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

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• 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)*

**Description**

NASA’s Multi-Source Land Imaging (MuSLI) Land Surface Phenology (LSP) Yearly North America 30 meter (m) Version 1 product (MSLP30) 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. MSLP30 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 ecosystems and land-cover change modeling, monitoring the response of terrestrial ecosystems to climate variability and extreme events.
Ongoing Work: (1) In Season Anomalies
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**Corn**

- 2018
- 2019
- 50% threshold dates

**Soy**

- 2018
- 2019
- 50% threshold dates
Ongoing Work: (1) In Season Anomalies
Ongoing Work: (1) In Season Anomalies
Ongoing Work: (2) Synthetic Imagery

15% Greenup

90% Greenup

SWIR  NIR  Red

SWIR  NIR  Red
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.

Ongoing Work: (4) Evaluation vs Planet (Moon)
Planet vs MS-LSP
Ongoing Work: (4) Evaluation vs Planet

- **Correlation Coefficient ($r$):**
  - HLS phenometrics vs Planet phenometrics:
    - 0.97
    - 0.968
    - 0.941
    - 0.907
    - 0.977
    - 0.886

- **Root Mean Square Error (RMSE):**
  - 19.36
  - 15.78
  - 19.91
  - 25.22
  - 14.53
  - 28.64

- **Bias:**
  - -3.49
  - -0.13
  - -4.44
  - -2.17
  - -2.53
  - 1.39

- **Sample Size ($n$):**
  - 100000
Questions?

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