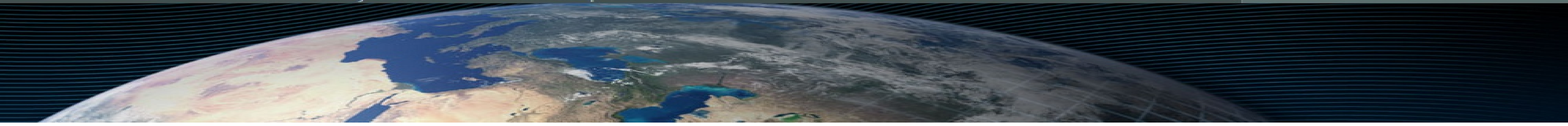

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NASA's Land, Atmosphere Near real-time Capability for EOS (LANCE): Delivering Data and Imagery to Meet the Needs of Near Real-Time Applications.

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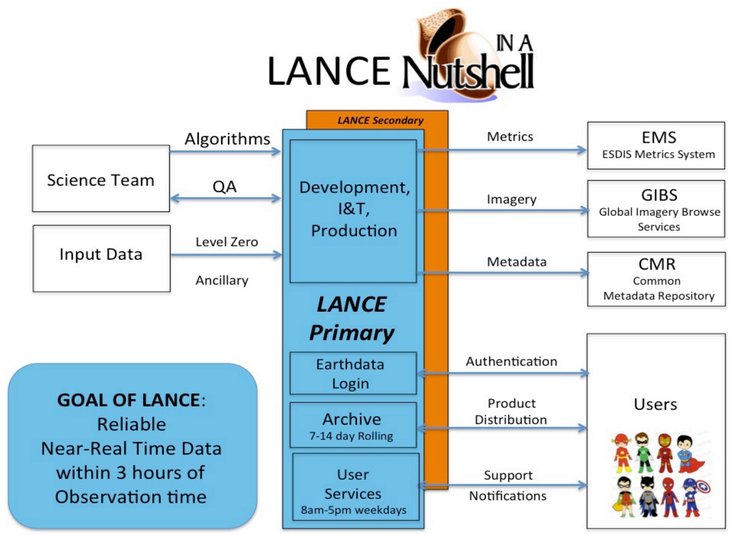
Abstract

NASA's Land, Atmosphere Near real-time Capability for EOS (LANCE) is a virtual system that provides near real-time EOS data and imagery from the AIRS, AMSR2, LIS (ISS), MISR, MLS, MODIS, MOPITT, OMI, OMPS, and VIIRS instruments, to meet the needs of scientists and application users interested in monitoring a wide variety of natural and man-made phenomena. NRT imagery from LANCE are available through NASA's Global Imagery Browse Services (GIBS), Worldview, FIRMS and most recently through Worldview Snapshots – a low band width application that has replaced the Rapid Response Subsets. Over the past year: data and imagery from the Lightning Imaging Sensor (LIS) on board the International Space Station (ISS), OMPS and VIIRS-Land have been added to LANCE. In the coming year LANCE will integrate the MODIS NRT Global Flood product, VIIRS Black Marble nighttime lights and Cloud Mask and Aerosol Dark Target from VIIRS Atmosphere. Here we provide a brief overview of LANCE, focusing on what's new and describing how these new data sets have been used to monitor lightning flashes, hurricanes and fires. For more information on LANCE visit: https://earthdata.nasa.gov/lance



LANCE Near Real-Time Products

Instrument	Platform	Product Categories	Average Latency
Atmospheric Infrared Sounder (AIRS)	Terra	Radiances, Temperature, Moisture Profiles, Precipitation, Dust, Clouds and Trace Gases	75 - 140 minutes
Advanced Microwave Scanning Radiometer 2 (AMSR2)	Global Change Observation Mission - Water 1 (GCOM-W1) - a Japanese Earth Observation Satellite	Global Total Precipitation, Global Rainfall, Total Precipitable Water (TPW), Ocean Wind Speed (OWS), Columnar Cloud Liquid Water (CLW) over ocean, Columnar Water Vapor (CWV) over ocean, Snow Water Equivalent (SWE), Sea Ice Concentration, Brightness Temperature (Tb), Soil Moisture	75 – 165 minutes**
Lightning Imaging Sensor (LIS) on International Space Station (ISS)	ISS	Lightning, Atmospheric Electricity, Weather Events	2 minutes
Multi-angle Imaging SpectroRadiometer (MISR)	Terra	Cloud motion vectors (Winds), Radiances	90 - 120 minutes
Microwave Limb Sounder (MLS)	Aura	Ozone, Temperature, Carbon Monoxide (CO), Water Vapor, Nitric Acid, Nitrous Oxide (N_2O), Sulfur Dioxide (SO_2)	75 - 140 minutes
Moderate Resolution Imaging Spectroradiometer (MODIS)	Terra / Aqua	Radiances, Clouds/Aerosols, Water Vapor, Fire, Snow Cover, Sea Ice, Land Surface Reflectance, Land Surface Temperature	60 - 125 minutes*
Measurements of Pollution in the Troposphere (MOPITT)	Terra	Retrieved CO (Thermal Infrared Radiances)	180 minutes
Ozone Mapping and Profiler Suite (OMPS)	S-NPP	Total Column Ozone and Aerosol Index, SO_2, Ozone Profile	180 minutes
Ozone Monitoring Instrument (OMI)	Aura	Ozone, SO_2, Aerosols, Cloud Top Pressure	100 - 165 minutes**
Visible Infrared Imaging Radiometer Suite (VIIRS)	S-NPP	375 m Active Fire, Corrected Reflectance Imagery, Land Surface Reflectance Coming soon: Snow, Land Surface Temperature, Sea Ice and Ice Surface Temperature	180 minutes

* Latency excludes daily Land Surface Reflectance
** Latency excludes Level 3 products*** It is anticipated that this initial latency will be reduced

Note: In order to generate data products within 3 hours of observation time, a number of changes have been made to the standard processing approach to expedite the availability of input data sets. More information on the differences can be found at https://earthdata.nasa.gov/earth-observation-data/near-real-time/near-real-time-versus-standard-products

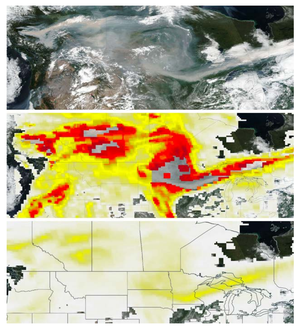
New products in LANCE

Lightning Imaging Sensor (LIS)

Knowing where and when lightning is occurring enables operational partners, including the National Weather Service (NWS) Pacific Region, the Ocean Prediction Center, the NWS Aviation Weather Center, and the NOAA National Hurricane Center to to track the movement of severe storms. In February 2017 the LIS was placed on the International Space Station (ISS) for a 2-4 year mission. The data, available through LANCE within two minutes of observation, are used for storm warnings, oceanic aviation safety and international Significant Meteorological (SIGMET) advisories, long-range lightning system validation, hurricane rapid intensification evaluations, and support of Fire Weather in the data sparse regions of the western United States.

New OMPS Product Provides a Better View of High-Aerosol Events

The new PyroCumuloNimbus product from the Ozone Mapping and Profiler Suite (OMPS) makes it easier to track and analyze high concentrations of aerosols from wildfires and similar events. As heat from the fires rises in to the atmosphere, it has the potential to produce a pyrocumulonimbus or pyroCb events – a fire caused or fire-enhanced thunderstorm that in its most extreme form pumps high amounts of smoke and aerosols into the lower stratosphere.



Suomi-NPP images from August 17, 2018, showing the utility of the new OMPS PyroCumuloNimbus AI product. Top image is a true color Visible Infrared Imaging Radiometer Suite (VIIRS) image of the Northern U.S. and Southern Canada. Milky white areas are smoke from wildfires in British Columbia (bright white areas are clouds or snow). Middle image is the same area overlain with the OMPS AI product. Note the red indicating AI values at the extreme high end of the AI scale and the gaps in the image where AI values are so high they are screened out. Bottom image is the same area overlain with the new OMPS PyroCumuloNimbus AI product. Note the correlation of the bright yellow areas in the lower image and the bright red areas in the middle image. Images courtesy of NASA Worldview. Caption courtesy of Josh Blumenfeld, NASA ESDIS.

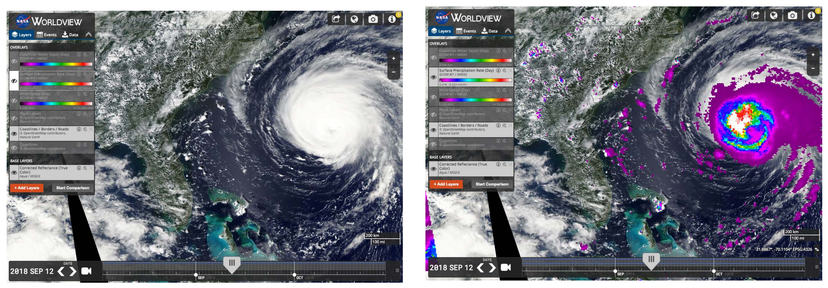
The new NRT product makes it easier to track the extent and spread of pyroCb and other high-aerosol events. This is vital information as according to the U.S. Environmental Protection Agency high aerosol concentrations can affect climate and reduce visibility as well as impact breathing, reproduction, the cardiovascular system, and the central nervous system,.

The pyroCb product compliments the existing OMPS "aerosol index," or AI product. The AI value is related to both the thickness and height of the atmospheric aerosol layer. For most atmospheric events involving aerosols, the AI ranges from 0.0 to 5.0, with 5.0 indicating heavy concentrations of aerosols that could reduce visibilities or impact health. However, the AI signal for pyroCb events, which are both dense and high in the atmosphere, easily can be much larger than 5.0. In fact, the highest AI value ever observed (55.0) occurred during a pyroCb event in August 2017.

To provide better near real-time imagery for these high AI events, the OMPS and LANCE teams designed a new pyroCb product with an upper AI limit of 50.0. The design team also removed flags that screened out unusually high AI values. The resulting OMPS PyroCumuloNimbus AI product more accurately captures high AI events and makes it easier to track the spread of high aerosol concentrations in the atmosphere.

Tracking recent events

NRT Imagery and data from LANCE are routinely used to track ongoing events.



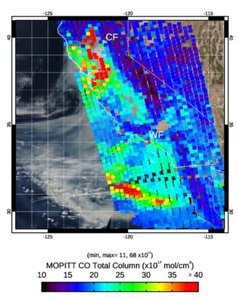
Tracking Hurricane Michael: VIIRS Corrected Reflectance (left) and NRT AMSR2 Surface Precipitation (right) imagery showing the high precipitation rates in the eye of the storm as it approaches Florida

Mapping fire and smoke during the Camp and Woolsey Fires, California

NRT data from MODIS, VIIRS, OMI, OMPS and MOPITT were all used to track the Camp and Woolsey fires in California in November 2018. The Measurement of Pollution in the Troposphere (MOPITT) instrument is flying on board NASA's Terra satellite. It observes Carbon Monoxide (CO) in the troposphere through thermal and near infrared channels. This product was created by the MOPITT Near-Real Time system on Saturday November 10, 2018. The images clearly show enhanced levels of carbon monoxide associated with the Camp and Woolsey wildfires in northern and southern California.

Image courtesy of NASA Disasters Program

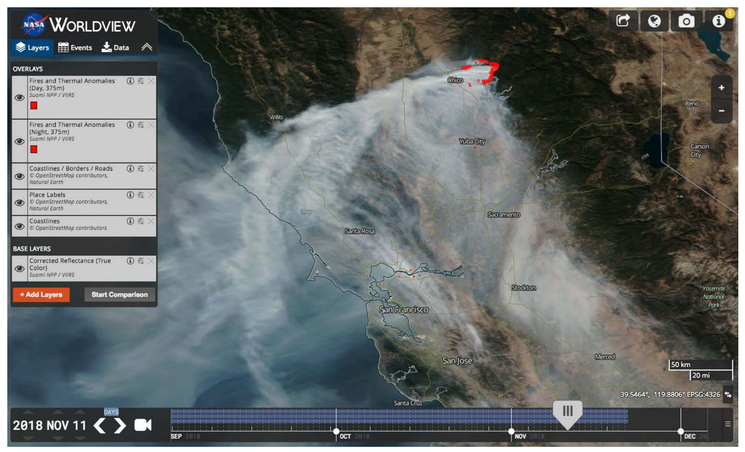
Carbon Monoxide from California Wildfires Observed by NASA



Accessing LANCE NRT Data and Imagery

Imagery and data from LANCE are available through NASA's Earthdata website, GIBS, Worldview, FIRMS, Earthdata Search and the new Worldview Snapshots which is the replacement for Rapid Response Subsets.

GIBS or the Global Imagery Browse Services (GIBS) delivers global, full-resolution satellite imagery through standards-based APIs.



Screenshot of Worldview showing the Camp Fire, California. The Corrected Reflectance Image is from VIIRS (S-NPP) acquired on 11 November 2018. VIIRS 375m active fire/hotspots are shown in red.

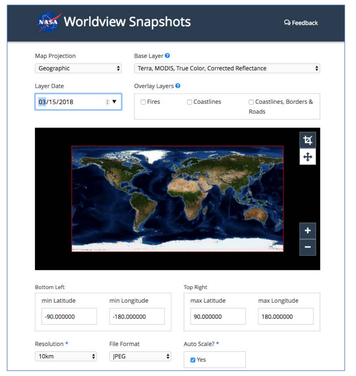
Worldview is the EOSDIS client that displays GIBS imagery. NRT imagery is generally available within four hours of observation and can be compared to previous observations from past dates using the time slider or comparison tool. Arctic and Antarctic data of several products, in suitable polar projections, are also available.

Fire Information for Resource Management System (FIRMS)

FIRMS delivers active fire data from MODIS and VIIRS. Users can view data in an online mapping tool, download the data in vector format or to subscribe to fire email alerts for their area of interest.

Worldview Snapshots

Worldview Snapshots is a new lightweight tool for creating image snapshots from a selection of popular NASA satellite imagery layers. Users can preview and download imagery in different band combinations and add overlays on the imagery of active fire detections, coastlines, borders and roads.



Coming soon

Over the next year the following products will be added to LANCE:

- MODIS Global Flood Products
- VIIRS Nighttime lights data (imagery is already available in Worldview)
- VIIRS – Atmosphere Cloud Mask, Aerosol Dark Target and Aerosol Deep Blue

For more information:

https://earthdata.nasa.gov/lance
GIBS: https://earthdata.nasa.gov/gibs
Worldview: https://earthdata.nasa.gov/worldview
Earthdata Search: https://search.earthdata.nasa.gov
FIRMS: https://earthdata.nasa.gov/firms

Contact: support@earthdata.nasa.gov