



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

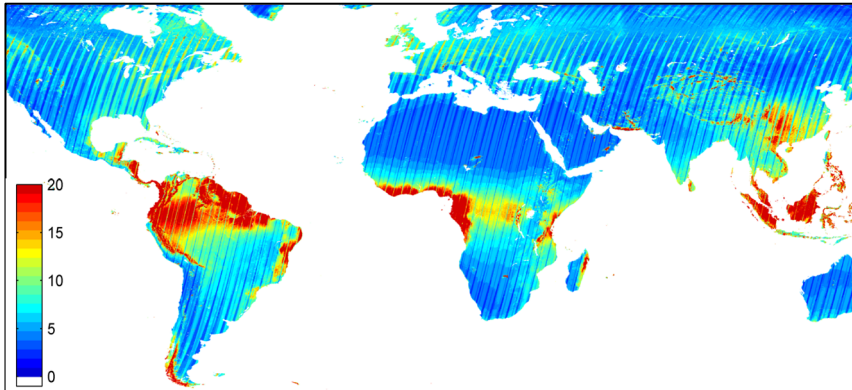
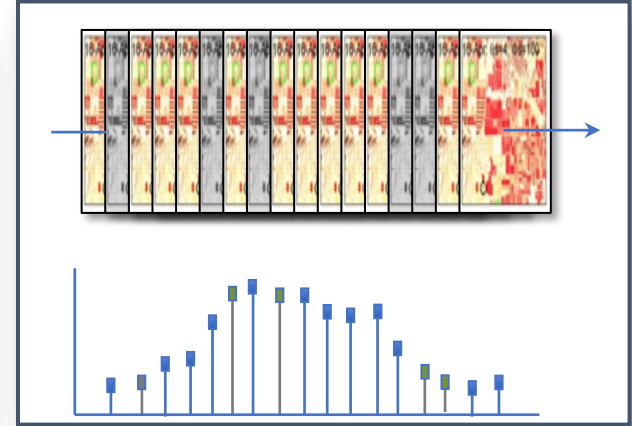
photo credit: NASA

HLS Constellation Overview (courtesy: NASA SVS)

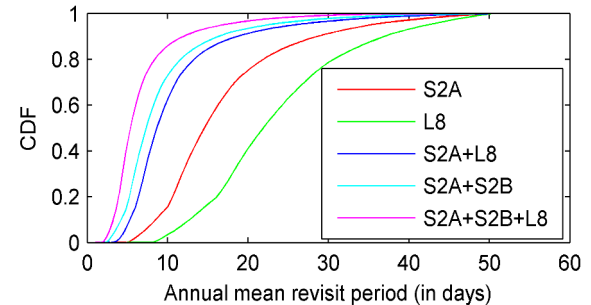


HLS Overview

- Merging Sentinel-2 and Landsat data streams can provide **2-4 day global coverage**
- Goal is “seamless” near-daily 30m surface reflectance record including atmospheric corrections, spectral and BRDF adjustments, regridding
- Project initiated as collaboration among NASA GSFC, UMD, NASA Ames



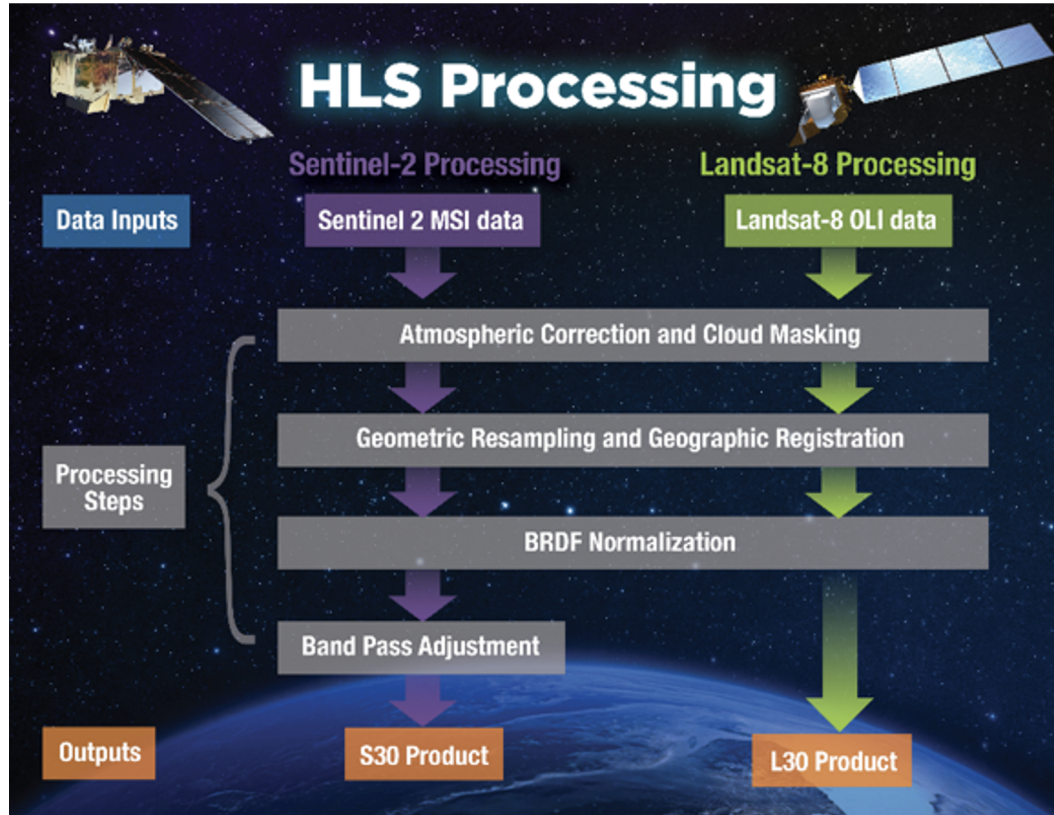
Potential Revisit using different Virtual Constellations



“Global” HLS Coverage Area



HLS Algorithm Workflow



Band Pass Adjustment

Comparison of Landsat 7 and 8 bands with Sentinel-2

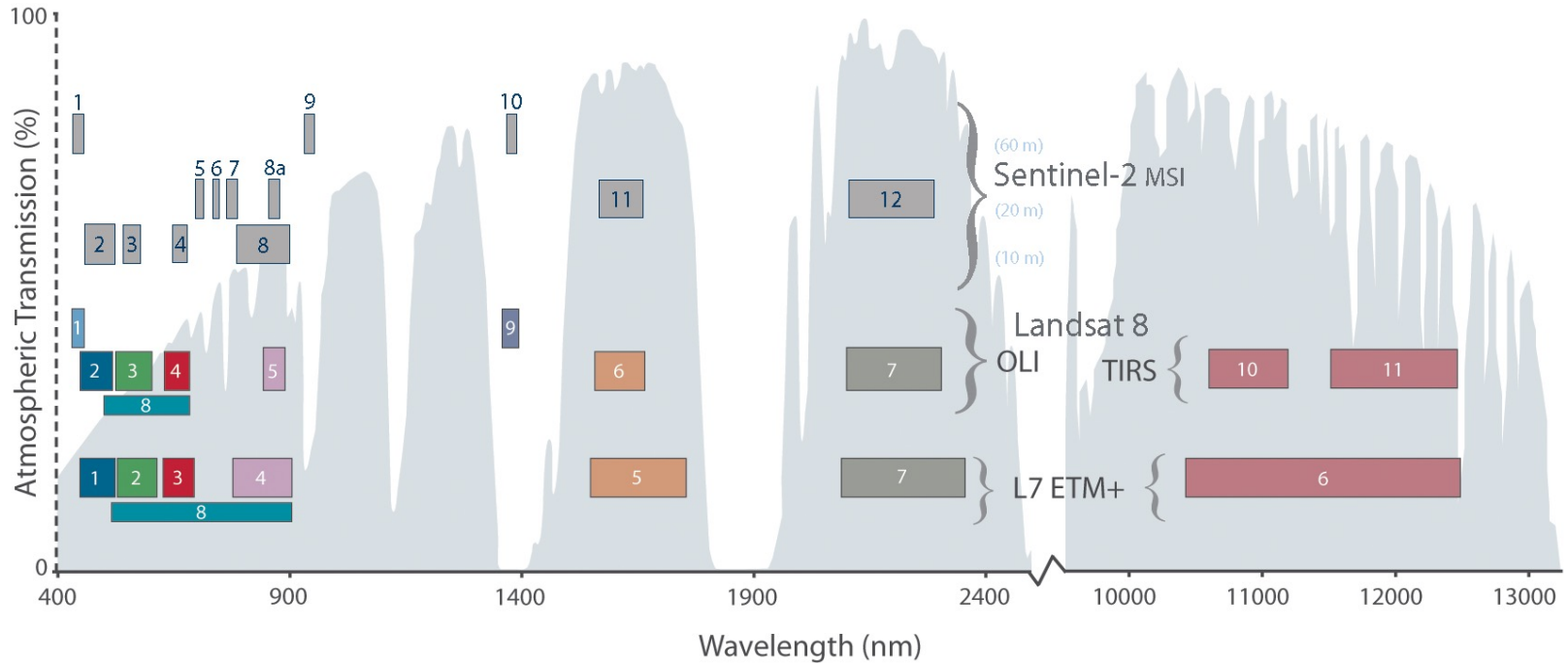
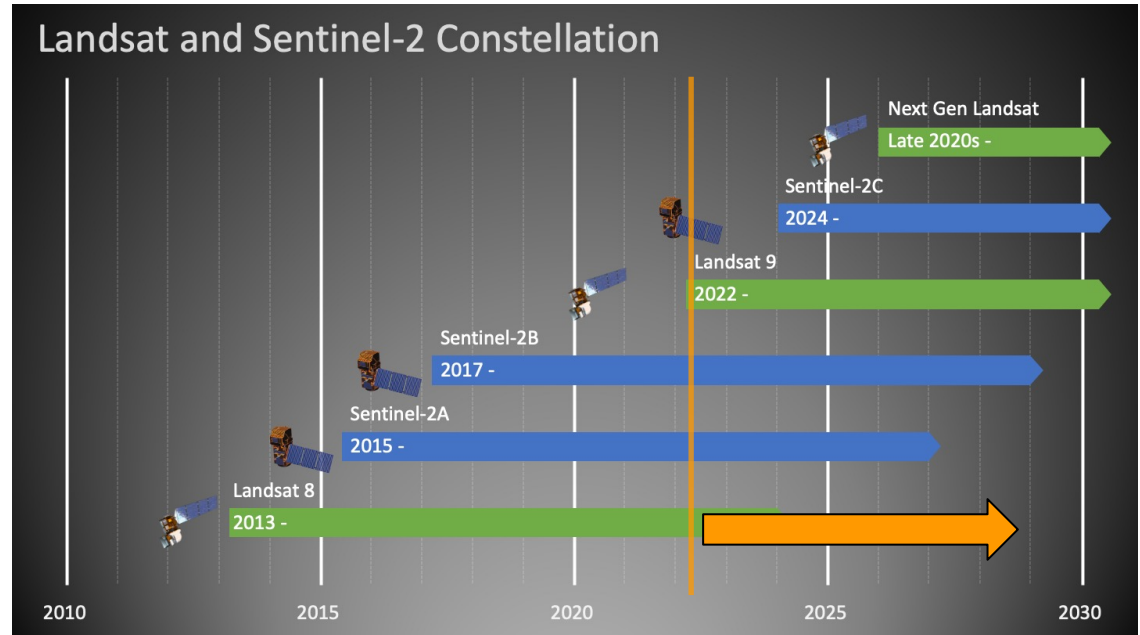


photo credit: USGS

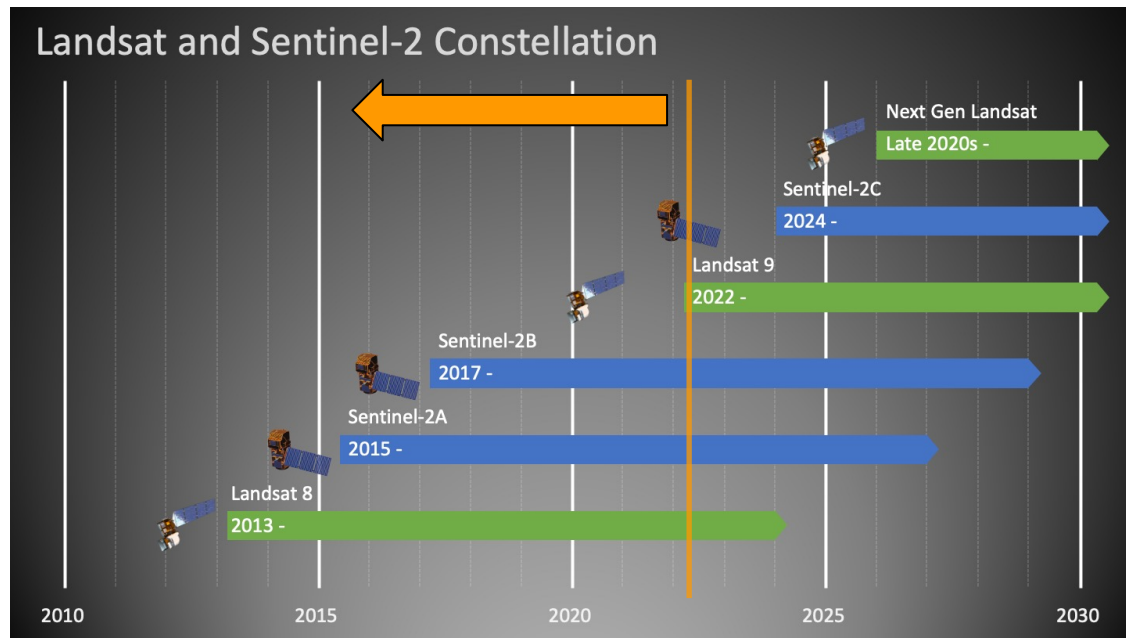
Forward HLS processing

- Data Sources
 - L30 generated using Landsat 8/9 Collection 2 from USGS
 - S30 generated using Sentinel-2 data from ESA International Hub
- HLS data products available with 2-3 days latency
 - Dependent upon availability of ancillary data for atmospheric correction



Historical HLS processing

- Historical HLSL30 processing completed in April 2022
 - Dataset extends from April 11, 2013 – present
- Historical HLSS30 processing ongoing
 - Data currently available from Sep. 29, 2020 - present
 - HLSS30 archive start date: Nov 28, 2015
 - Full archive should be available in late-2022



Current Status of Data Production

- [HL30](#) and [HLSS30](#) version 2.0 data products released on 24 August 2021 at stage 1 validation
- Data products available via [Earthdata Search](#) and browse imagery available in [NASA Worldview](#)



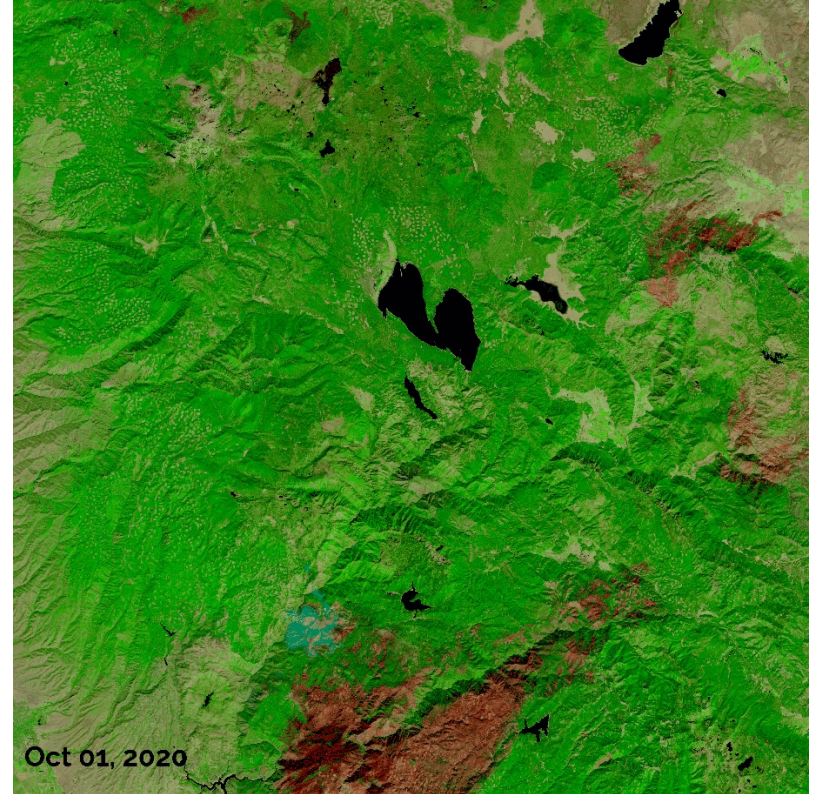
Dataset Statistics

	HLSSL30	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

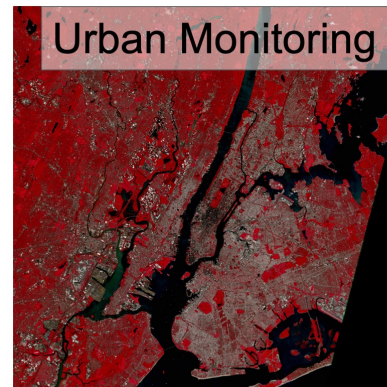
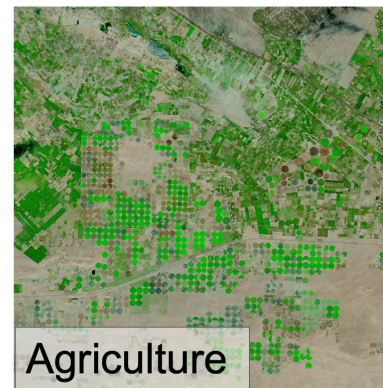
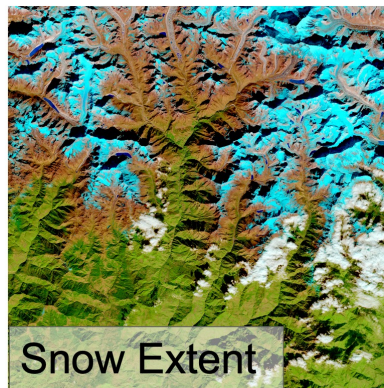
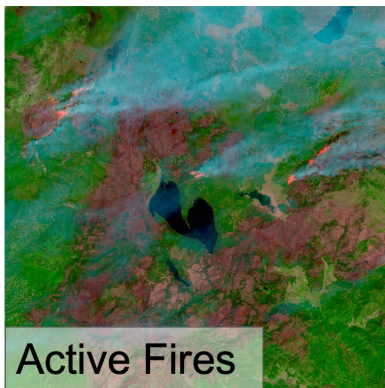


Dataset Characteristics

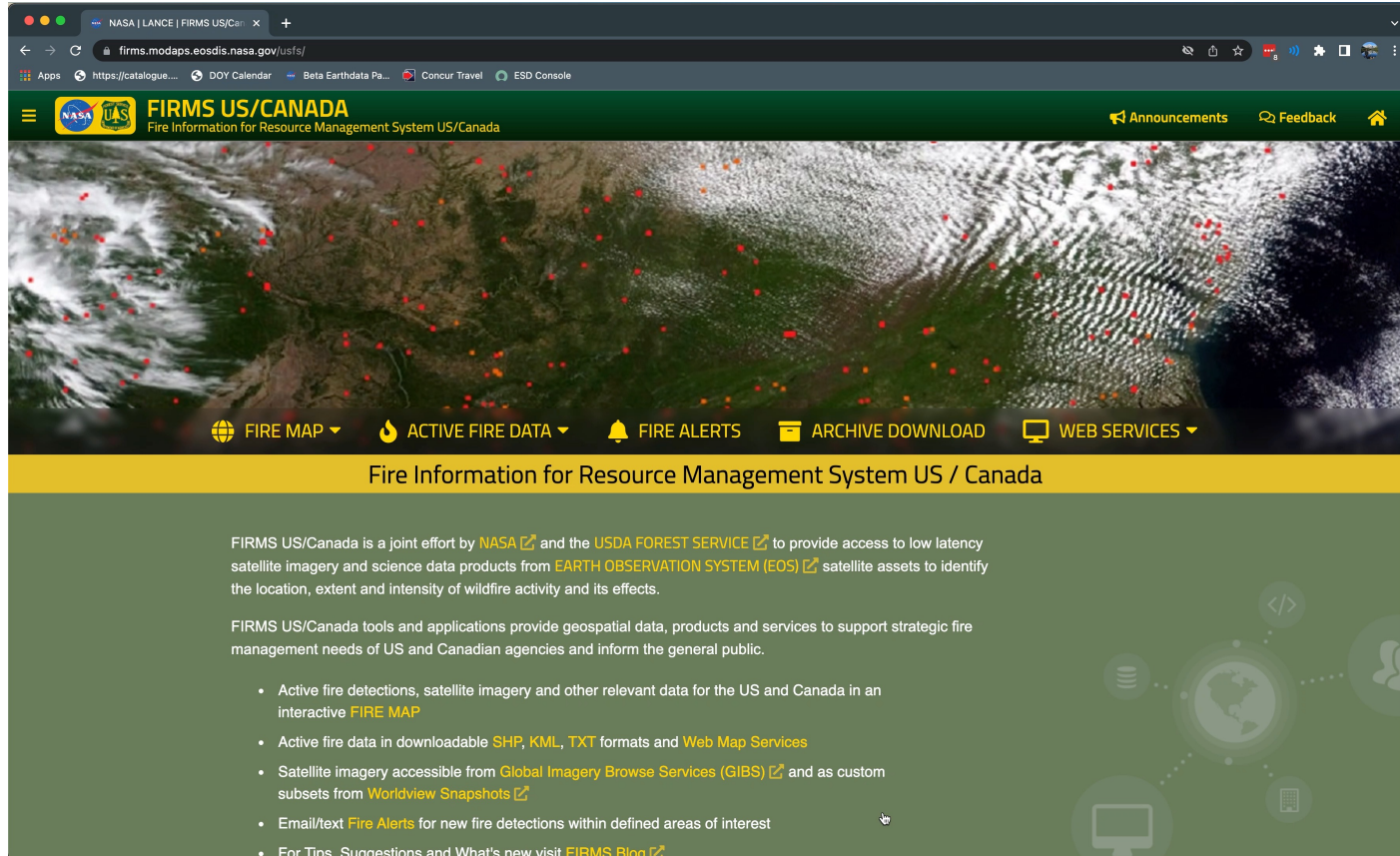
- Resolution: 30 m
- Latency: 2-4 days – dependent upon MODIS data for AC
- Data Format: Cloud-optimized GeoTIFF
- Granule Structure:
 - 13 single band data files
 - 4 angle bands
 - 1 QA band, 1 browse image
- Data Distributor: LP DAAC



HLS Science Applications



HLS capabilities in FIRMS



The screenshot shows the FIRMS US/CANADA website interface. At the top, there's a navigation bar with the NASA and USFS logos, the text "FIRMS US/CANADA", and the subtitle "Fire Information for Resource Management System US/Canada". To the right of the navigation bar are links for "Announcements", "Feedback", and a home icon. Below the navigation bar is a large satellite map of North America with numerous red dots indicating fire locations. Below the map is a dark green navigation bar with icons and labels for "FIRE MAP", "ACTIVE FIRE DATA", "FIRE ALERTS", "ARCHIVE DOWNLOAD", and "WEB SERVICES". Below this is a yellow banner with the text "Fire Information for Resource Management System US / Canada". The main content area has a green background and contains the following text:

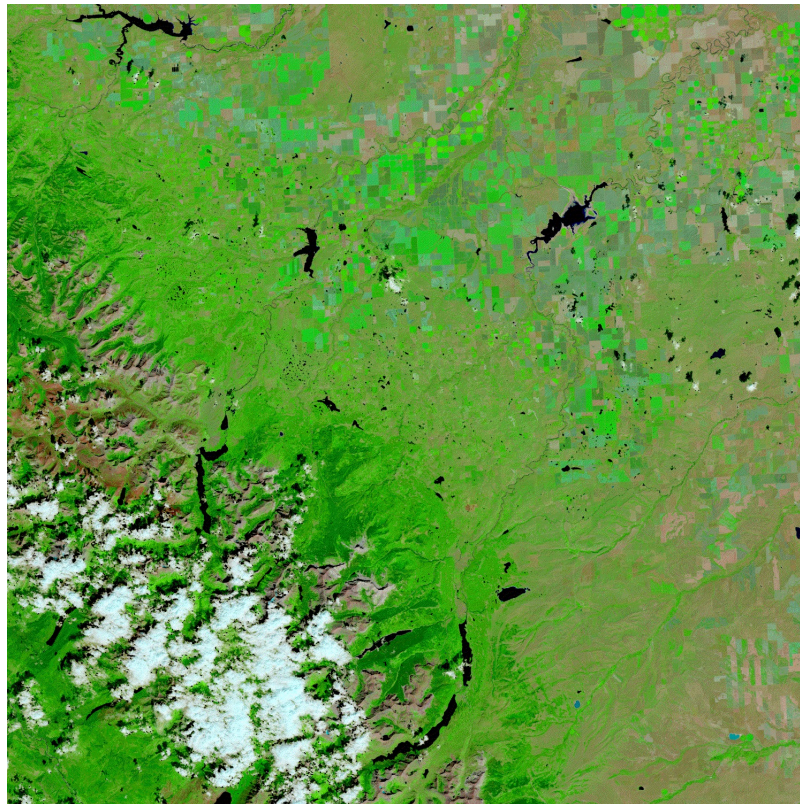
FIRMS US/Canada is a joint effort by [NASA](#) and the [USDA FOREST SERVICE](#) to provide access to low latency satellite imagery and science data products from [EARTH OBSERVATION SYSTEM \(EOS\)](#) satellite assets to identify the location, extent and intensity of wildfire activity and its effects.

FIRMS US/Canada tools and applications provide geospatial data, products and services to support strategic fire management needs of US and Canadian agencies and inform the general public.

- Active fire detections, satellite imagery and other relevant data for the US and Canada in an interactive [FIRE MAP](#)
- Active fire data in downloadable [SHP](#), [KML](#), [TXT](#) formats and [Web Map Services](#)
- Satellite imagery accessible from [Global Imagery Browse Services \(GIBS\)](#) and as custom subsets from [Worldview Snapshots](#)
- Email/text [Fire Alerts](#) for new fire detections within defined areas of interest
- For Tips, Suggestions and What's new visit [FIRMS Blog](#)

Concluding Remarks

- Completion of historical HLSS30 processing planned for late-2022
- Cloud-optimized data format allows for dynamic band combinations and calculation on HLS scenes
 - Pilot dataset for future NASA visualization and analysis clients
- Collaboration with external partners (USGS, ESA) has been crucial to success of HLS





Thank you.