Maximizing Earth Science Observations With Data Harmonization: Harmonized Landsat/Sentinel-2

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What is HLS?

- What is "harmonized"?
    - Using data from two similar instruments and constructing an algorithm so products from each instrument can be used interchangeably
- Initiative to produce a virtual constellation of surface reflectance data from Landsat 8 OLI and Sentinel-2 MSI
    - Spectral similarities of L8 and S2 allow for harmonization
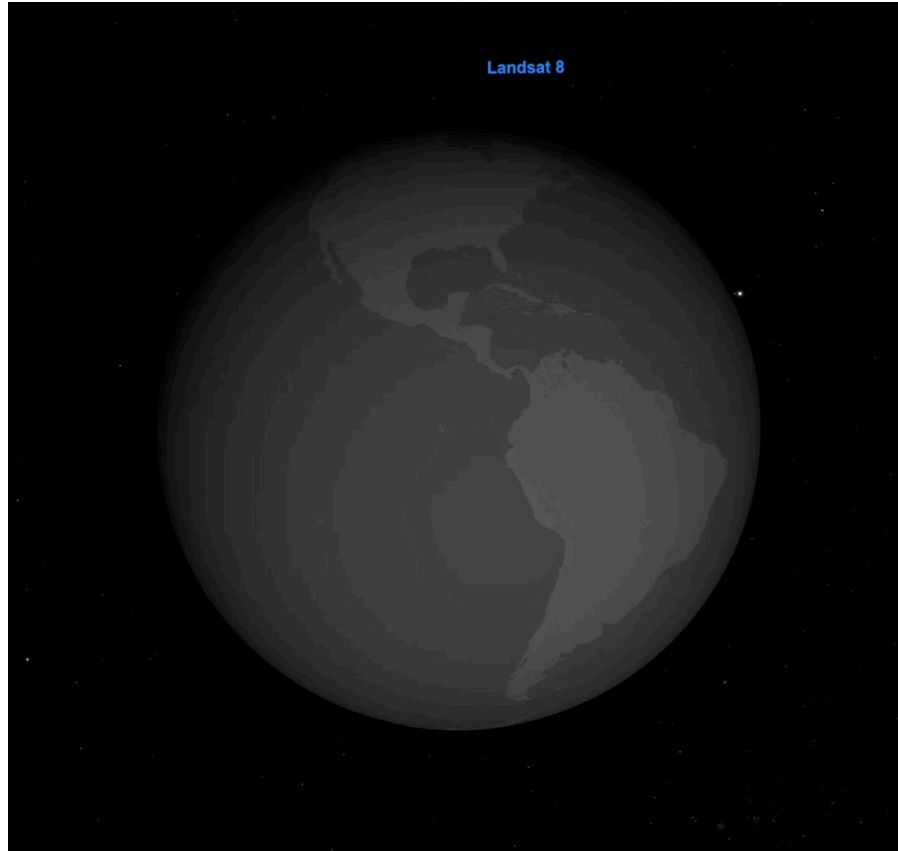

Sentinel-2   photo credit: ESA

Landsat 8   photo credit: NASA

HLS Constellation Overview (courtesy: NASA SVS)

HLS Overview

- Harmonizing Sentinel-2A/B and Landsat 8/9 data streams provides analysis ready data with **2-4 day global coverage at 30m resolution**

- Access to input data products a coordinated effort between NASA, ESA, and USGS

- Data production and distribution fully contained within the cloud
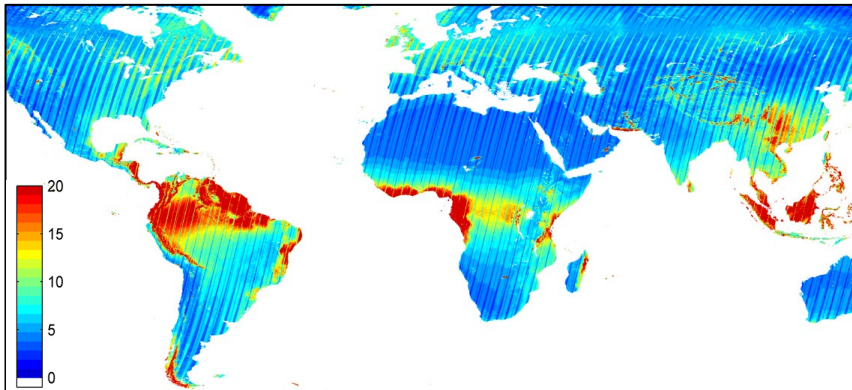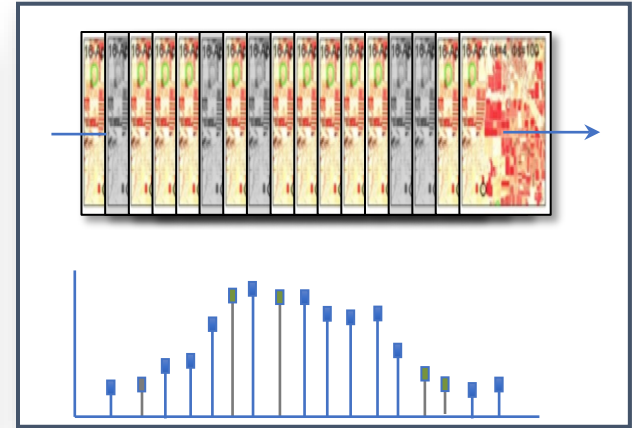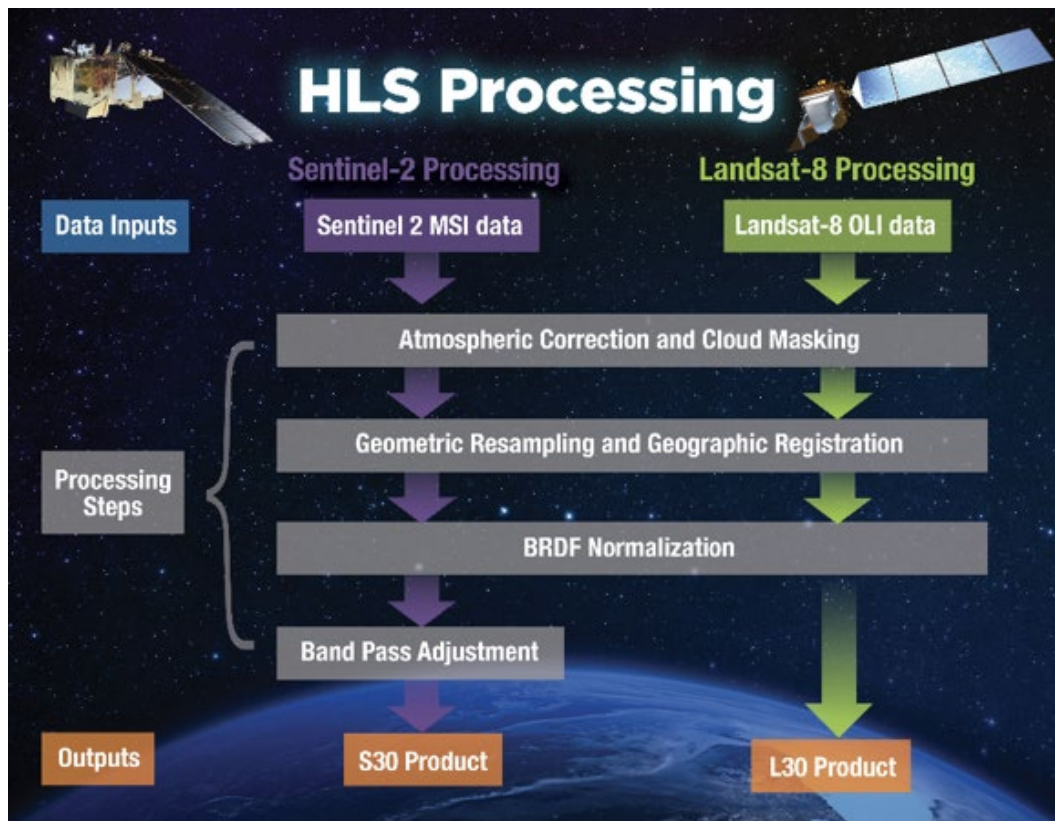

Potential Cloud free revisit using different Virtual Constellations
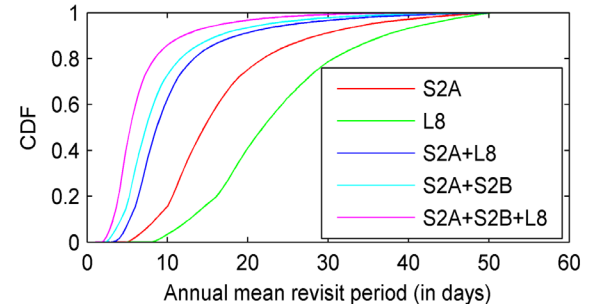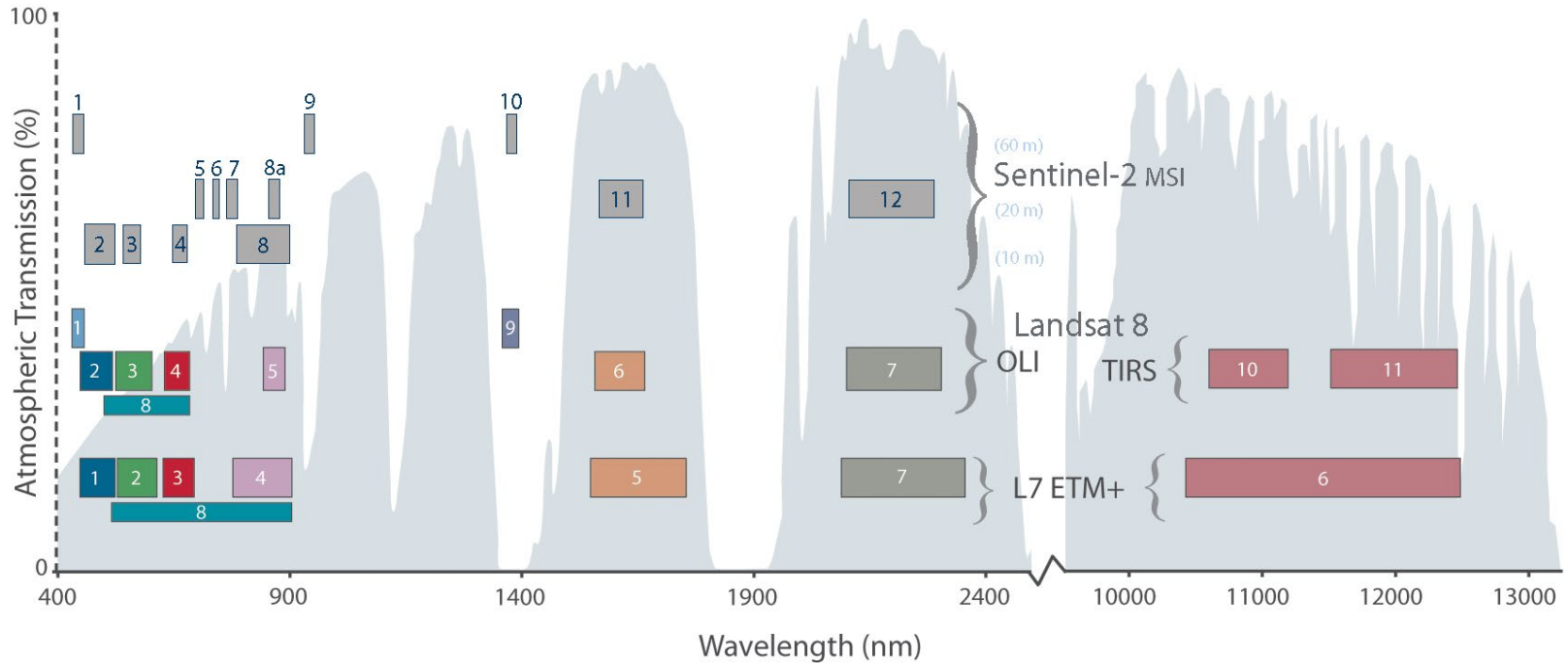
"Global" HLS Coverage Area

HLS Algorithm Workflow

Band Pass Adjustment

Comparison of Landsat 7 and 8 bands with Sentinel-2

photo credit: USGS

Current Status of Data Production

- HLSL30 and HLSS30 version 2.0 data products released on 24 August 2021 at stage 1 validation
  - Historical HLSL30 processing completed in early April
  - Historical HLSS30 planned for completion in late-2022
  - Landsat 9 integrated into HLSL30 on May 17

Dataset Statistics

	HLSL30	HLSS30
Current data start date	11-Apr-2013	29-Sep-2020
Number of granules	~7.8M	~3.5M
Average daily files	2350	5860
Average daily volume (TB)	0.75	1.9

Dataset Characteristics
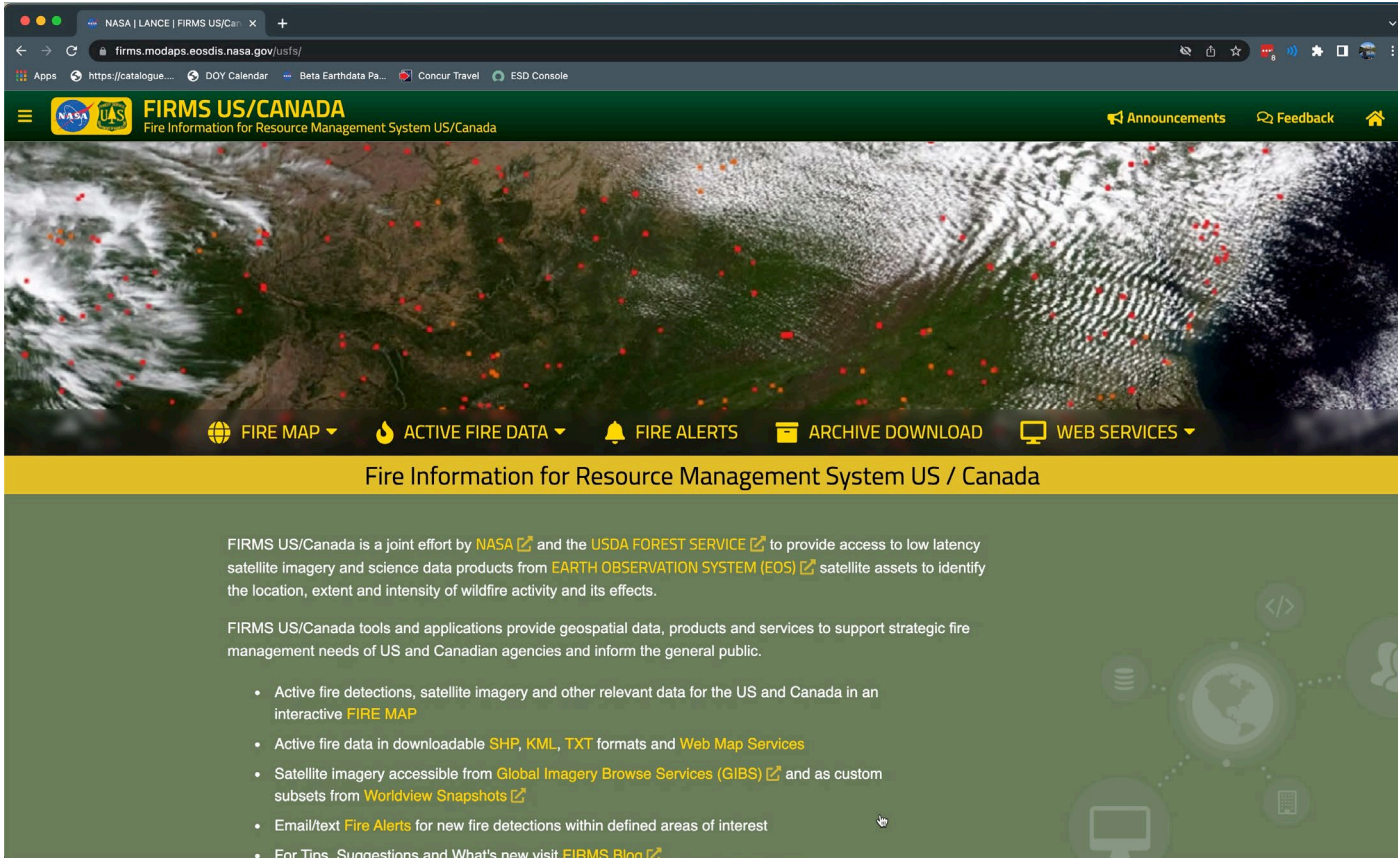
- Resolution: 30 m
- Latency: 2-3 days
- Data Format: Cloud-optimized GeoTIFF
- Granule Structure:
  - 13 single band data files
  - 4 angle bands
  - 1 QA band, 1 browse image
- Data Distributor: LP DAAC

Oct 01, 2020
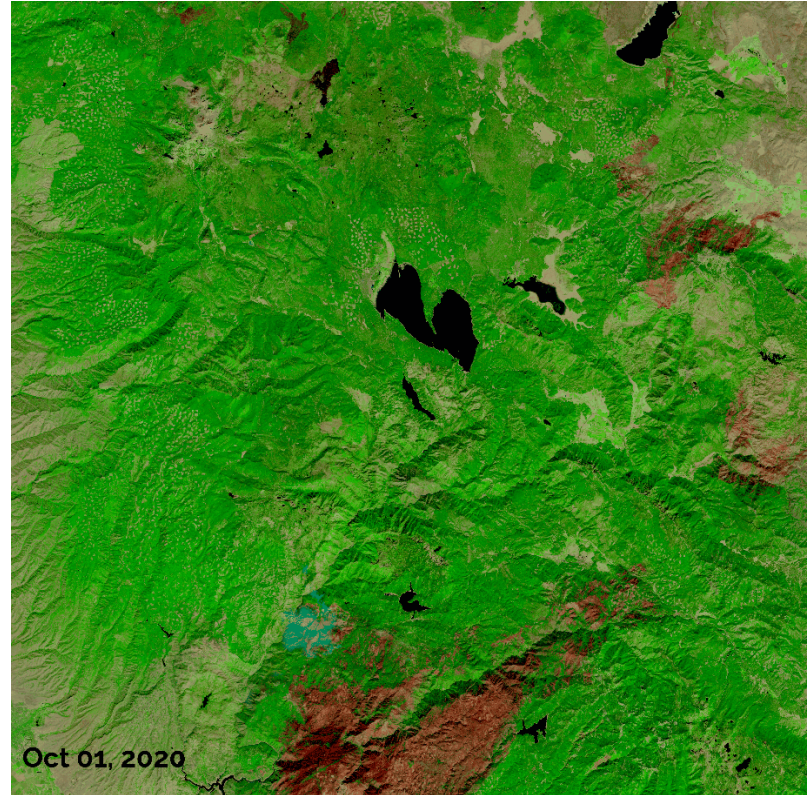
HLS Science Applications

Active Fires

Snow Extent

Agriculture

Inland Flooding

Urban Monitoring
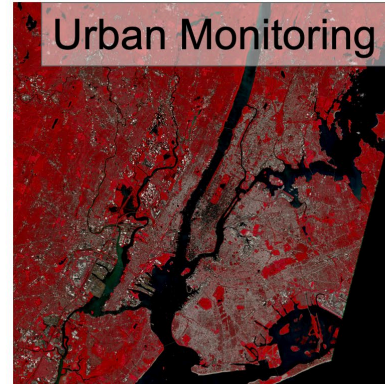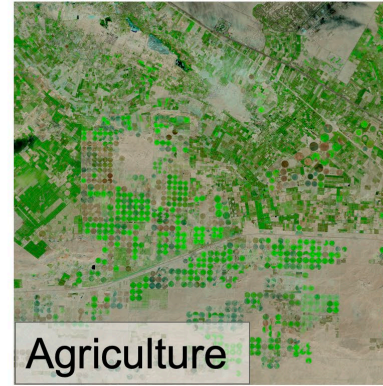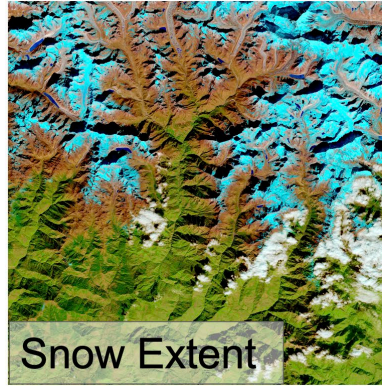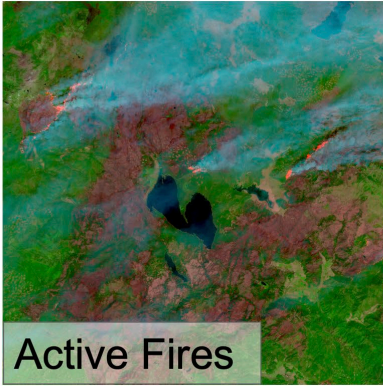
HLS capabilities in FIRMS

Next Steps

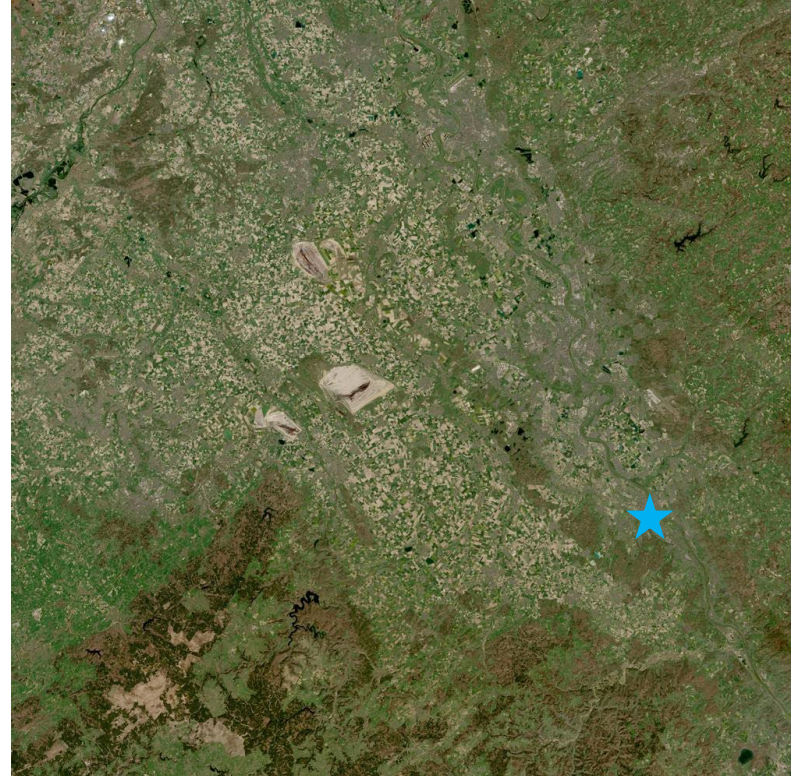- Integration of HLS products into surface water extent and surface deformation and change products (planned for ~2025)
- Update atmospheric correction to use VIIRS as MODIS reaches end of life
- Algorithm enhancements and improvements
- Explore development and distribution of add-on HLS products
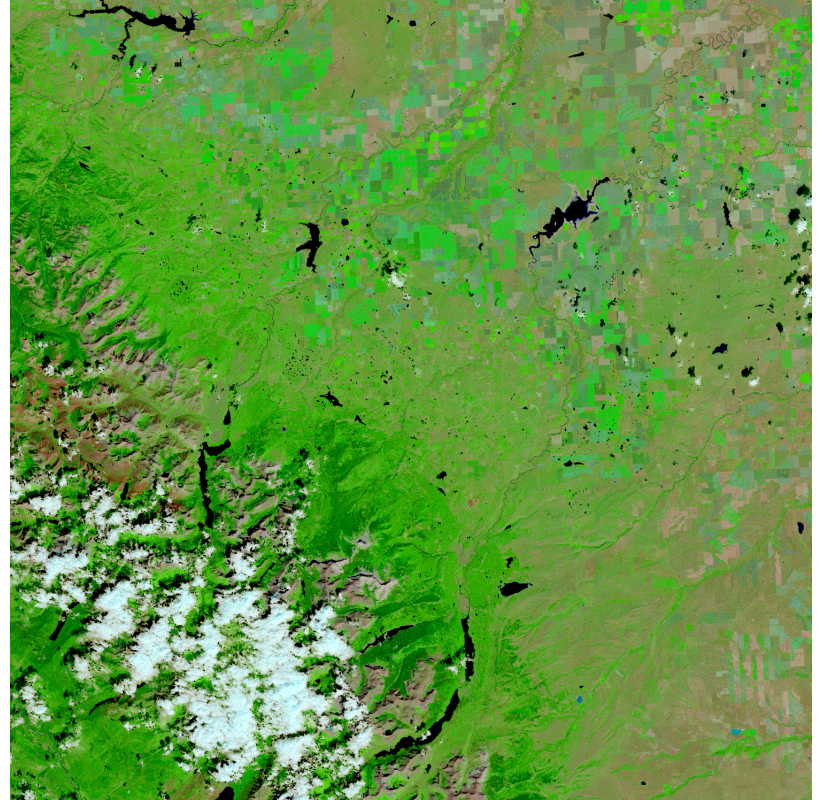
Concluding Remarks

- HLS continues to serve as a pilot for cloud-based data production, distribution, and visualization for NASA
- Cloud-optimized data format allows for dynamic band combinations and calculation on HLS scenes
- Collaboration with external partners (USGS, ESA) is crucial to success of HLS

Thank you.