

An Update on NASA's Harmonized Landsat and Sentinel-2 (HLS) Project

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NASA-IMPACT



AGU 2024, Washington D.C.

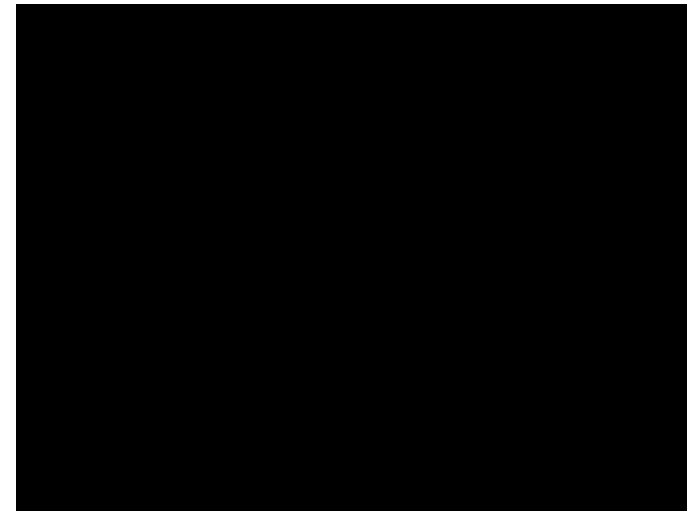
12-09-2024

Outline

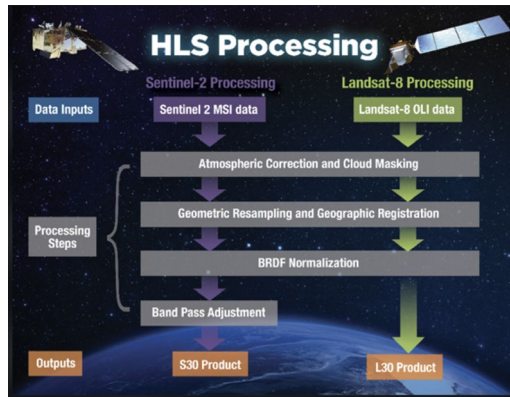
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- 4 HLS-derived Global Composites
- 5 Other Notable Updates
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Overview of HLS Project

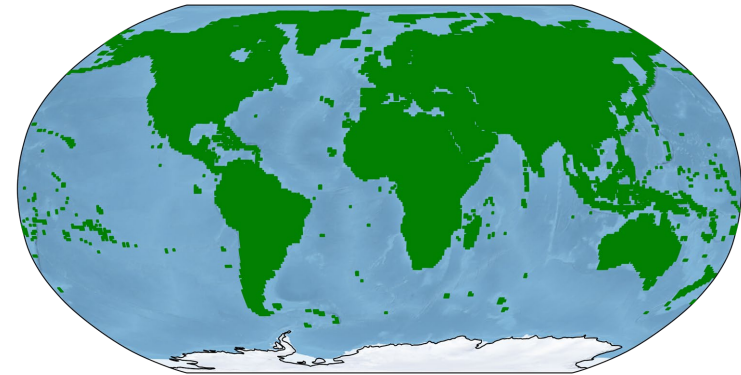
- Generate 30m global surface reflectance products from Landsat 8/9 and Sentinel-2A/2B to be used interchangeably for land surface monitoring.
- Latency: 2 - 3 days
- Cloud-based data production and distribution
- HL30: April 2013 - present
- HLSS30: Nov. 2015 - present



Credit: NASA SVS



HLS processing workflow



HLS "global" coverage

Overview

HLS-VI

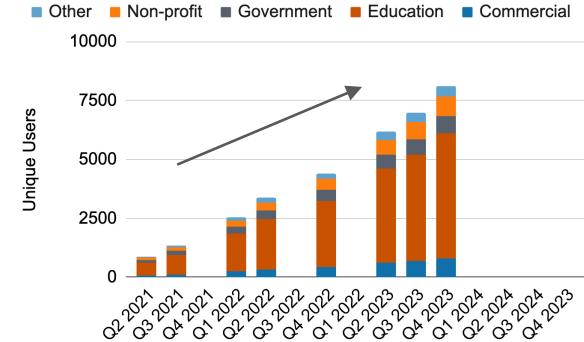
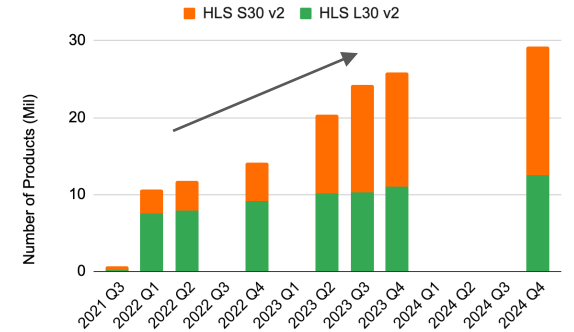
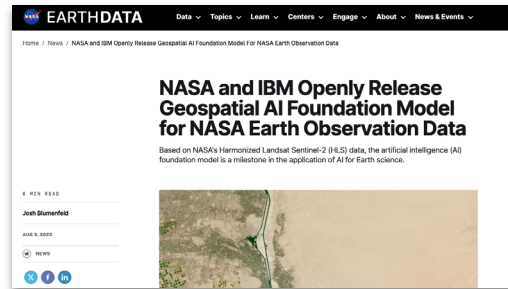
HLS-LL

HLS Composites

Other Updates

Success of HLS

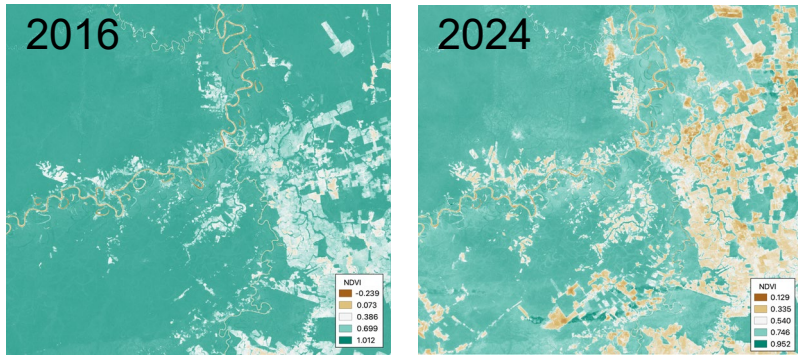
- HLS archive
 - Approx. 30 Million Products
 - Approx. 6 PB
- Supporting AI Innovations in Earth Science
 - Training data for NASA/IBM open source geospatial AI foundation model
- Downstream products (SNWG C2 solutions)
 - OPERA Land Surface Change Detection (DIST)
 - OPERA Global surface water extent (DSWx)



Source: LPDAAC, NASA EDS

HLS-derived Vegetation Indices

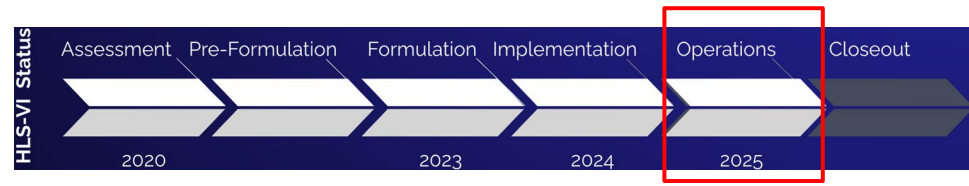
- Satellite Needs Working Group **Cycle 3** solution
- HLS-VI suite contains nine commonly used indices
- Forward data production expected in Q1 FY25
- Products available for direct download from LPDAAC
- Historical production planned for FY25



NDVI change in Western Brazil

HLS-derived Vegetation Indices and Common Uses

Index	Potential Application or Use
Normalized Difference Vegetation Index (NDVI)	Vegetation density, plant health
Enhanced Vegetation Index (EVI)	Corrects NDVI for atmospheric conditions/background noise
Soil-Adjusted Vegetation Index (SAVI)	Corrects NDVI for soil-brightness
Modified Soil-Adjusted Vegetation Index (MSAVI)	Minimizes the effect of bare soil on SAVI
Normalized Difference Moisture Index (NDMI)	Vegetation water content
Normalized Difference Water Index (NDWI)	Surface water bodies and change in water content, vegetation water content
Normalized Burn Ratio (NBR)	Burn areas, burn severity
Normalized Burn Ratio 2 (NBR2)	Modifies NBR to highlight vegetation water sensitivity
Triangular Vegetation Index (TVI)	Chlorophyll content, leaf area index (LAI)



Credit: SNWG MO

Overview

HLS-VI

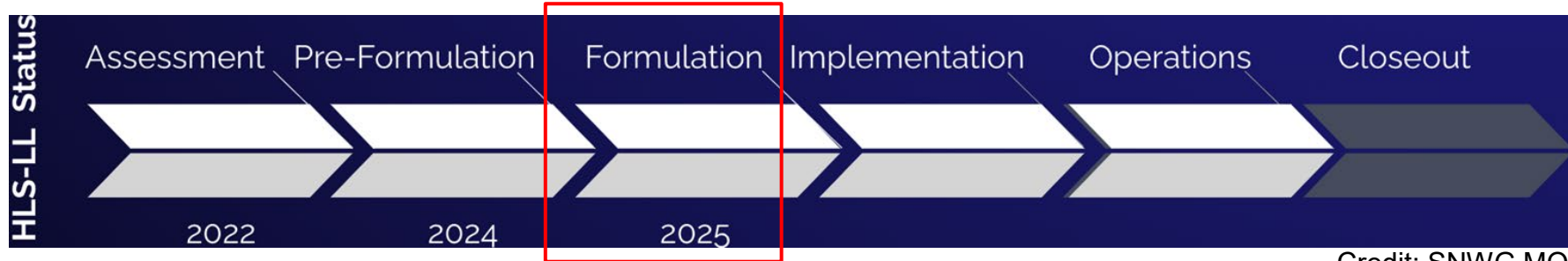
HLS-LL

HLS Composites

Other Updates

Low Latency HLS Product

- SNWG **Cycle 4** solution
- Generate HLS products with target latency of **6 hours or less**
- HLS-LL will partially meet the needs of agencies whose high-priority observables include disasters, forest damage, wildfires etc.
- Currently in formulation phase
- Expected to go into implementation phase in FY 25



Credit: SNWG MO

Overview

HLS-VI

HLS-LL

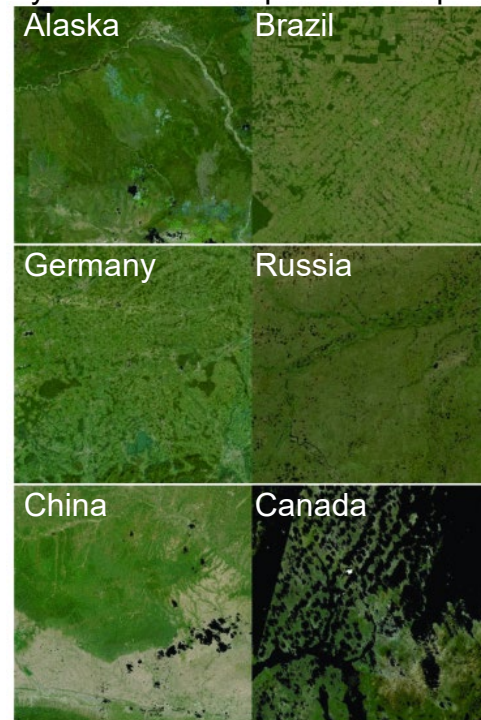
HLS Composites

Other Updates

HLS-derived Global Composites

- Pilot study in progress
 - Considers seven common spectral bands within HLS granule
 - Select observations with the greatest EVI for compositing
- Compositing period TBD
- Composites to be made freely available in NASA's Visualization, Exploration, and Data Analysis (VEDA) platform
- Composite products expected in FY 25
- More details in AGU24 Poster: *B11G-1450 - A Pilot Study of 10-day Composites from the NASA Harmonized Landsat and Sentinel-2 Images for Terrestrial Monitoring - Dec 9, 08:30 - 12:20, Hall B-C (Poster Hall)*

10-day HLS RGB composite examples

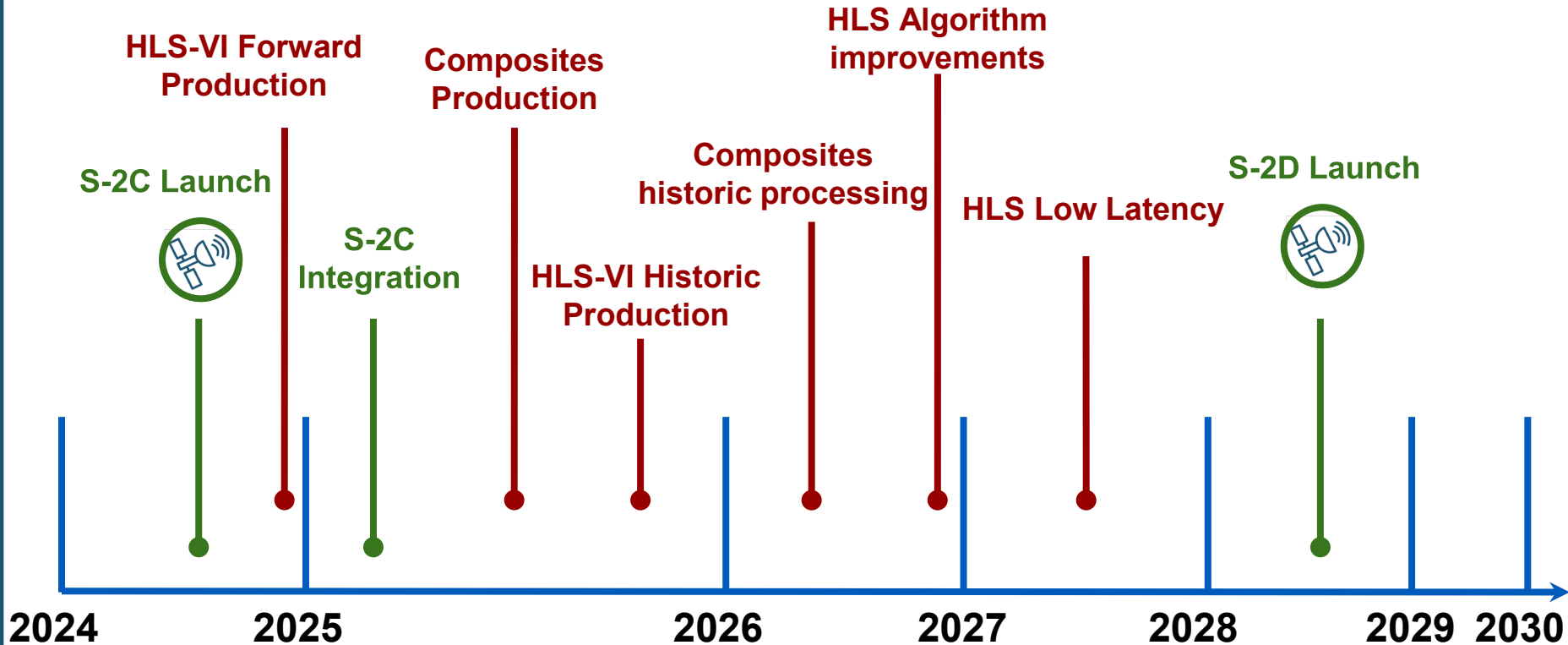


Ju et al., IEEE IGARSS 2024

Other Notable Updates

- HLS data production transitioned from MODIS-based to VIIRS-based auxiliary data products for performing atmospheric correction
- HLS journal article on version 2 products "*The Harmonized Landsat and Sentinel-2 Version 2.0 surface reflectance dataset*" currently in review
 - Investigates HLS algorithm improvements and assesses the harmonization efficacy on globally distributed L30/S30 image pairs
- HLS data availability on Google Earth Engine (GEE) Platform
 - HLS L30 available
 - HLS S30 ingestion in progress, expected in 2025

Tentative Timeline of Upcoming Milestones

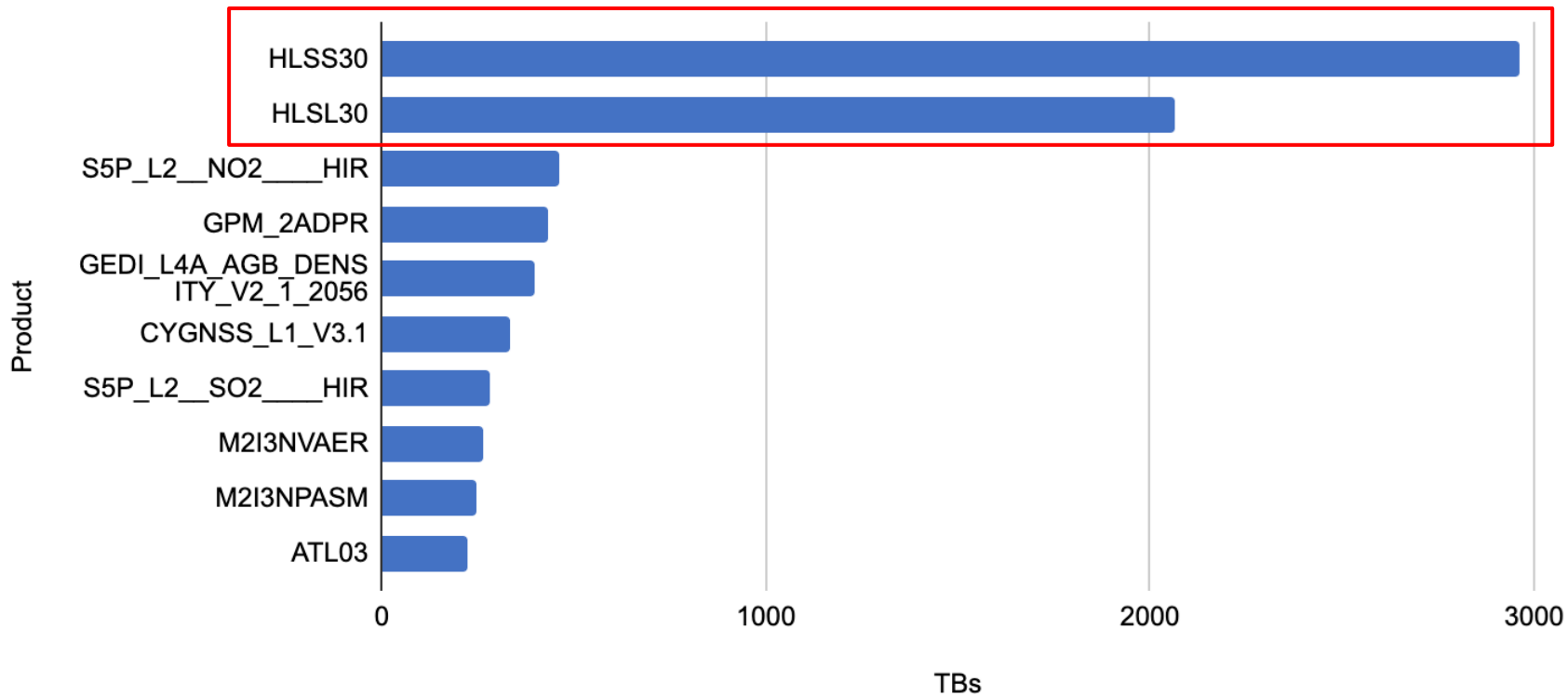


HLS at AGU24

- **B14A-06** - *An Update on NASA's Harmonized Landsat and Sentinel-2 (HLS) Project* - Dec 9, 16:50 - 17:00, 150 B (Convention Center)
- **B11G-1450** - *A Pilot Study of 10-day Composites from the NASA Harmonized Landsat and Sentinel-2 Images for Terrestrial Monitoring* - Dec 9, 08:30 - 12:20, Hall B-C (Poster Hall)
- **B11G-1453** - *Global Assessment of Consistency and Uncertainty in Vegetation Indices from NASA's Harmonized Landsat and Sentinel-2 Project* - Dec 9, 08:30 - 12:20 07:30 - 11:20 CST, Hall B-C (Poster Hall)
- **Upcoming:**
 - **TH43A** - *The Virtuous Cycle: User-Driven Remote Sensing Solutions for Decision-Making Through the Satellite Needs Working Group* - **Dec 12, 12:30 - 13:30, Salon C**

Thank you!

FY23 Distributed Volume (TB) - Top Ten Products



HLS Archive per MGRS tile (2013 - 2023)

