

NOAA-USGS Land Product Characterization System

STAR JPSS Science Team Meeting
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Kevin Gallo: NESDIS/STAR
John Dwyer: USGS/EROS
Steve Foga: SGT/EROS
Calli Jenkerson: SGT/EROS
Ryan Longhenry: USGS/EROS
Greg Stensaas: USGS/EROS

Landsat 8



Land Product Characterization System (LPCS)

What is LPCS

Highlights/Status of LPCS

1. Inventory & Ordering
2. Analysis Tools

Path Forward

Summary

Land Product characterization System (LPCS)

What is LPCS

Highlights/Status of LPCS

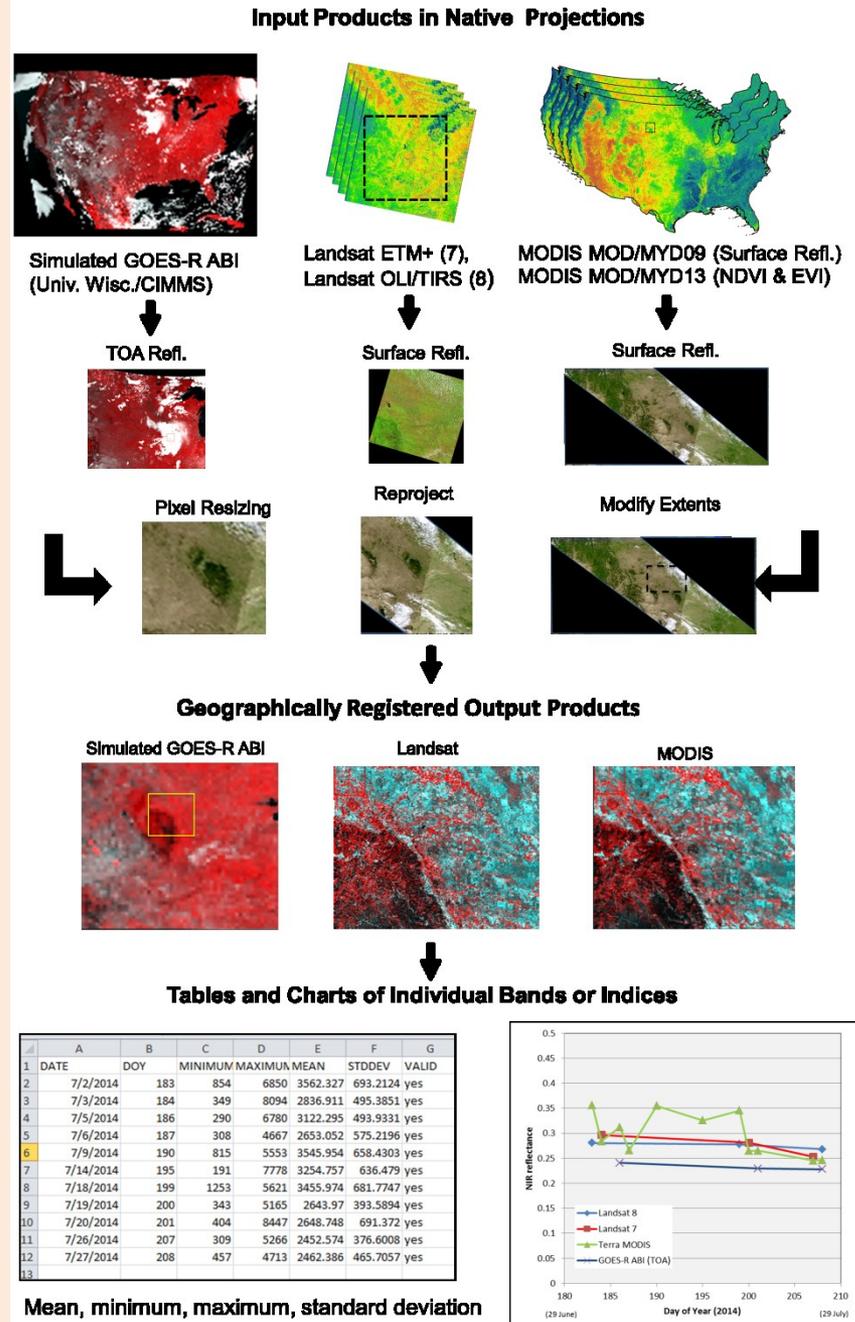
1. Inventory & Ordering
2. Analysis Tools

Path Forward

Summary

Land Product Characterization System

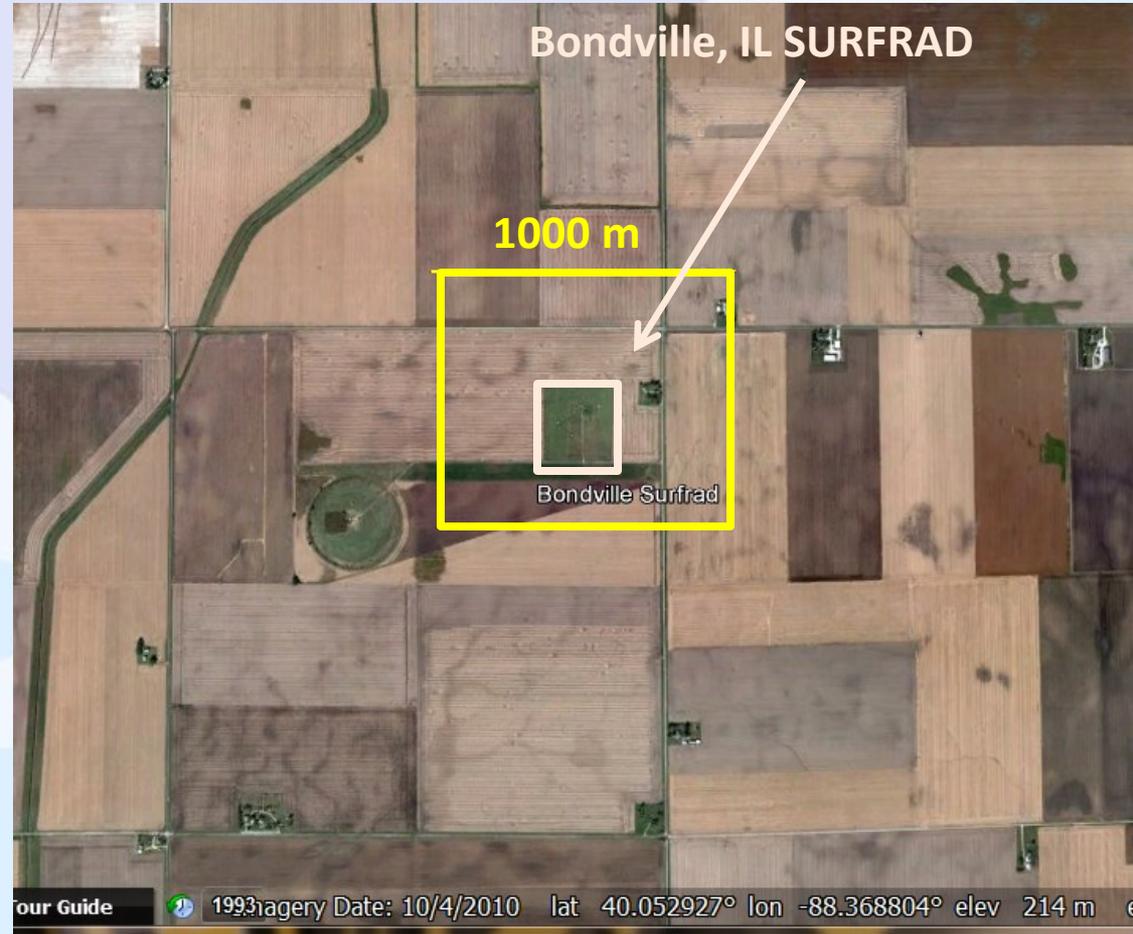
A web-based system designed to use moderate to high-resolution satellite data for characterization, and assist with validation, of GOES-R ABI and JPSS VIIRS products.



What is LPCS

A web-based system designed to use **moderate to high-resolution** satellite data for validation of GOES-R ABI and JPSS VIIRS products.

Bondville, IL SURFRAD



Bondville, IL SURFRAD

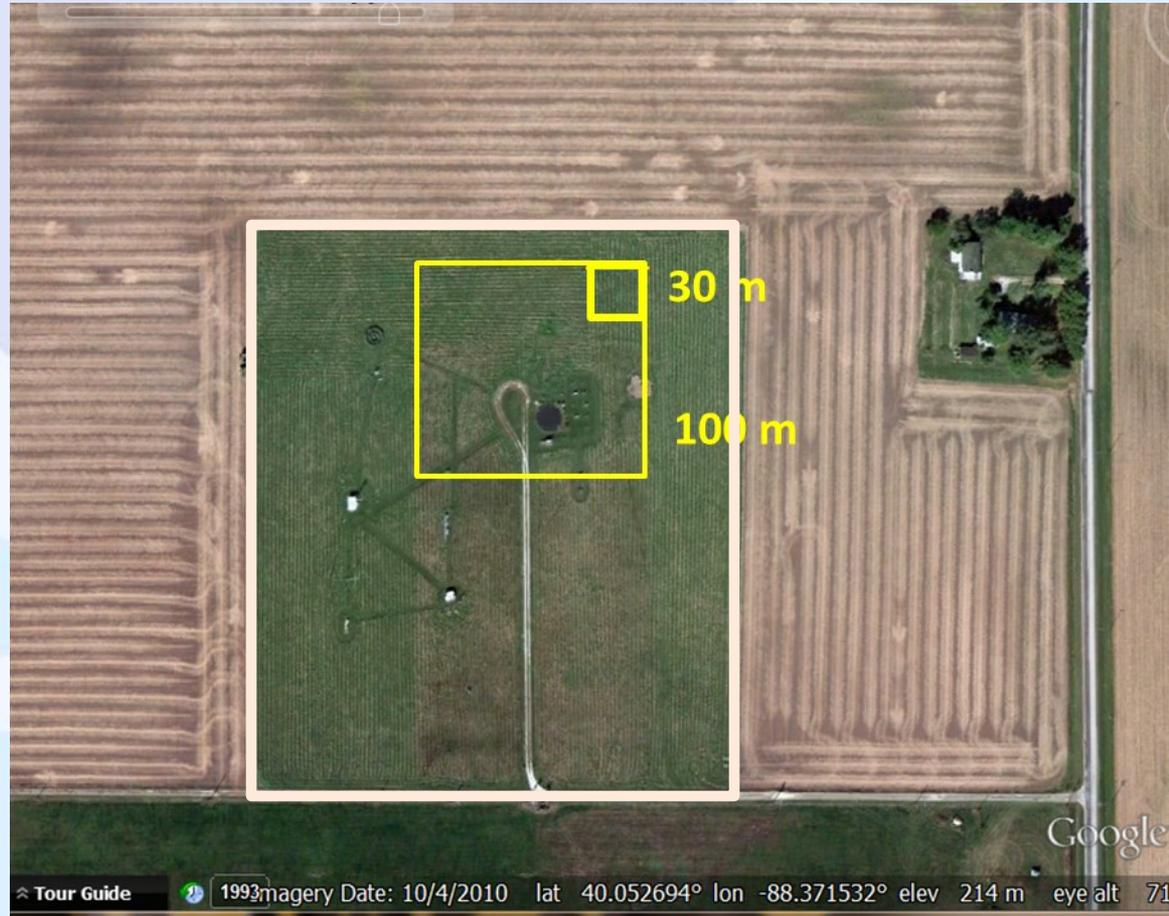
What is LPCS

1. General characteristics
2. Desired functionality

Landsat 8 spatial resolution

vis/near IR 30 m

Thermal IR 100 m



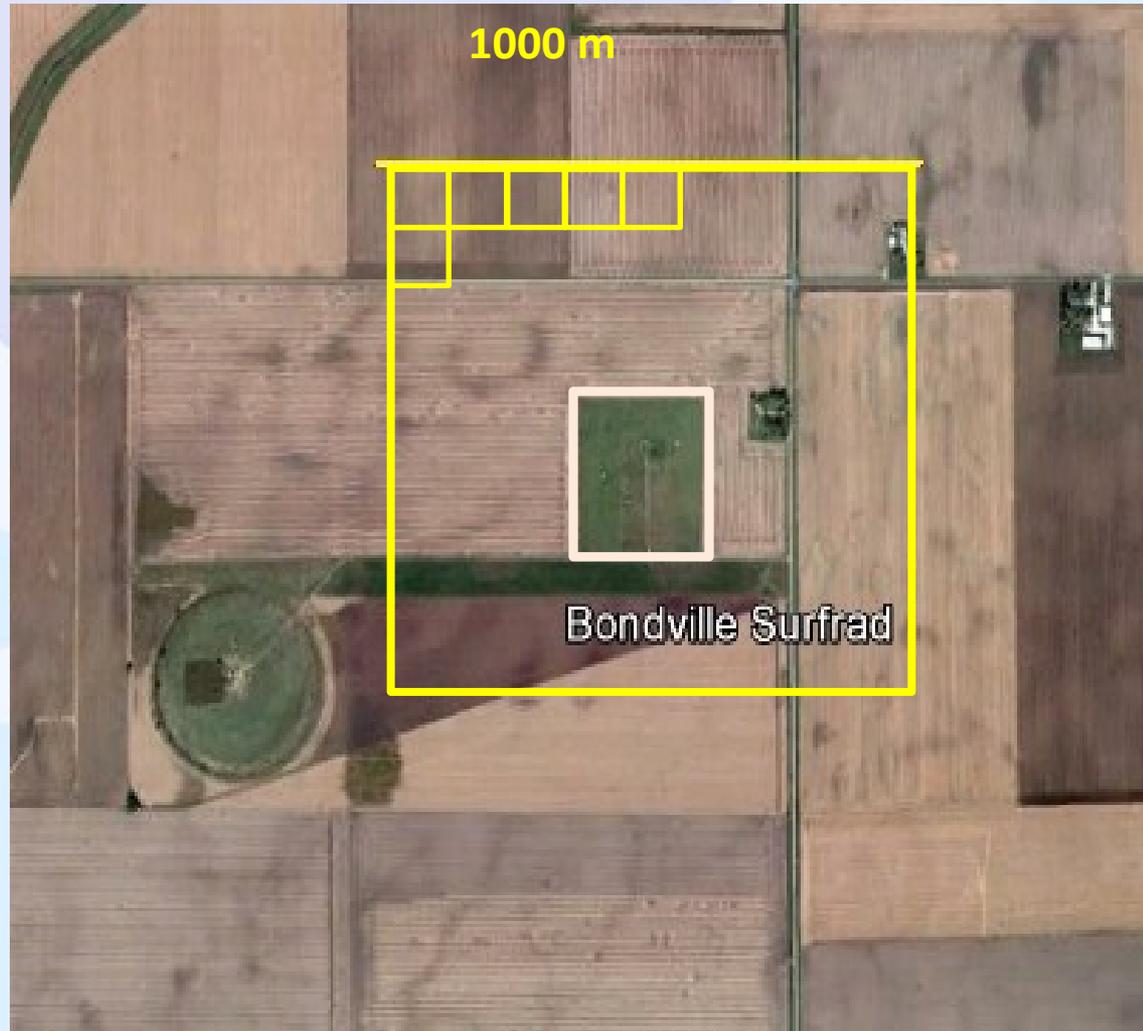
What is LPCS

1. General characteristics
2. Desired functionality

Landsat sampling for 1000 x 1000 m target:

- 1100 samples at 30 m resolution
- 100 samples at 100 m resolution

Bondville, IL SURFRAD

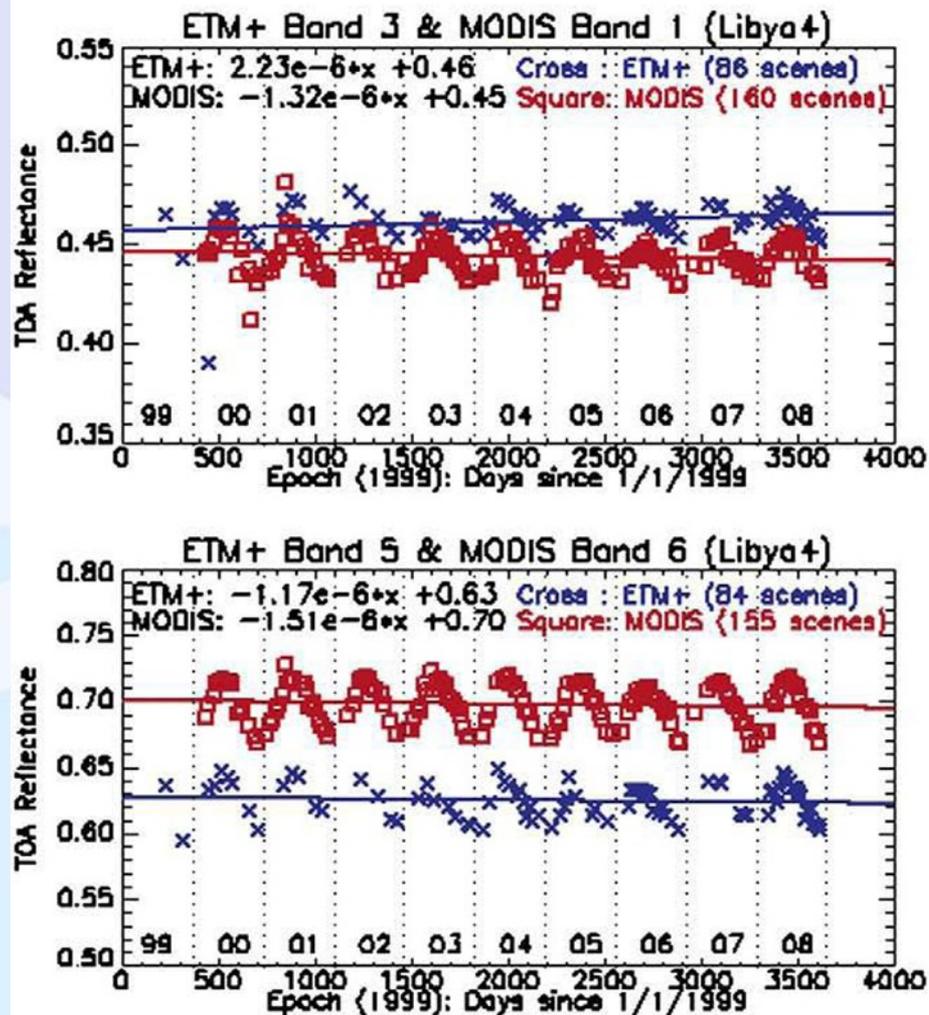


What is LPCS: General Characteristics

Potential Output examples

MODIS vs Landsat

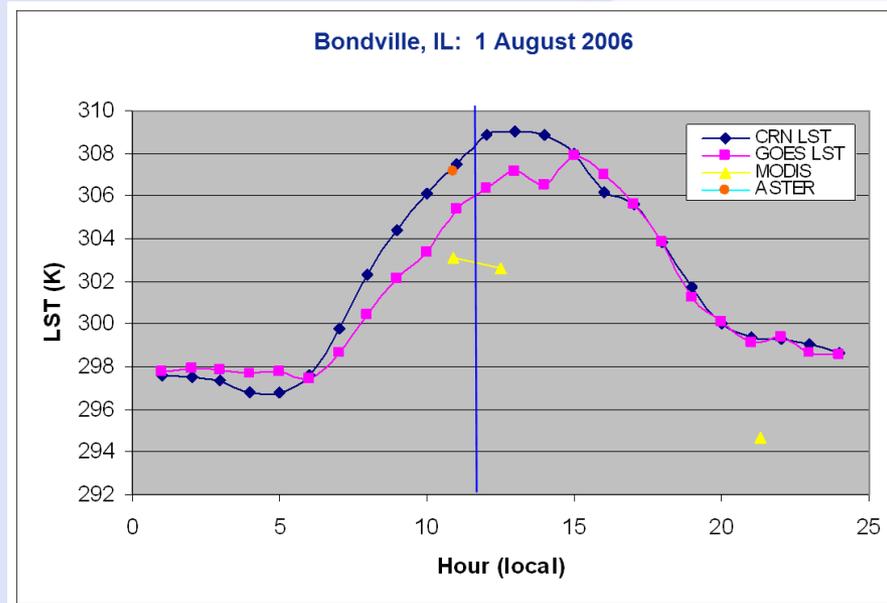
Trending of similar bands of data from multiple sensors.



What is LPCS: General Characteristics Potential Output examples

Multiple sensor (satellite and in situ) comparisons for **single location** and **date**.

Land
Surface
Temp.

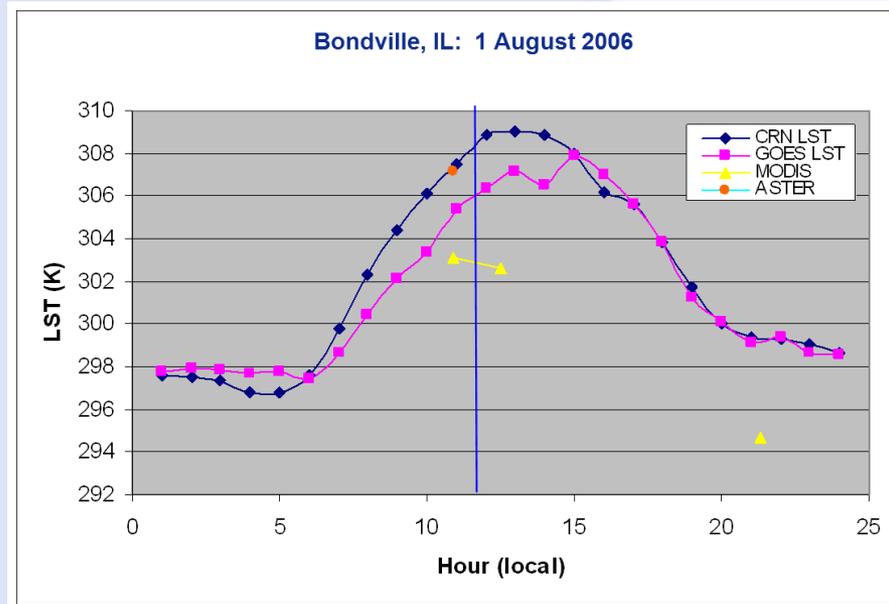


What is LPCS: General Characteristics

Potential Output examples

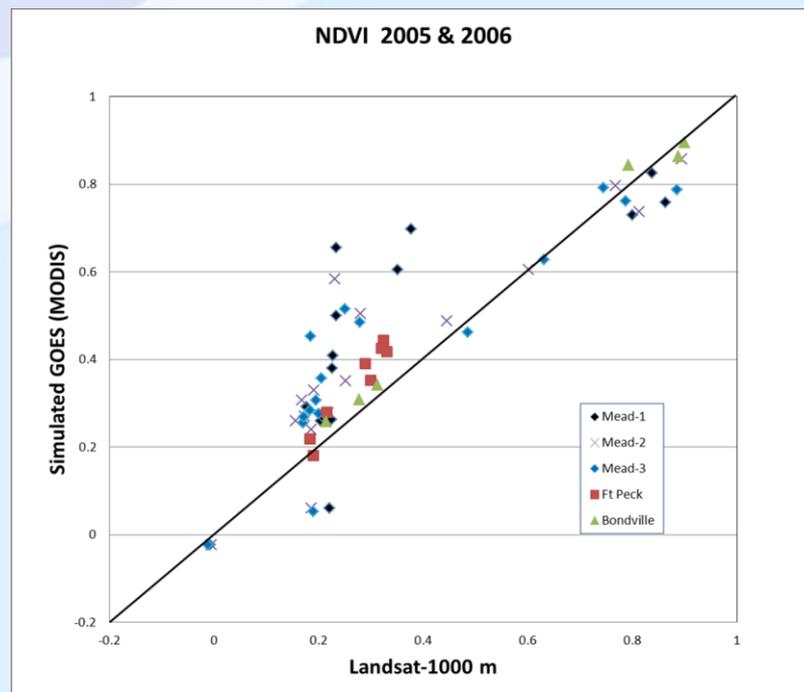
Multiple sensor (satellite and in situ) comparisons for single location and date.

Land Surface Temp.



Multiple sensor comparison for multiple locations and multiple dates.

NDVI



Why LPCS utilization of Landsat?

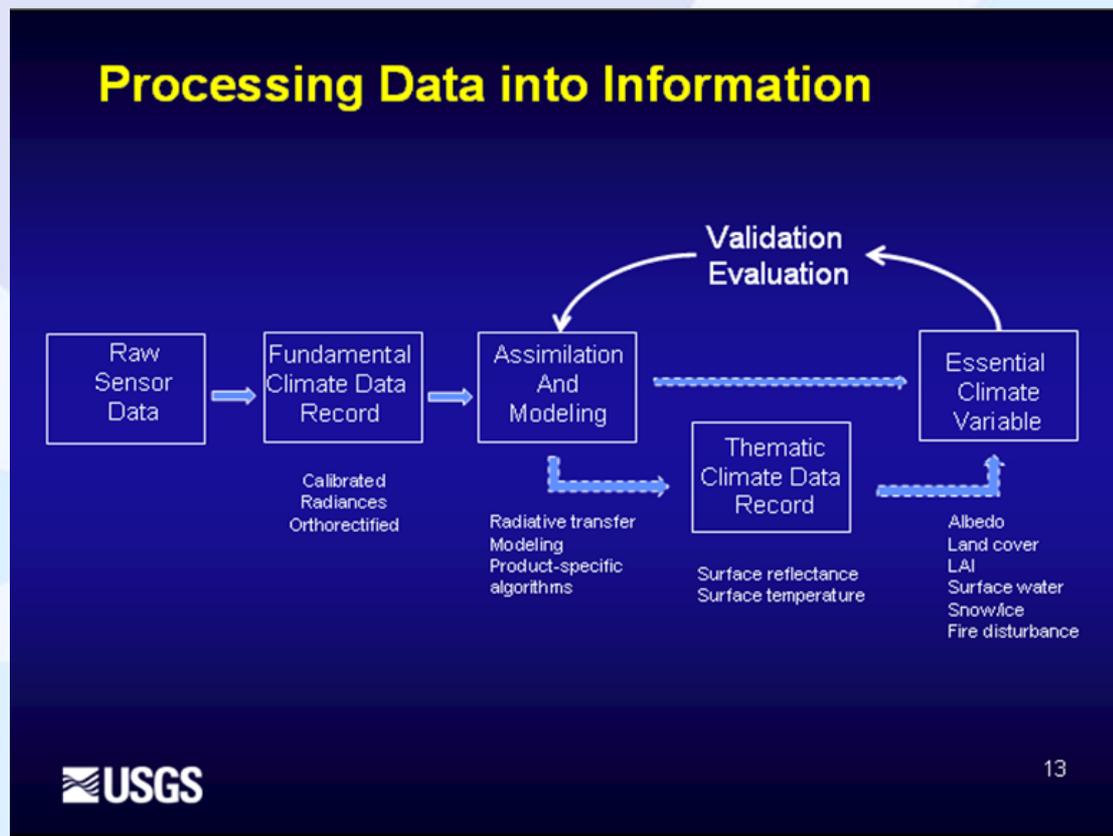
CDRs

Surface Reflectance (and NDVI),
Land Surface
Temperature/Emissivity

ECVs

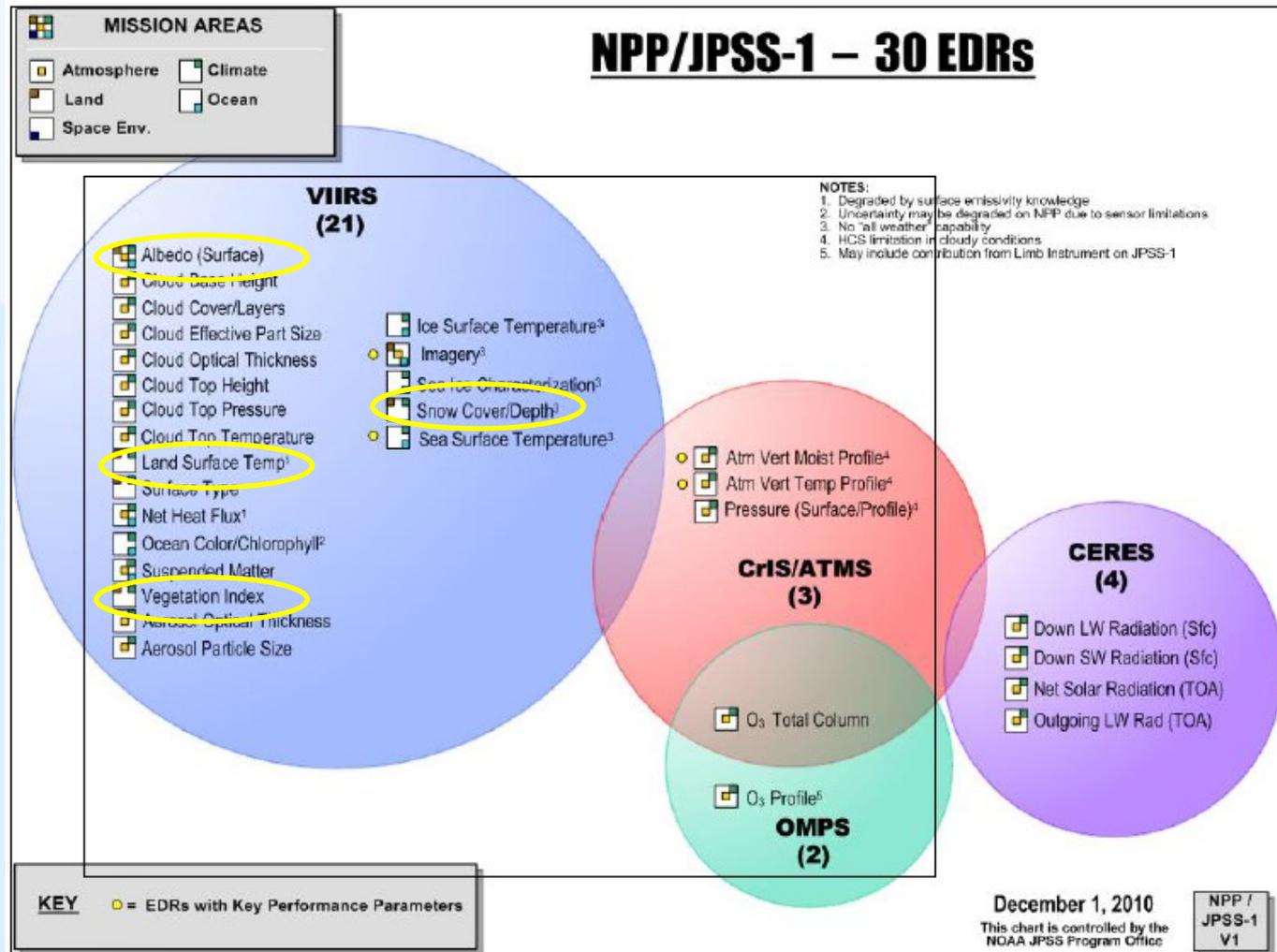
Surface Water Extent,
Burned Area Extent,
Snow Covered Area

Landsat Product Development



LPCS - VIIRS validation synergy

Several products of mutual interest
(e.g. VIIRS)



LPCS – GOES-R ABI validation synergy

Several products of mutual interest
(e.g. **GOES-R ABI**)

KEY

ABI	SUVI	EXIS
GLM	SEISS	MAG

ABI: Advanced Baseline Imager
 SUVI: Solar Ultraviolet Imager
 EXIS: Extreme Ultraviolet and X-ray Irradiance Suite
 GLM: Geostationary Lightning Mapper
 SEISS: Space Environment In-Situ Suite
 MAG: Magnetometer

BASELINE PRODUCTS

Aerosol Detection (Including Smoke and Dust)
 Aerosol Optical Depth (AOD)
 Volcanic Ash: Detection and Height
 Cloud and Moisture Imagery
 Cloud Optical Depth
 Cloud Particle Size Distribution
 Cloud Top Phase
 Cloud Top Height
 Cloud Top Pressure
 Cloud Top Temperature
 Hurricane Intensity
 Lightning Detection: Events, Groups & Flashes
 Rainfall Rate / QPE
 Legacy Vertical Moisture Profile
 Legacy Vertical Temperature Profile
 Derived Stability Indices
 Total Precipitable Water
 Clear Sky Masks
 Radiances
 Downward Shortwave Radiation: Surface
 Reflected Shortwave Radiation: TOA
 Derived Motion Winds
 Fire/Hot Spot Characterization
 Land Surface Temperature (Skin)
 Snow Cover
 Sea Surface Temperature (Skin)
 Energetic Heavy Ions
 Mag. Electrons & Protons: Low Energy
 Mag. Electrons & Protons: Med & High Energy
 Solar & Galactic Protons
 Geomagnetic Field
 Solar Flux: EUV
 Solar Flux: X-Ray
 Solar Imagery: X-Ray

OPTION 2 PRODUCTS

Aerosol Partical Size
 Aircraft Icing Threat
 Cloud Ice Water Path
 Cloud Layers/Heights
 Cloud Liquid Water
 Cloud Type
 Convective Initiation
 Enhanced "V" / Overshooting Top Detection
 Low Cloud and Fog
 Tropopause Folding Turbulence Prediction
 Visibility
 Probability of Rainfall
 Rainfall Potential
 Absorbed Shortwave Radiation: Surface
 Downward Longwave Radiation: Surface
 Upward Longwave Radiation: Surface
 Upward Longwave Radiation: TOA
 Ozone Total
 SO2 Detection
 Flood/Standing Water
 Ice Cover
 Snow Depth (Over Plains)
 Surface Albedo
 Surface Emissivity
 Vegetation Fraction: Green
 Vegetation Index
 Currents
 Currents: Offshore
 Sea and Lake Ice: Age
 Sea and Lake Ice: Concentration
 Sea and Lake Ice: Motion

Land Product characterization System (LPCS)

What is LPCS

Why LPCS developed/hosted at EROS

Highlights of LPCS

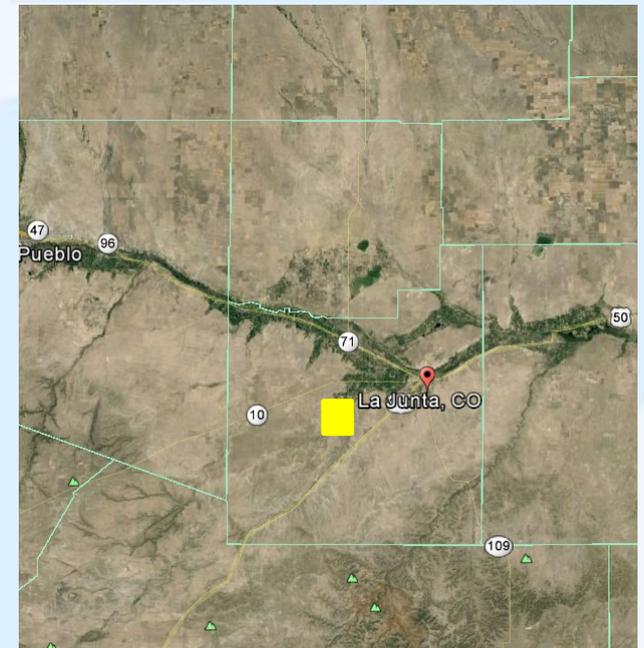
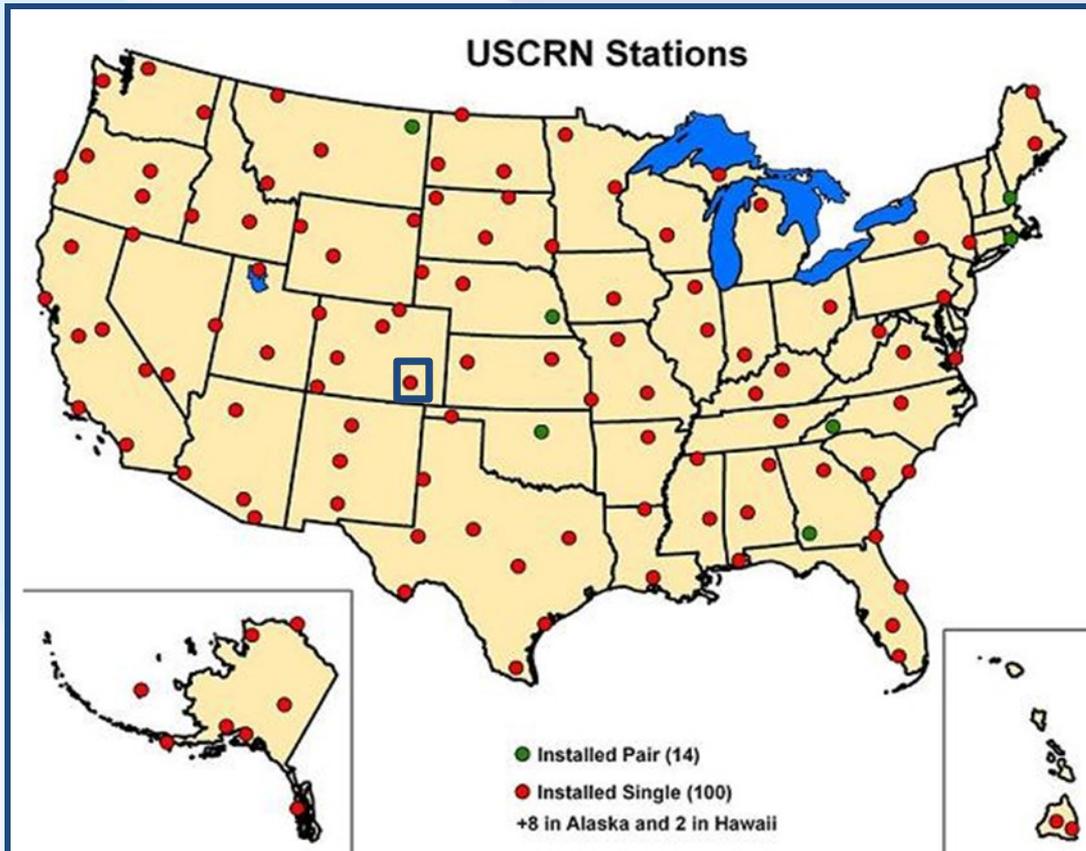
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2. Analysis Tools

Path Forward

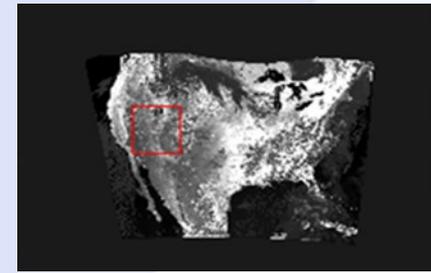
Summary

Example of LPCS Functionality

Data extracted for VIIRS (NOAA and NASA products), MODIS, Landsat 8, and simulated GOES-R ABI for the La Junta, CO, CRN station located within NASA golden tile (h09v05).



Search within LPCS for Landsat and MODIS data coincident with VIIRS and simulated GOES-R ABI data (provided by Univ. Wisc./CIMSS).



The screenshot displays the LPCS (Land Product Characterization System) web interface. The header includes logos for NOAA, USGS, and the system name. Navigation links for Home, Login, Register, RSS, Feedback, and Help are present. The main content area is divided into tabs: Search Criteria, Data Sets, Additional Criteria, and Results. The 'Search Criteria' tab is active, showing a section titled '2. Select Your Data Set(s)' with instructions on how to select data sets. Below this, there is a 'Data Set Search' input field and a list of data sets categorized under 'Landsat Archive', 'Landsat CDR', and 'NASA LPDAAC Collections'. A blue rounded rectangle highlights the 'Landsat Archive' and 'Landsat CDR' sections. To the right, a 'Search Criteria Summary' section shows a map of the United States with a search box containing coordinates (69° 05' 59" N, 037° 47' 34" W) and buttons for 'Options', 'Overlays', 'Map', and 'Satellite'.

Landsat Archive

- L8 OLI/TIRS
- LPVS - Landsat7 ETM+
- LPVS - Landsat TM

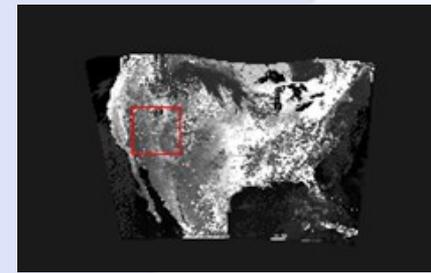
Landsat CDR

- Land Surface Reflectance - GLS2010
- Land Surface Reflectance - GLS2005
- Land Surface Reflectance - GLS2000
- Land Surface Reflectance - L7 ETM+
- Land Surface Reflectance - L4-5 TM

NASA LPDAAC Collections

- MODIS Land Surface Reflectance
- MODIS Land Surface Temp and Emiss
- MODIS Vegetation Indices

Search for Landsat and MODIS data coincident with VIIRS and simulated GOES-R ABI data (provided by Univ. Wisc./CIMSS).



La Junta CO: Landsat 8 and MODIS data search criteria

LPCS  **USGS**
science for a changing world
Land Product Characterization System

USGS Home
Contact USGS
Search USGS

Land Product Characterization System (LPCS) Page Expires In 1:57:48

Home Login Register RSS Feedback Help

Search Criteria Data Sets Additional Criteria Results

1. Enter Search Criteria

To narrow your search area: type in an address or place name, enter coordinates or click the map to define your search area (for advanced map tools, view the [help documentation](#)), and/or choose a date range.

Address/Place Path/Row Feature Circle

Show Clear

Coordinates Predefined Area Shapefile KML

Degree/Minute/Second Decimal

1. Lat: 38.0000, Lon: -103.9000	 
2. Lat: 38.0000, Lon: -103.7000	 
3. Lat: 37.8000, Lon: -103.7000	 
4. Lat: 37.8000, Lon: -103.9000	 

Use Map Add Coordinate Clear Coordinates

Date Range Result Options

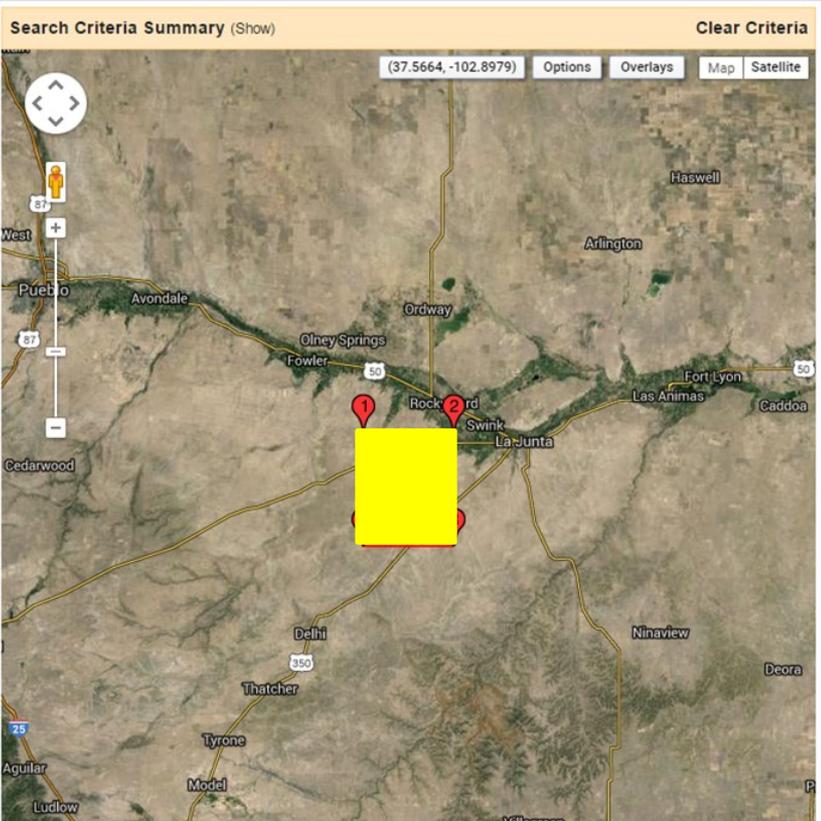
Search from: 05/25/2013 to: 07/05/2013

Search months: (all)

Data Sets » Additional Criteria » Results »

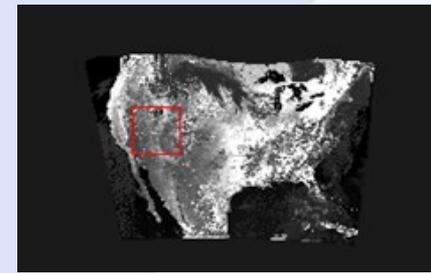
Search Criteria Summary (Show) Clear Criteria

(37.5664, -102.8979) Options Overlays Map Satellite



The map displays a satellite view of the La Junta, Colorado area. A yellow rectangle highlights the search area, which is centered around the intersection of Rock Rd and Swink Rd. Red markers labeled '1' and '2' are placed on the map. The map includes a search bar at the top right with the coordinates (37.5664, -102.8979) and buttons for Options, Overlays, Map, and Satellite. The map also shows various towns and roads, including West, Pueblo, Avondale, Ordway, Olney Springs, Fowler, Rock Rd, Swink Rd, La Junta, Las Animas, Fort Lyon, Caddoa, Cedarwood, Delhi, Thatcher, Tyrone, Model, Ludlow, Villavieja, Deora, and Ninaview.

Search for Landsat and MODIS data coincident with VIIRS and simulated GOES-R ABI data (provided by Univ. Wisc./CIMSS).



La Junta CO: Landsat 8 data results

LPCS  **USGS**
science for a changing world
Land Product Characterization System

USGS Home
Contact USGS
Search USGS

Land Product Characterization System (LPCS) Page Expires In 1:56:39

Home Save Criteria Load Favorite Manage Criteria Item Basket (1) kgallo@usgs.gov RSS Feedback Help

Search Criteria Data Sets Additional Criteria **Results**

4. Search Results

If you selected more than one data set to search, use the dropdown to see the search results for each specific data set.

Show Result Controls

Data Set
Landsat Surface Reflectance - L8 OLI/TIRS

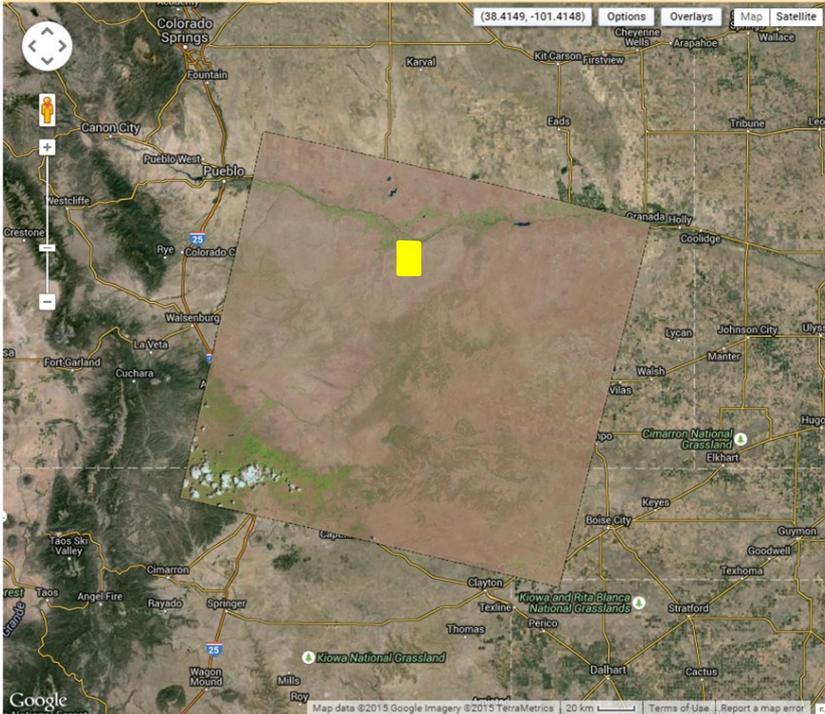
3		Entity ID: LC80330332013173LGN00 Coordinates: 38.90448,-104.66749 Acquisition Date: 22-JUN-13 Path: 33 Row: 33
4		Entity ID: LC80320342013166LGN00 Coordinates: 37.47472,-103.67328 Acquisition Date: 15-JUN-13 Path: 32 Row: 34
5		Entity ID: LC80330332013157LGN00 Coordinates: 38.90424,-104.70401 Acquisition Date: 06-JUN-13 Path: 33 Row: 33
6		Entity ID: LC80330342013157LGN00 Coordinates: 37.4743,-105.13802 Acquisition Date: 06-JUN-13 Path: 33 Row: 34

[View Item Basket >](#)

Search Criteria Summary (Show)

Clear Criteria

(38.4149, -101.4148) Options Overlays Map Satellite



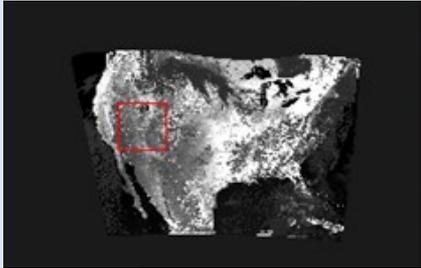
The up-to-date Google map is not for purchase or for download; it is to be used as a guide for reference and search purposes only.

Accessibility FOIA Privacy Policies and Notices Google Maps API Disclaimer

U.S. Department of the Interior U.S. Geological Survey
URL: <http://lpcsexplorer.cr.usgs.gov>
Page Contact Information: ita@usgs.gov



Search for Landsat and MODIS data coincident with VIIRS and simulated GOES-R ABI data (provided by Univ. Wisc./CIMSS).



La Junta CO: MODIS-Terra data results

LPCS **USGS**
Land Product Characterization System

USGS Home
Contact USGS
Search USGS

Land Product Characterization System (LPCS) Page Expires In 1:58:05

Home Save Criteria Load Favorite Manage Criteria Item Basket (2) kgallo@usgs.gov RSS Feedback Help

Search Criteria Data Sets Additional Criteria **Results**

4. Search Results

If you selected more than one data set to search, use the dropdown to see the search results for each specific data set.

Show Result Controls

Data Set
LPCS - MODIS MOD09GA

« First Previous 1 Next Last »
Displaying 1 - 41 of 41

- 1 Entity ID: MOD09GA.A2013185.h09v05.005
Coordinates: 35.2926 , -104.0738
Acquisition Date: 04-JUL-13
- 2 Entity ID: MOD09GA.A2013184.h09v05.005
Coordinates: 35.2926 , -104.0738
Acquisition Date: 03-JUL-13
- 3 Entity ID: MOD09GA.A2013183.h09v05.005
Coordinates: 35.2926 , -104.0738
Acquisition Date: 02-JUL-13
- 4 Entity ID: MOD09GA.A2013182.h09v05.005
Coordinates: 35.2926 , -104.0738
Acquisition Date: 01-JUL-13
- 5 Entity ID: MOD09GA.A2013181.h09v05.005
Coordinates: 35.2926 , -104.0738
Acquisition Date: 30-JUN-13

View Item Basket »

Search Criteria Summary (Show)

Clear Criteria

(32.8057, -104.4580) Options Overlays Map Satellite

United States

Mexico

Google

Map data ©2015 Google, INEGI Imagery ©2015 TerraMetrics 200 km Terms of Use Report a map error

The up-to-date Google map is not for purchase or for download; it is to be used as a guide for reference and search purposes only.

Enhanced Landsat Products

Additional ECVs and CDRs will be added to menu as available.

Select Product Contents

Source Products

- [Source Products](#)
- [Source Metadata](#)

Climate Data Records

- [Top of Atmosphere Reflectance](#)
- [Surface Reflectance](#)
- [Band 6 Brightness Temperature](#)

Spectral Indices

- [Surface Reflectance NDVI](#)
- [Surface Reflectance NDMI](#)
- [Surface Reflectance NBR](#)
- [Surface Reflectance NBR2](#)
- [Surface Reflectance SAVI](#)
- [Surface Reflectance EVI](#)

Other Products

- [CFMask \(standalone file\)](#)
- [Solr Index](#)

Product Customization



Enhanced Functionality

- 1. Auto-registration of data to common map projections for analysis.
- 2. User defines area of interest for analysis
- 3. Match pixel size for all images
- 4. Several resampling options

Product Customization

Reproject Products

1 Projection:

Modify Image

2 Upper left X coordinate
 Upper left Y coordinate
 Lower right X coordinate
 Lower right Y coordinate

Pixel Resizing

3

Resample Method:

Other Description (optional)

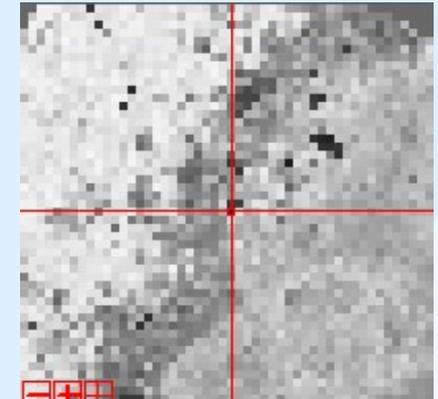
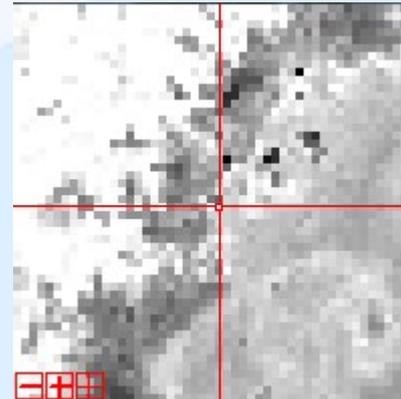
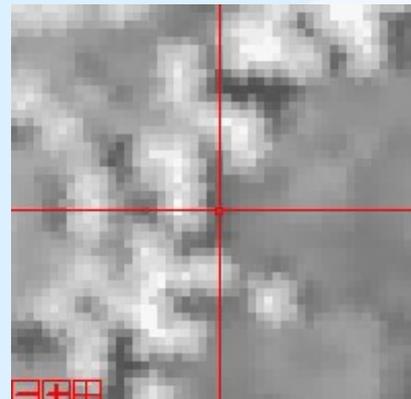
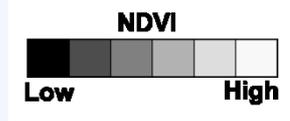
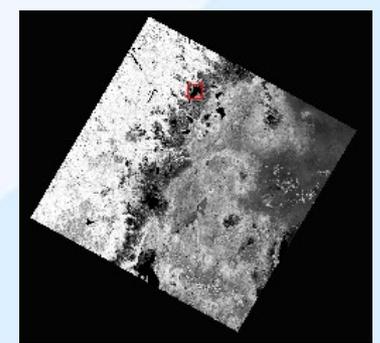
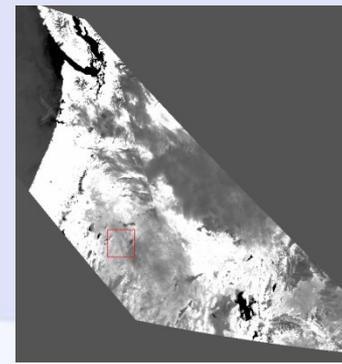
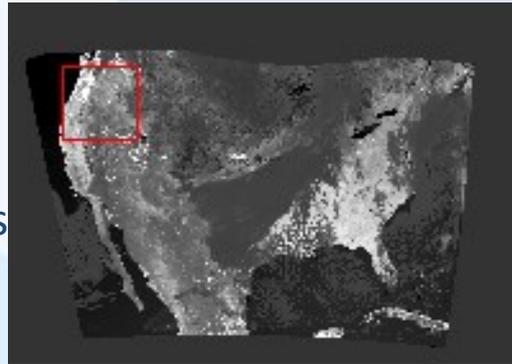
Example of LPCS Functionality

Example of georegistration of simulated ABI, VIIRS and Landsat data.

Simulated GOES-R ABI

VIIRS

Landsat



Input Data

Varied Pixel Sizes
Varied Map Projections

Georegistered Data

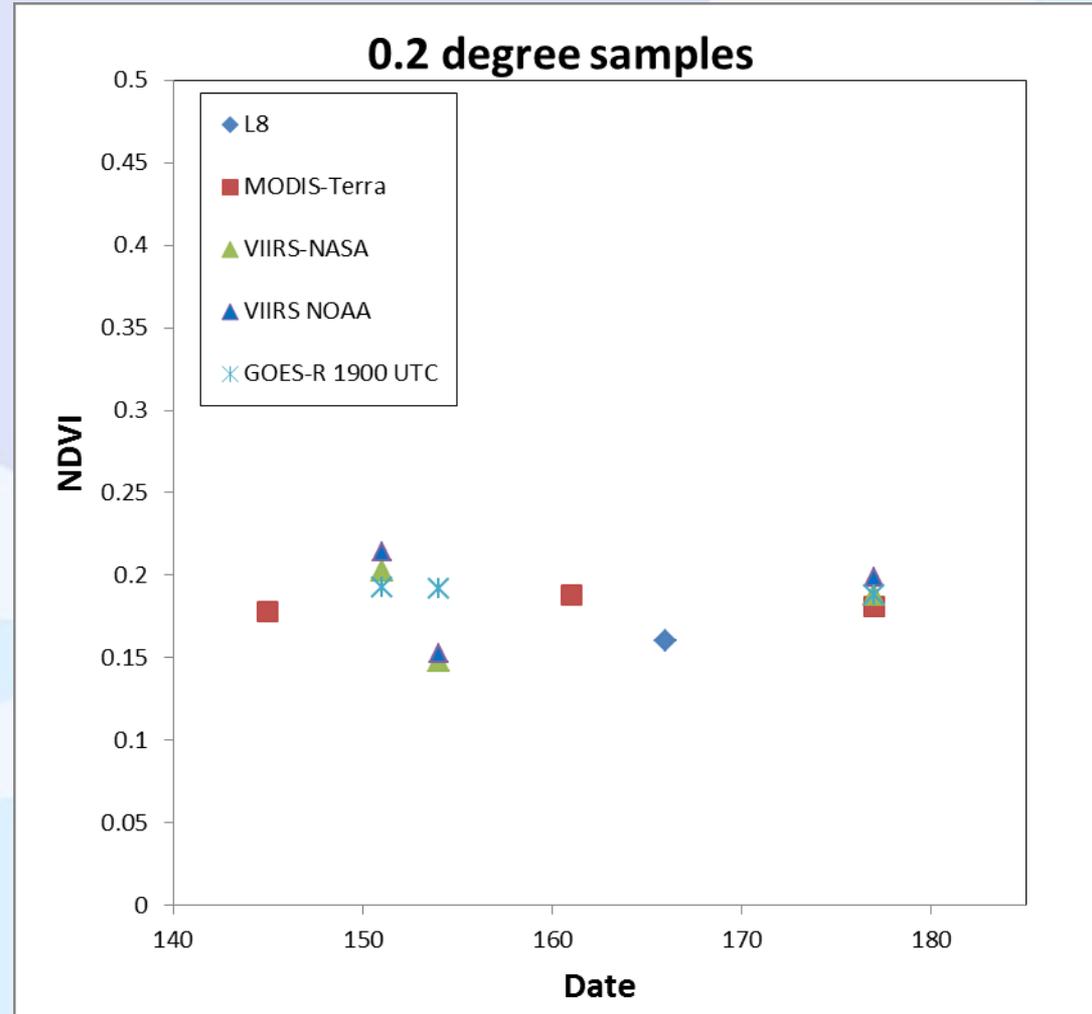
Same Pixel Size
Same Map Projection

Example of Potential Analysis

Multisensor/multidate comparison for La Junta, CO, CRN station in 2013.

Data included in analysis:

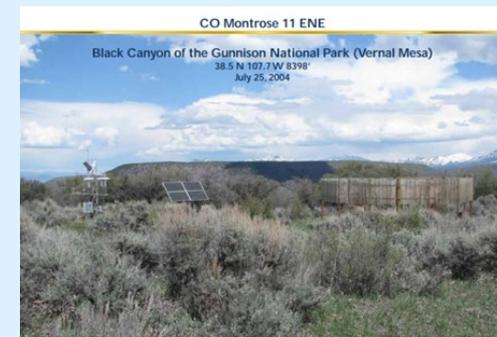
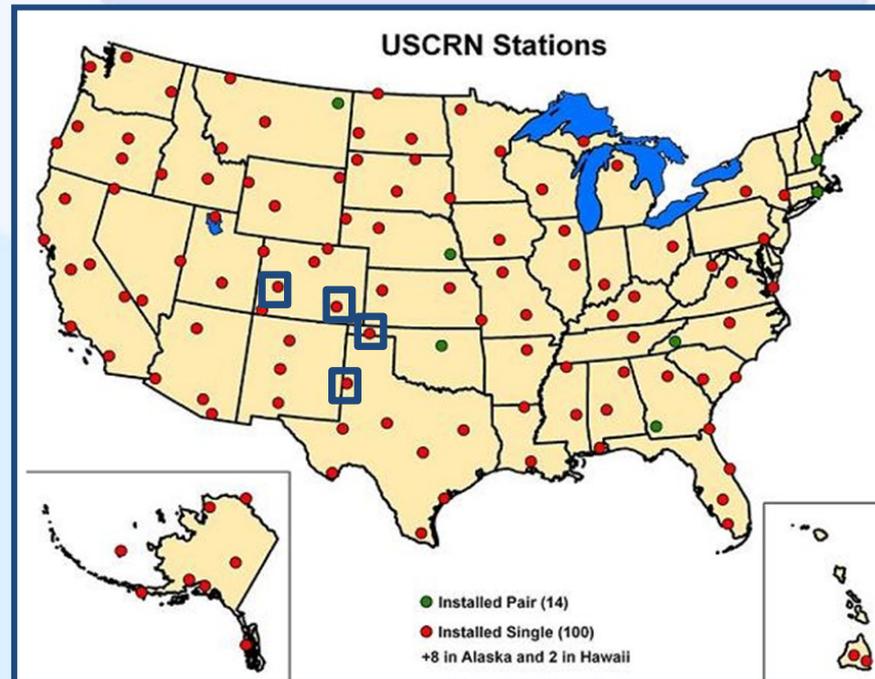
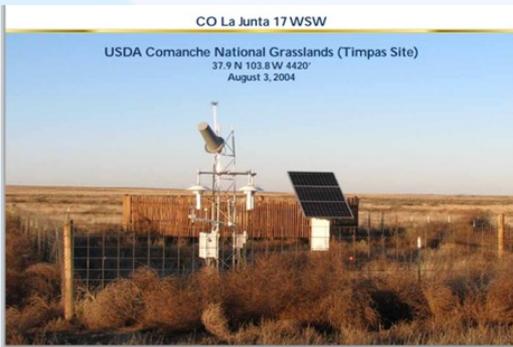
- Landsat 8: TOC NDVI
- NOAA-VIIRS: TOA NDVI
- NASA-VIIRS: TOC NDVI
- MODIS: TOC NDVI
- Simulated GOES-R: TOA NDVI



Each point within figures represents 0.2 x 0.2degree sample area.

Example of LPCS Functionality

Data extracted for VIIRS (NOAA and NASA products) and Landsat 8 for four CRN stations located within NASA golden tile (h09v05).



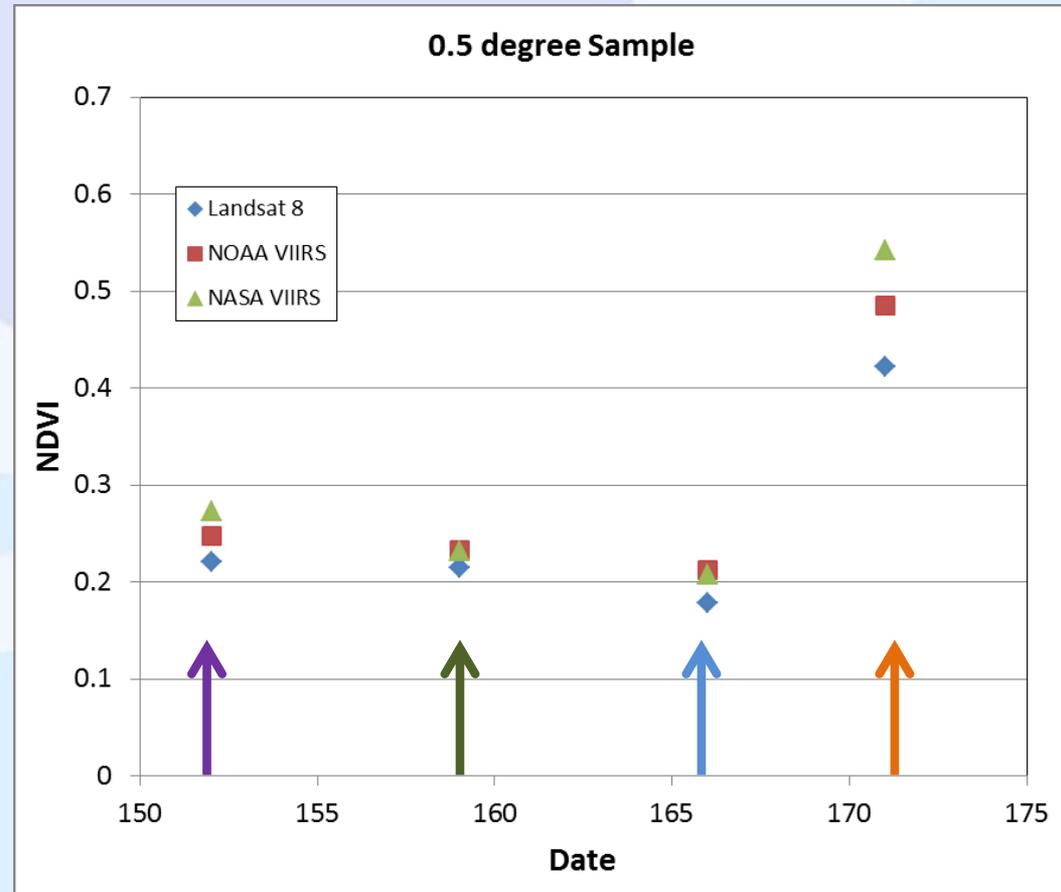
Example of Potential Analysis

Multisensor/multidate comparison for four CRN station locations in 2013.

- **Goodwell, OK, day 152**
- **Muleshoe, TX, day 159**
- **LaJunta, CO, day 166**
- **Montrose, CO day 171**

Data included in analysis:

- Landsat 8: TOA NDVI
- NOAA-VIIRS: TOA NDVI
- NASA-VIIRS: TOC NDVI



Each point within figures represents .5 x .5 degree sample area.

Land Product characterization System (LPCS)

What is LPCS

Why LPCS developed/hosted at EROS

Highlights of LPCS

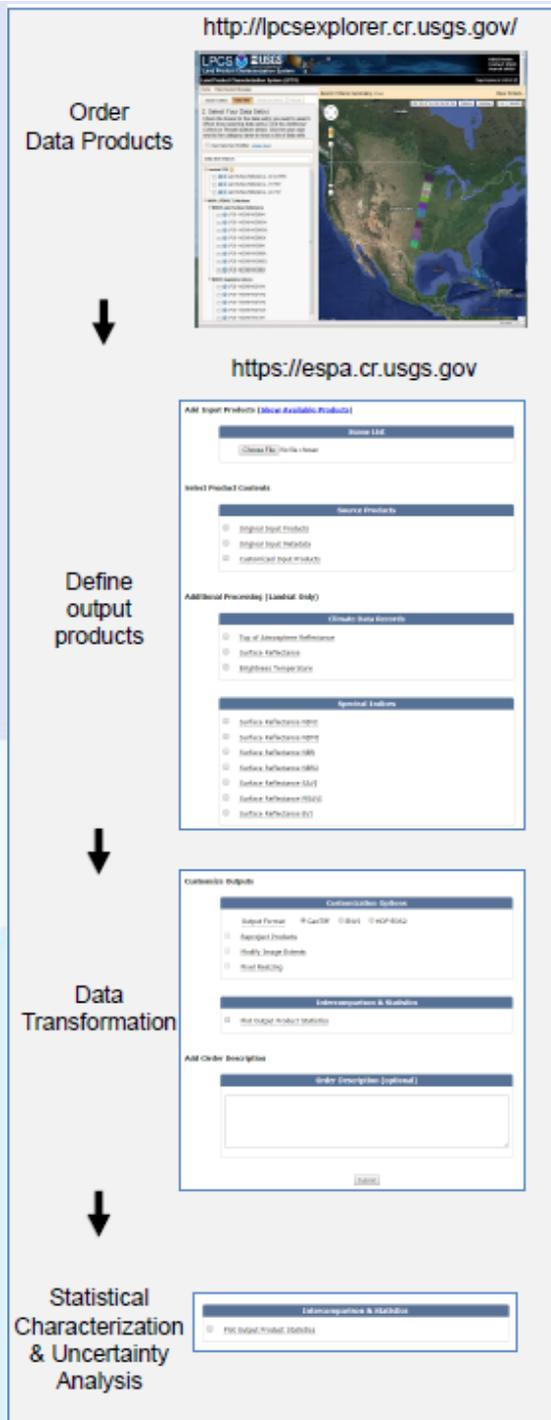
1. Inventory & Ordering
2. Analysis Tools

Path Forward

Summary

Path Forward

LPCS interface update:
Expected 30 Nov. 2015, one
seamless system for LPCS data
selection, ordering, and
product processing requests.



Path Forward

Predefined sample sites: user selectable for satellite (and potential in situ) inter-comparisons

The screenshot displays the USGS Land Product Characterization System (LPCS) search interface. The top navigation bar includes the USGS logo and the text "USGS Home Contact USGS Search USGS". The main header reads "Land Product Characterization System (LPCS)" and "Page Expires In 1:58:31".

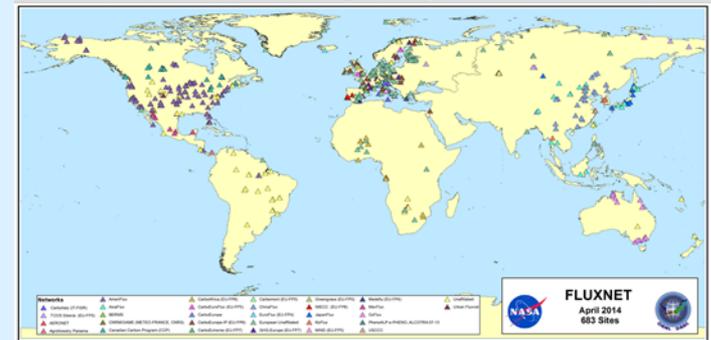
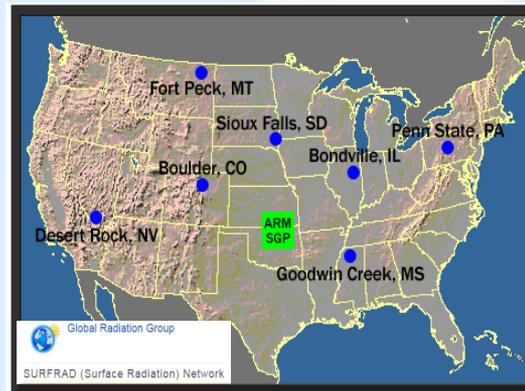
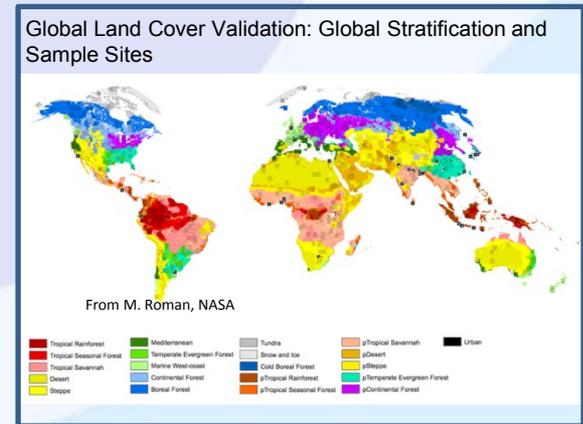
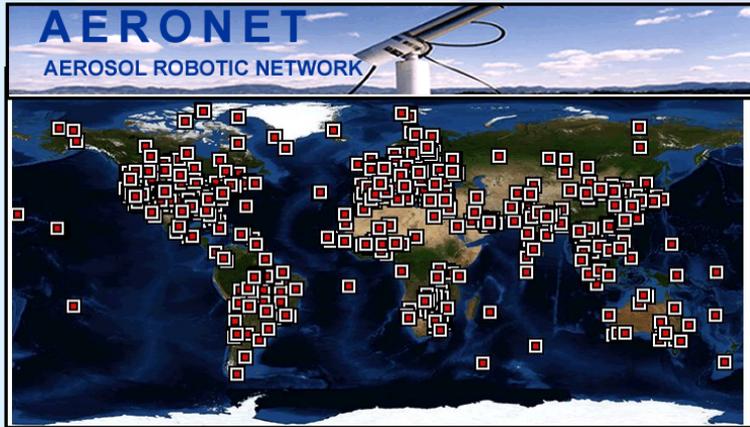
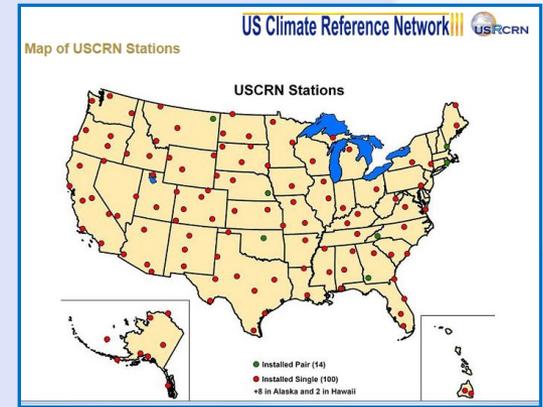
The search criteria form on the left includes the following sections:

- Search Criteria Summary (Show)** and **Clear Criteria** buttons.
- 1. Enter Search Criteria**: "To narrow your search area: type in an address or place name, enter coordinates or click the map to define your search area (for advanced map tools, view the [help documentation](#)), and/or choose a date range." Below this are tabs for "Address/Place", "Path/Row", "Feature", and "Circle".
- Coordinates**: Includes a "Predefined Area" tab with a "Cal/Val sites" button circled in blue. Other options include "Shapefile" and "KML". Below are radio buttons for "Degree/Minute/Second" and "Decimal", and a message "No coordinates selected." with "Use Map", "Add Coordinate", and "Clear Coordinates" buttons.
- Date Range**: Includes "Result Options" and a date range selector set to "Search from: 01/01/1920 to: 02/11/2015". A "Search months" dropdown is set to "(all)".
- Buttons for "Data Sets", "Additional Criteria", and "Results".

The map on the right shows a satellite view of the United States, with a search criteria summary overlay showing coordinates (48° 39' 42" N, 095° 53' 19" W) and a "Show" button. The map includes labels for states like NORTH DAKOTA, MINNESOTA, SOUTH DAKOTA, NEBRASKA, IOWA, and WISCONSIN, as well as cities like Fargo, Bismarck, Minneapolis, and Rapid City. A yellow square marker is visible on the map.

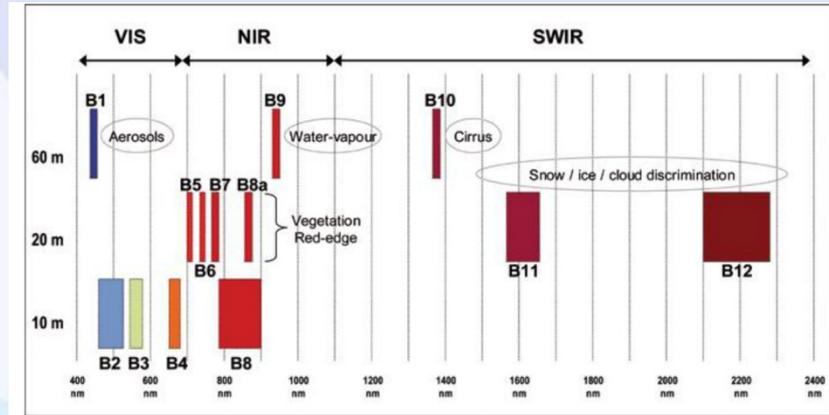
Path Forward

Predefined sample sites: user selectable for satellite (and potential in situ) inter-comparisons



Path Forward

Sentinel-2 and Sentinel-3 data hosted at USGS/EROS



Sentinel-2

- 13 Bands
- 4 bands at 10 m resolution
- 6 bands at 20 m
- 3 bands at 60 m



Band	λ centre (nm)	Width (nm)	L_{min} ($W m^{-2} sr^{-1} \mu m^{-1}$)	L_{ref} ($W m^{-2} sr^{-1} \mu m^{-1}$)	L_{sat} ($W m^{-2} sr^{-1} \mu m^{-1}$)	SNR @ L_{ref}
0a1	400	15	21.60	62.95	413.5	2188
0a2	412.50	10	25.93	74.14	501.3	2061
0a3	442.50	10	23.96	65.61	466.1	1811
0a4	490	10	19.78	51.21	483.3	1541
0a5	510	10	17.45	44.39	449.6	1488
0a6	560	10	12.73	31.49	524.5	1280
0a7	620	10	8.86	21.14	397.9	997
0a8	665	10	7.12	16.38	364.9	883
0a9	673.75	7.5	6.87	15.70	443.1	707
0a10	681.25	7.5	6.65	15.11	350.3	745
0a11	708.75	10	5.66	12.73	332.4	785
0a12	753.75	75	4.70	10.33	377.7	605
0a13	761.25	2.5	2.53	6.09	369.5	232
0a14	764.375	3.75	3.00	7.13	373.4	305
0a15	767.50	2.5	3.27	7.58	250.0	330
0a16	778.75	15	4.22	9.18	277.5	812
0a17	865	20	2.88	6.17	229.5	666
0a18	885	10	2.80	6.00	281.0	395
0a19	900	10	2.05	4.73	237.6	308
0a20	940	20	0.94	2.39	171.7	203
0a21	1020	40	1.81	3.86	163.7	152

Ocean Land Color Instrument

- 21 Bands
- 300 m spatial resolution

Land Product characterization System (LPCS)

What is LPCS

Why LPCS developed/hosted at EROS

Highlights of LPCS

1. Inventory & Ordering
2. Analysis Tools

Path Forward

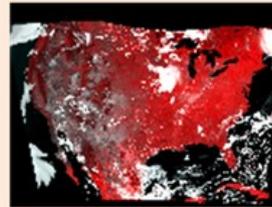
Summary



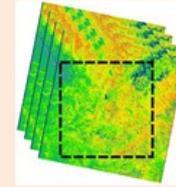
Land Product Characterization System

A web-based system designed to use moderate to high-resolution satellite data for characterization, and assist with validation, of GOES-R ABI and JPSS VIIRS products.

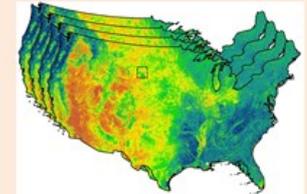
Input Products in Native Projections



Simulated GOES-R ABI
(Univ. Wisc./CIMMS)



Landsat ETM+ (7),
Landsat OLI/TIRS (8)

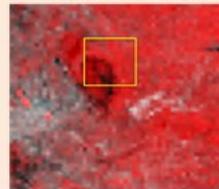


MODIS MOD/MYD09 (Surface Refl.)
MODIS MOD/MYD13 (NDVI & EVI)

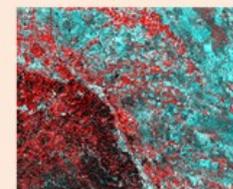


Geographically Registered Output Products

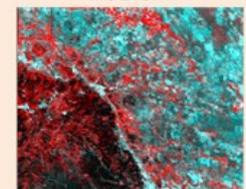
Simulated GOES-R ABI



Landsat



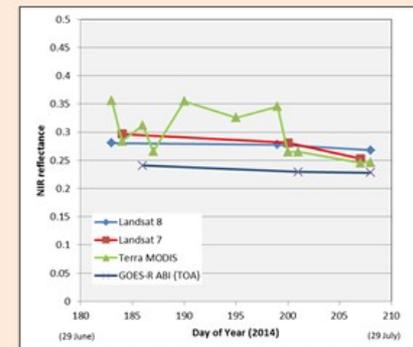
MODIS



Tables and Charts of Individual Bands or Indices

	A	B	C	D	E	F	G
1	DATE	DOY	MINIMUM	MAXIMUM	MEAN	STDDEV	VALID
2	7/2/2014	183	854	6850	3562.327	693.2124	yes
3	7/3/2014	184	349	8094	2836.911	495.3851	yes
4	7/5/2014	186	290	6780	3122.295	493.9331	yes
5	7/6/2014	187	308	4667	2653.052	575.2196	yes
6	7/9/2014	190	815	5553	3545.954	658.4303	yes
7	7/14/2014	195	191	7778	3254.757	636.479	yes
8	7/18/2014	199	1253	5621	3455.974	681.7747	yes
9	7/19/2014	200	343	5165	2643.97	393.5894	yes
10	7/20/2014	201	404	8447	2648.748	691.372	yes
11	7/26/2014	207	309	5266	2452.574	376.6008	yes
12	7/27/2014	208	457	4713	2462.386	465.7057	yes
13							

Mean, minimum, maximum, standard deviation



Near-IR time series inter-comparisons