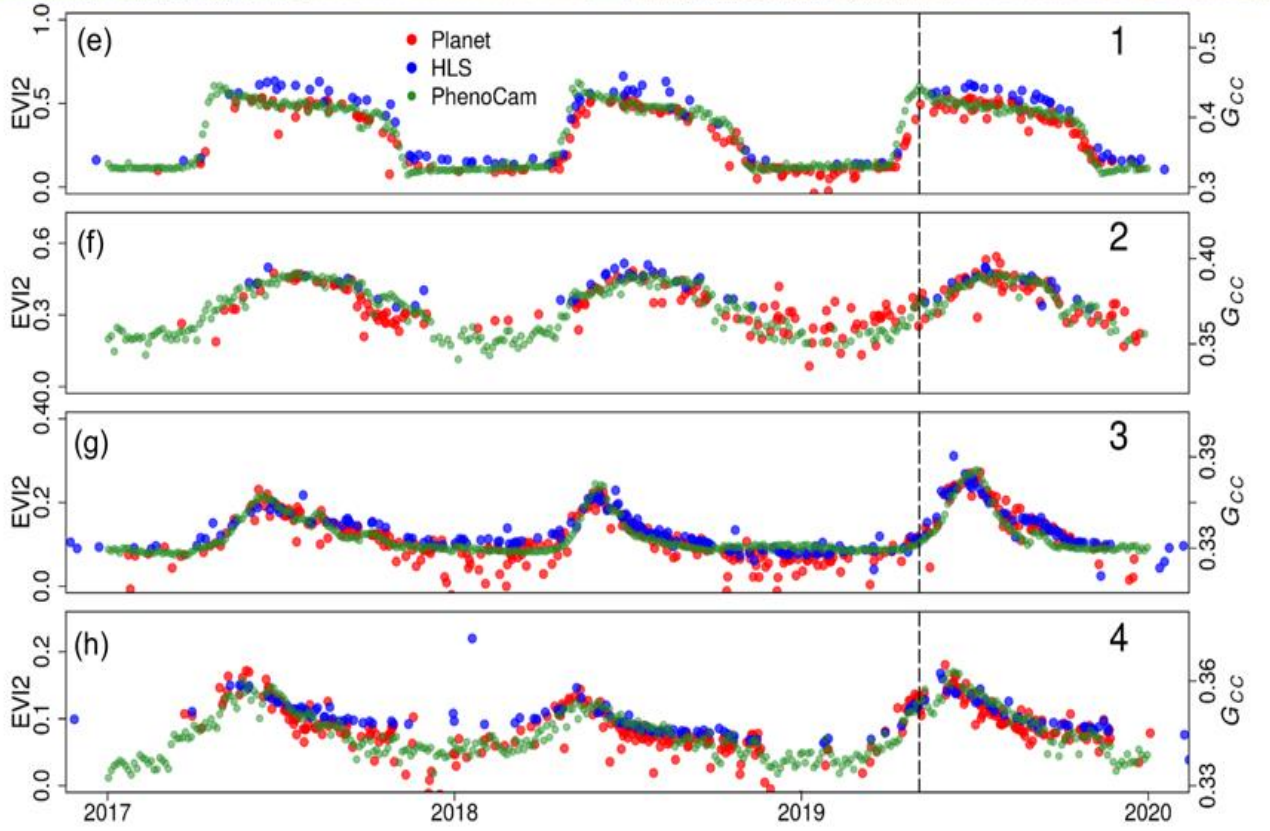

Mid-Greendown

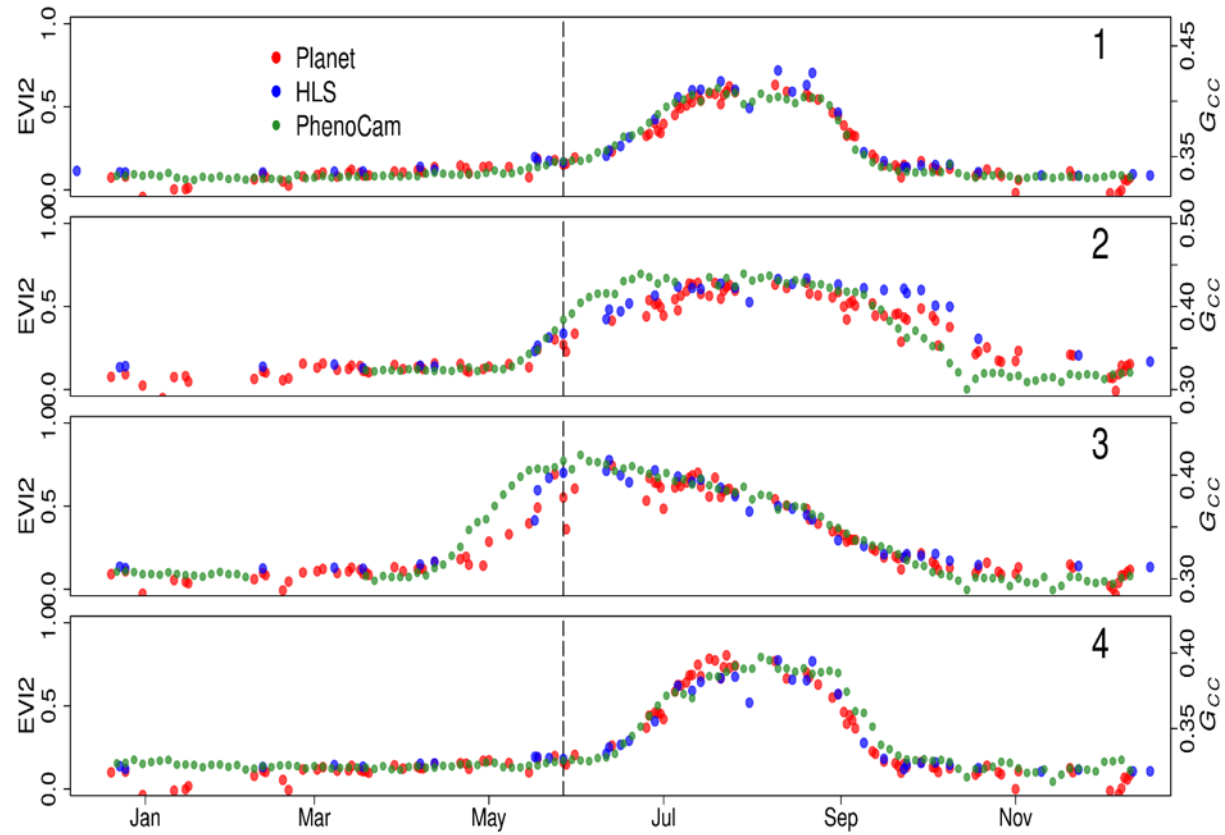
*Model assessment in Harvard Forest from 1990 to 2019. Weighted regression based on uncertainty. MAD: mean absolute deviance*



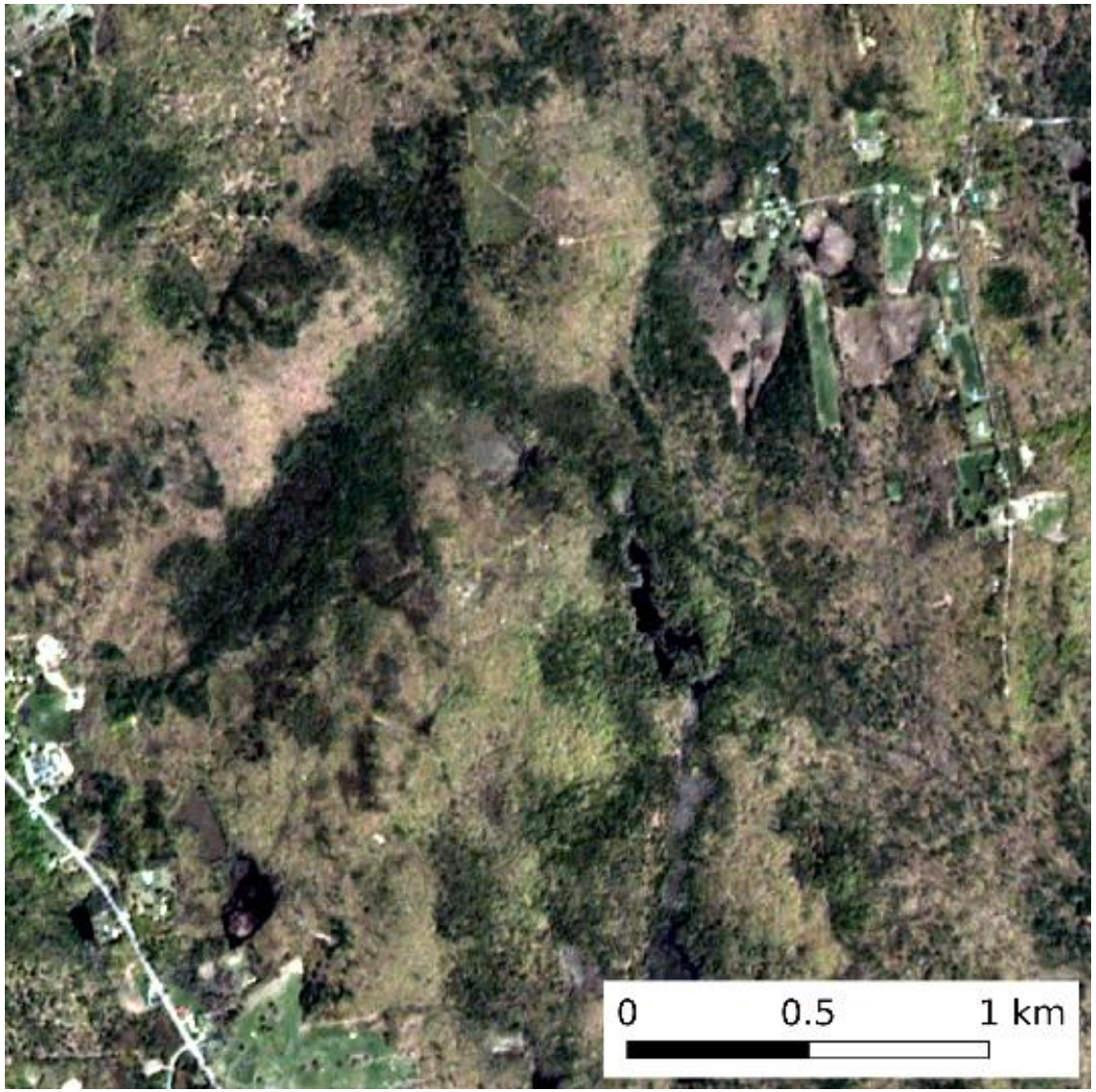
# Ongoing Work: (4) Evaluation vs Planet (Moon)

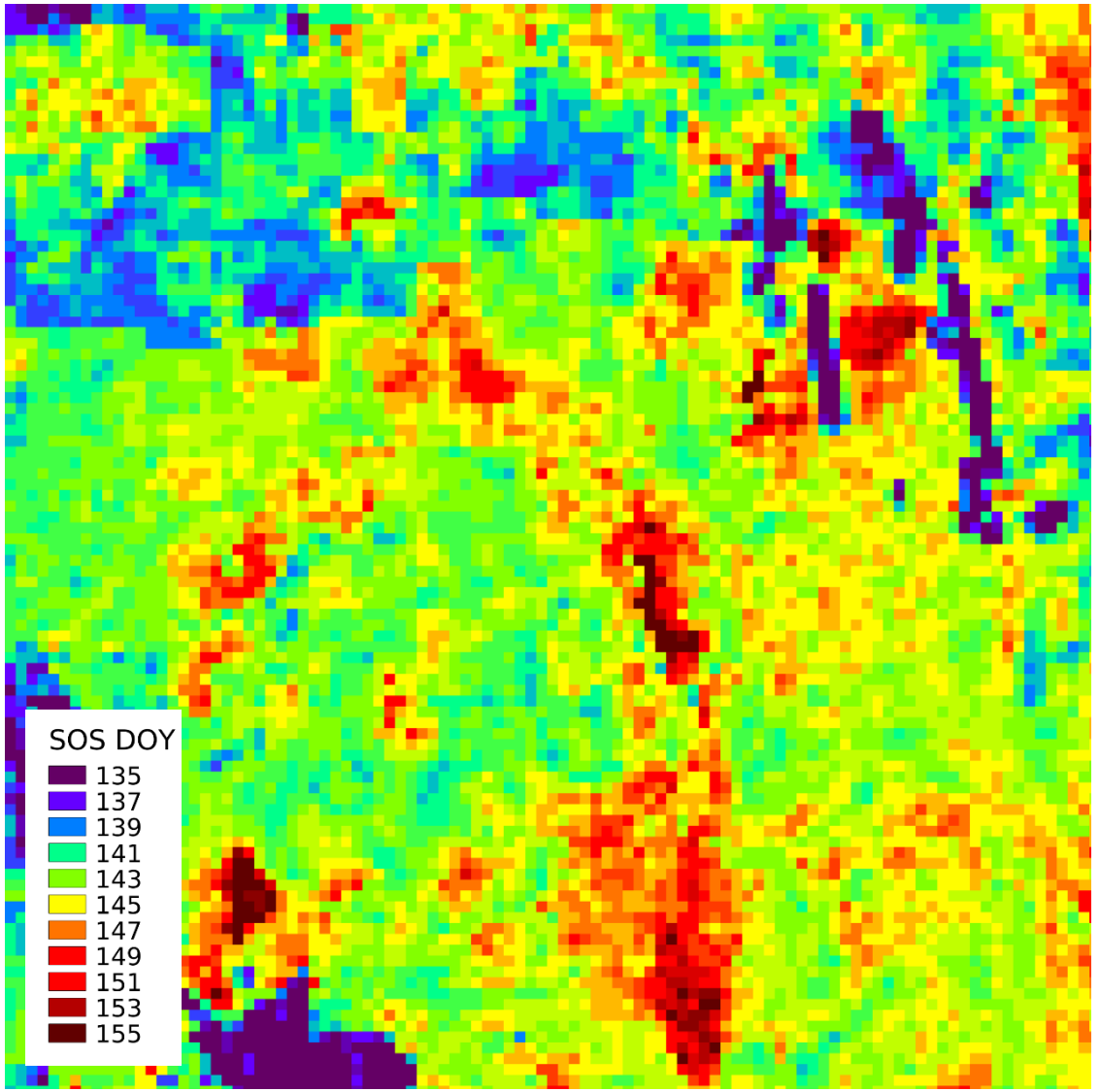




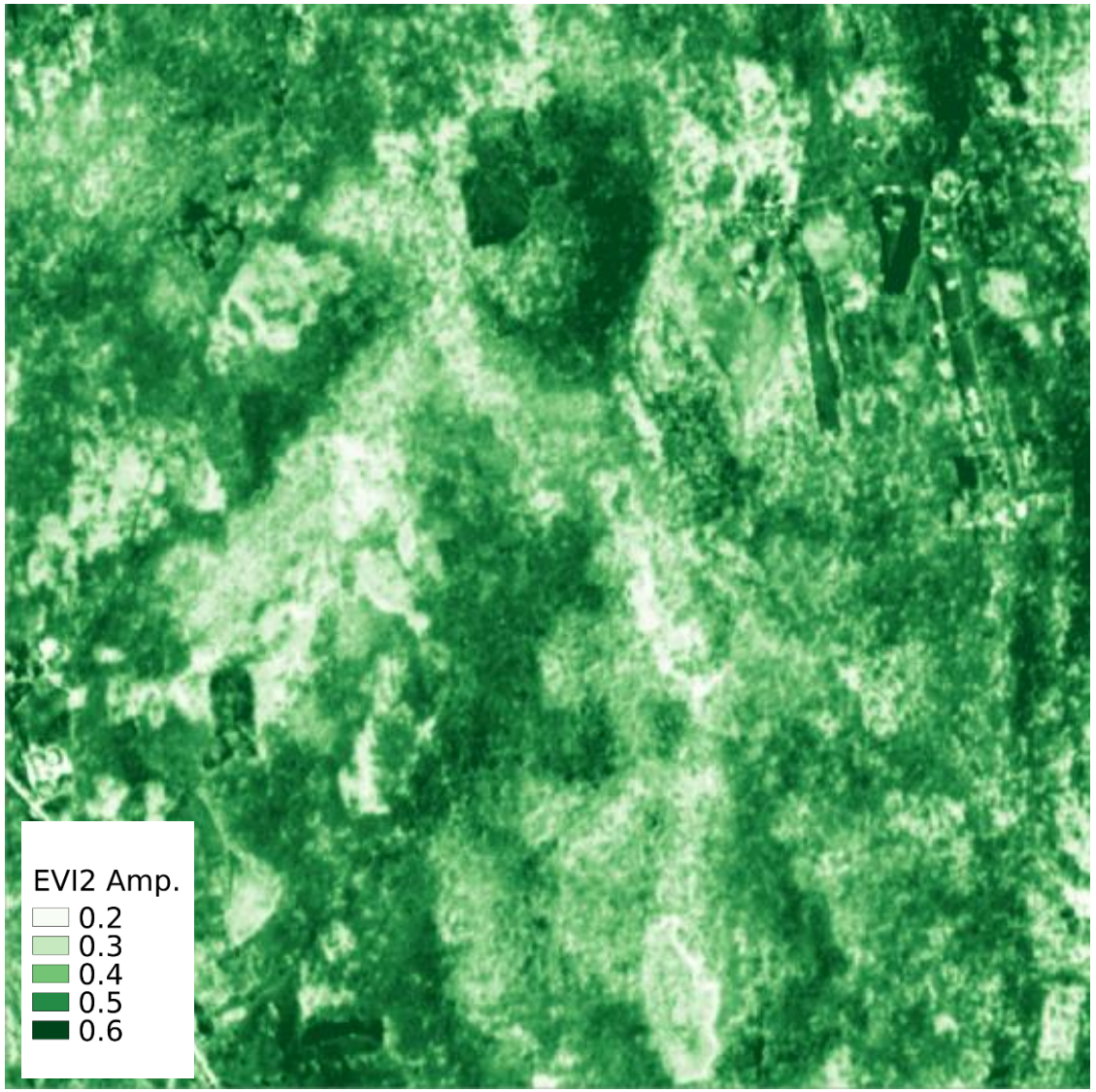



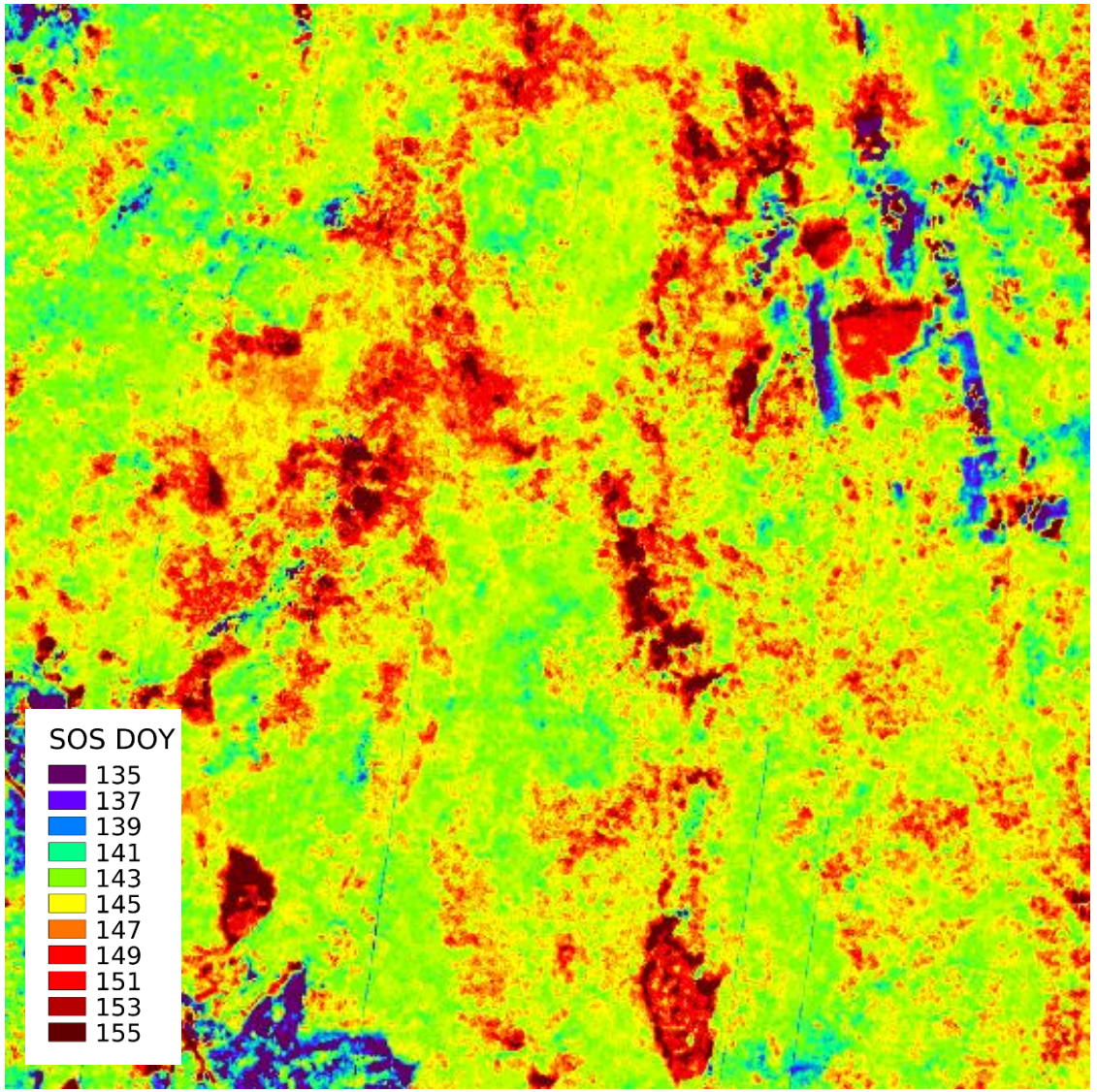
# Planet vs MS-LSP



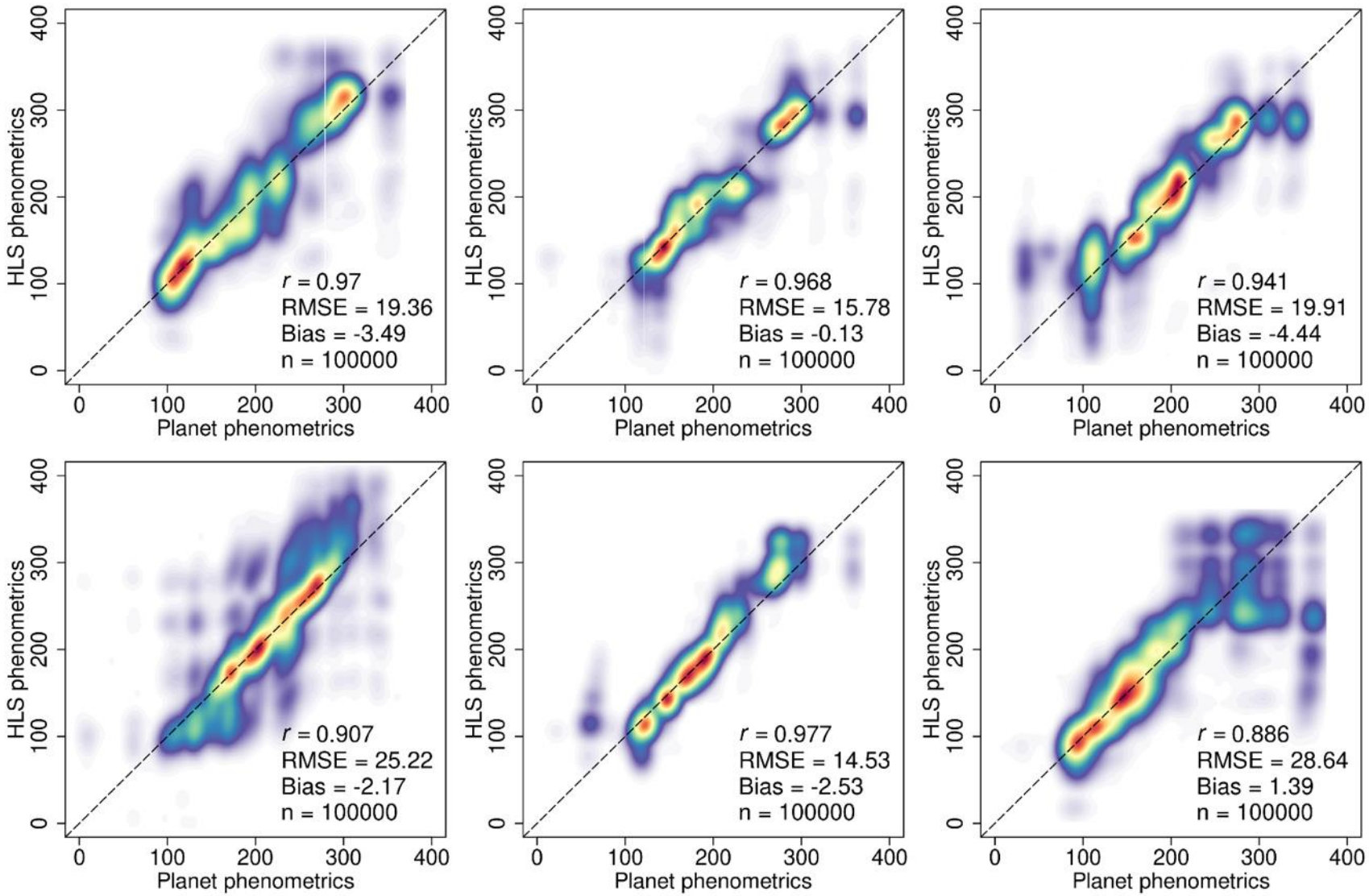



# Planet vs MS-LSP



# Ongoing Work : (4) Evaluation vs Planet



# Questions?

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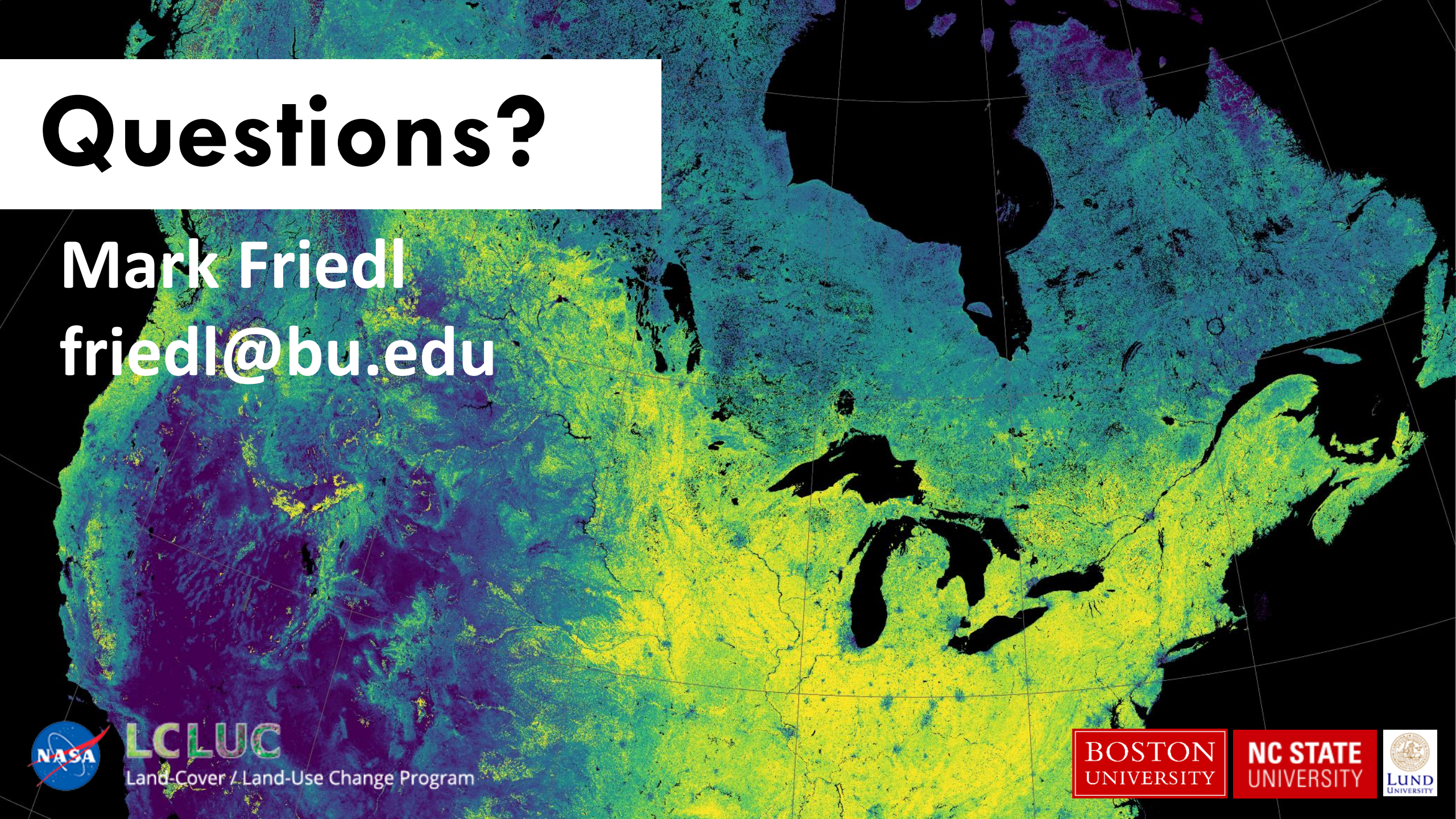

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