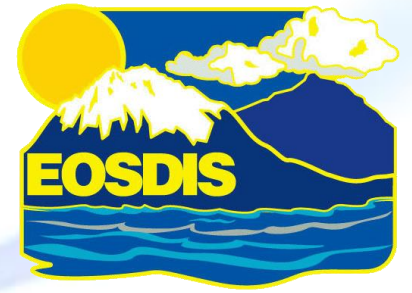


LANCE: Land Atmosphere Near-real-time Capability for EOS





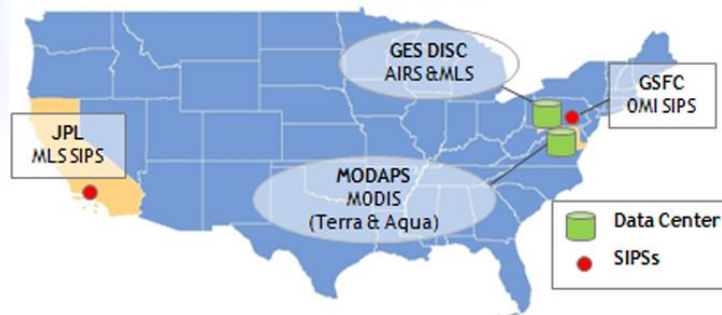
LANCE – A Component of EOSDIS



- The Land Atmospheres Near-real time Capability for EOS (LANCE) is a component of Earth Observing System Data and Information System (EOSDIS) that generates and distributes GLOBAL products from 5 instruments:

- *AIRS (Aqua) and MLS (Aura)*
- *MODIS (Aqua and Terra)*
- *OMI (Aura)*

LANCE Facilities

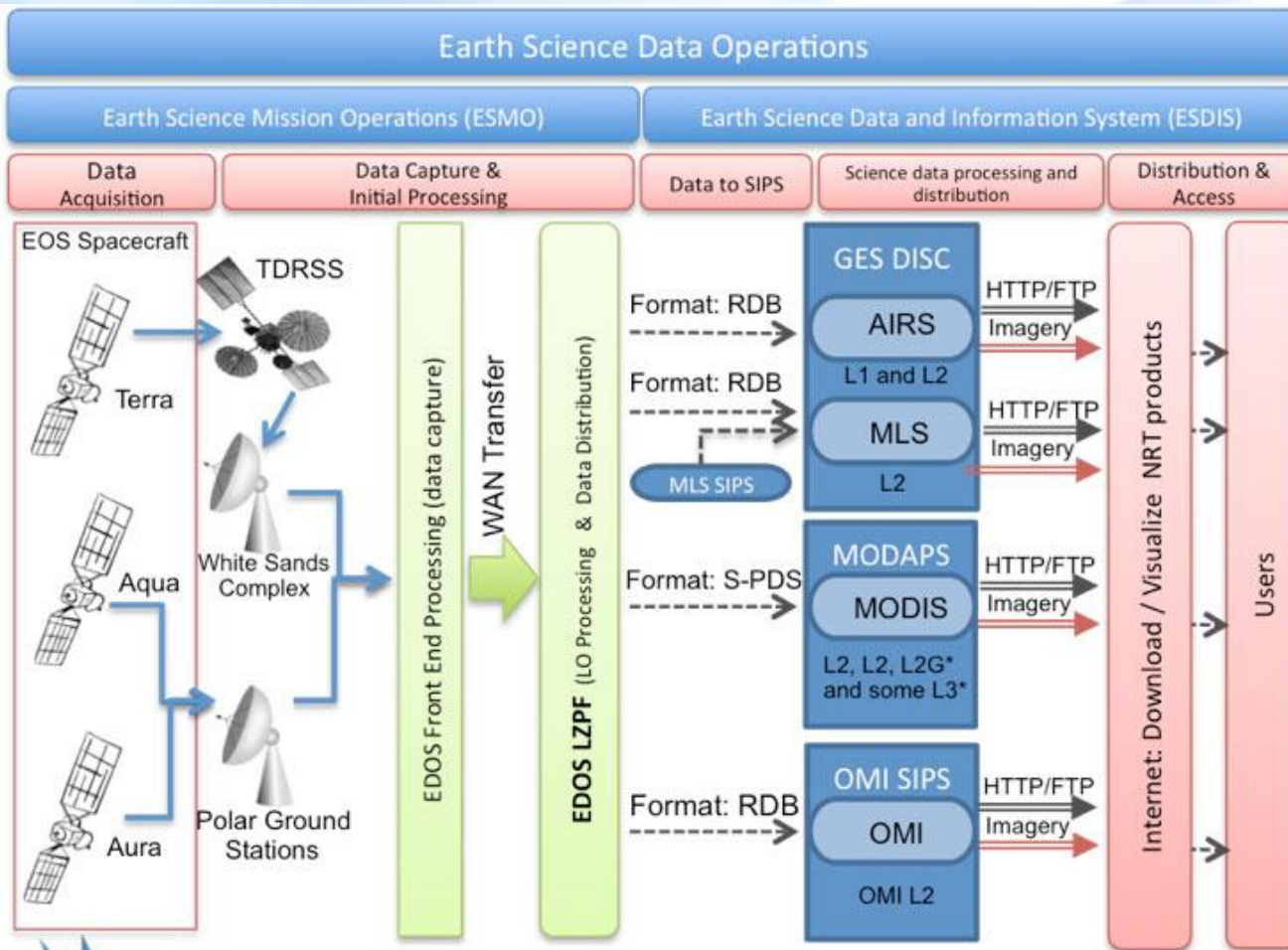


- LANCE Objectives:
 - *Leverage science processing expertise to create high quality NRT products*
 - *To provide Aqua, Terra, and Aura data to applications community within less than 3 hours of observation (The standard, science-quality products are typically available with a latency of 20-48 hours)*
 - *To provide data products with high reliability using redundant systems*
 - *To provide an umbrella environment with uniform high level requirements to foster coordination and cooperation between the individual elements*
- LANCE Web Site: <http://earthdata.nasa.gov/lance>





LANCE System Architecture



RBD: Rate Buffered Data

S-PDS: Session Based Production Data Set

*L2G and L3 daily products have latency of 27-28 Hours.

The Climate Modeling Grid (CMG) is the only L3 MODIS product produced by LANCE.

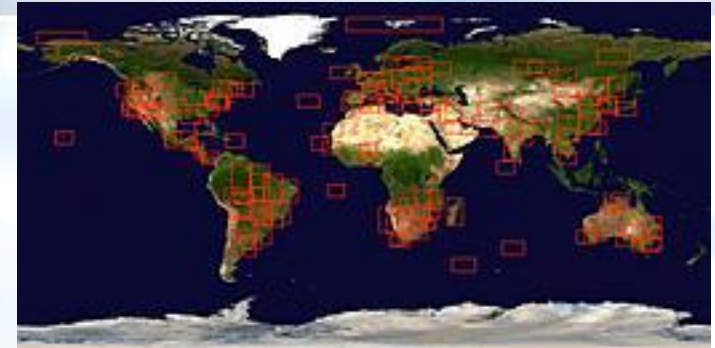




Product Availability



- Both data and imagery are freely available
- **Data products** are available following self registration through FTP and HTTP servers
- **Global Imagery Browse Services and Worldview**
Approx. 100 full resolution browse imagery products from MODIS, AIRS, OMI
- **Rapid Response**
 - MODIS subsets (customized Areas of Interest)
 - MODIS Near real time (orbit swath) images
 - Gallery images
- **FIRMS (Fire Information for Resource Management)**
 - MODIS active fire data viewer / downloads
 - customized fire email alerts
- **Data Casting** feed reader (from PO DAAC) allows users to subscribe to XML-based data feeds using RSS/GeoRSS technologies



Terra / MODIS

Product	Description	PGE	Volume (GB/day)	Browse
AM1EPHNO 🔗	Spacecraft Ephemeris Data	N/A	N/A	N/A
AM1EPHNE 🔗	Extrapolated Orbital Data	97	N/A	N/A
MOD00S 🔗	L0 PDS Data, Session-Based	N/A	N/A	N/A
MOD00F 🔗	L0 PDS Data, 5-Min Swath	95	N/A	N/A
MOD01 🔗	L1A Raw Radiances, 5-Min Swath	01	N/A	N/A
MOD03 🔗	Geolocation, 5-Min Swath 1km	01	N/A	N/A
MOD021KM 🔗	L1B Calibrated Radiances, 5-Min Swath 1km	02	N/A	L1B Radiances Browse 🔗
MOD02HKM 🔗	L1B Calibrated Radiances, 5-Min Swath 500m	02	N/A	L1B Radiances Browse 🔗
MOD02QKM 🔗	L1B Calibrated Radiances, 5-Min Swath 250m	02	N/A	L1B Radiances Browse 🔗
MOD02SSH 🔗	L1B Subsampled Calibrated Radiances, 5-Min Swath 5km	93	N/A	N/A
MOD07_L2 🔗	L2 Temperature and Water Vapor Profiles, 5-Min Swath 5km	03	1.83	N/A
MOD35_L2 🔗	L2 Cloud Mask, 5-Min Swath 250m and 1km	03	0.85	N/A
MOD04_L2 🔗	L2 Aerosol, 5-Min Swath 10km	04	0.15	L2 Aerosol Browse 🔗





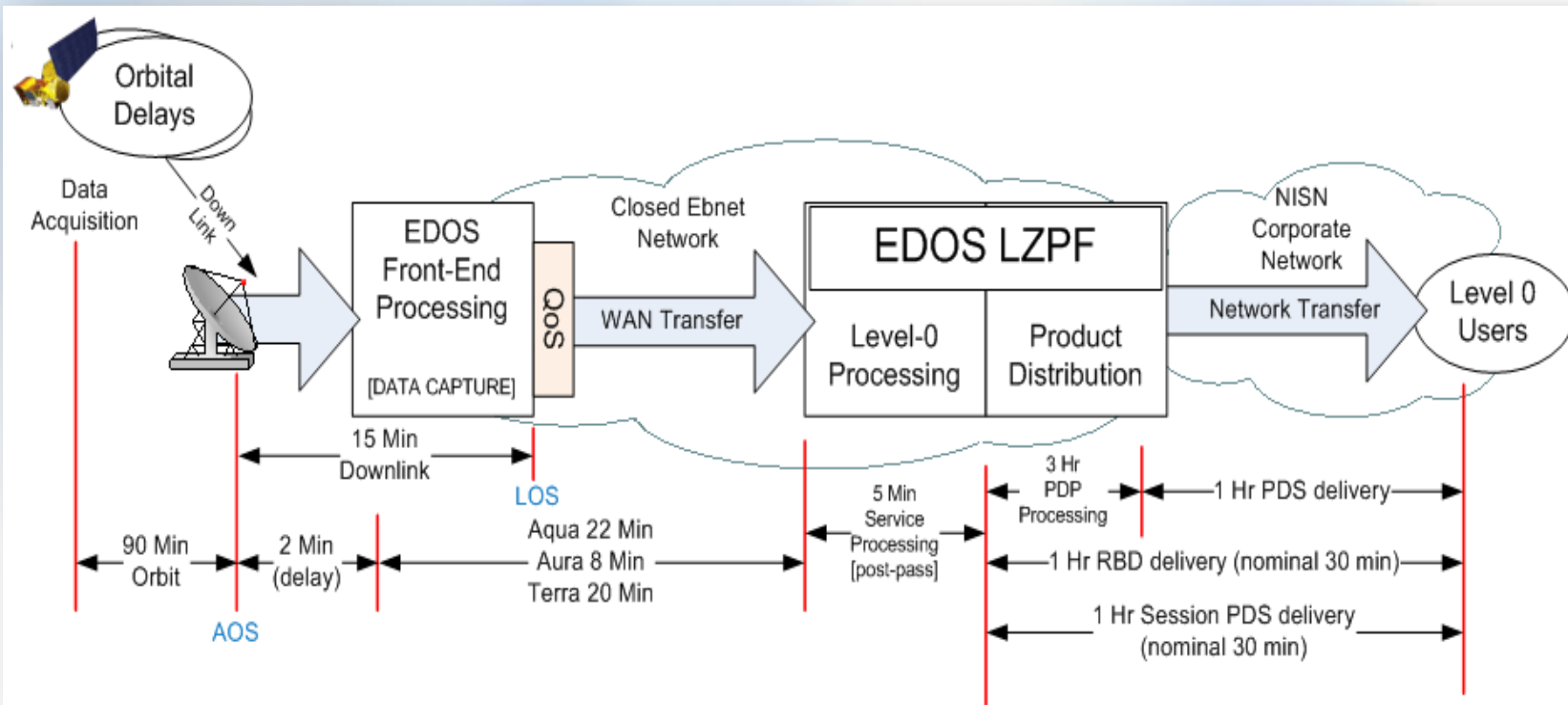
LANCE Data Products



Instrument	Product Categories	Average Latency
AIRS	Radiances, Temperature and Moisture Profiles, Clouds and Trace Gases	1.3 - 2.3 hours
MLS	Ozone, Temperature	1.3 - 2.3 hours
MODIS	Radiances, Clouds/Aerosols, Water Vapor, Fire, Snow, Sea Ice, Land Surface Reflectance (LSR), Land Surface Temperature	1.5 - 2.3 hours excluding the L2G and L3 daily, tiled LSR products
OMI	Ozone, Sulfur Dioxide, Aerosols, Cloud Top Pressure	1.6 - 2.8 hours excluding L3 products

**Over 50 NRT data products are provided by LANCE







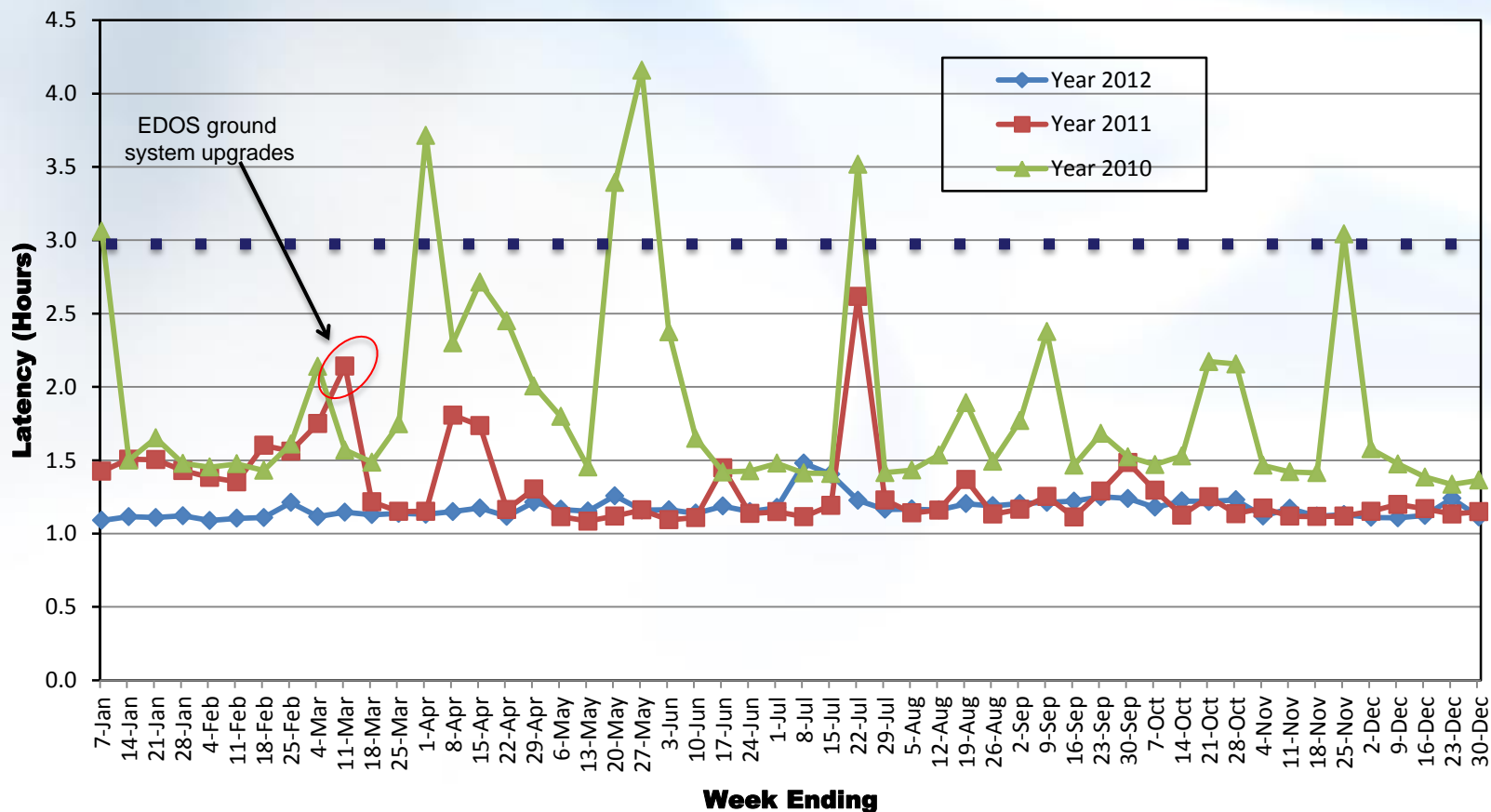
- **EDOS implemented three major latency enhancements in 2011, all focused on decreasing WAN transfer time to LZPF**
 - **Removal of Reed-Solomon decoding bits** (128 bytes/frame)
 - Release C5.4b – all sites – all missions – completed 2/1/2011
 - *Benefit:* 12% decrease in WAN transfer time
 - **Deploy 2nd Terra ebox-R at LZPF to eliminate WAN transfer time for MODIS** – Release C5.4c – completed 3/1/2011
 - *Benefit:* Expedited MODIS RBDs and session-based PDS
 - White Sands Ebox-S configured for dual antenna feeds
 - Ebox-S configured for MODIS and non-MODIS processing
 - New Ebox-R added to LZPF for MODIS-only expedited processing
 - MODIS data receives highest priority QoS routing from White Sands
 - **Implementation of lossless compression/decompression and Terra PN decoding** – Release C5.4d – all sites – all missions - completed 6/1/2011
 - *Benefit:* 20% average decrease in WAN transfer time



Latency - Annual Comparison

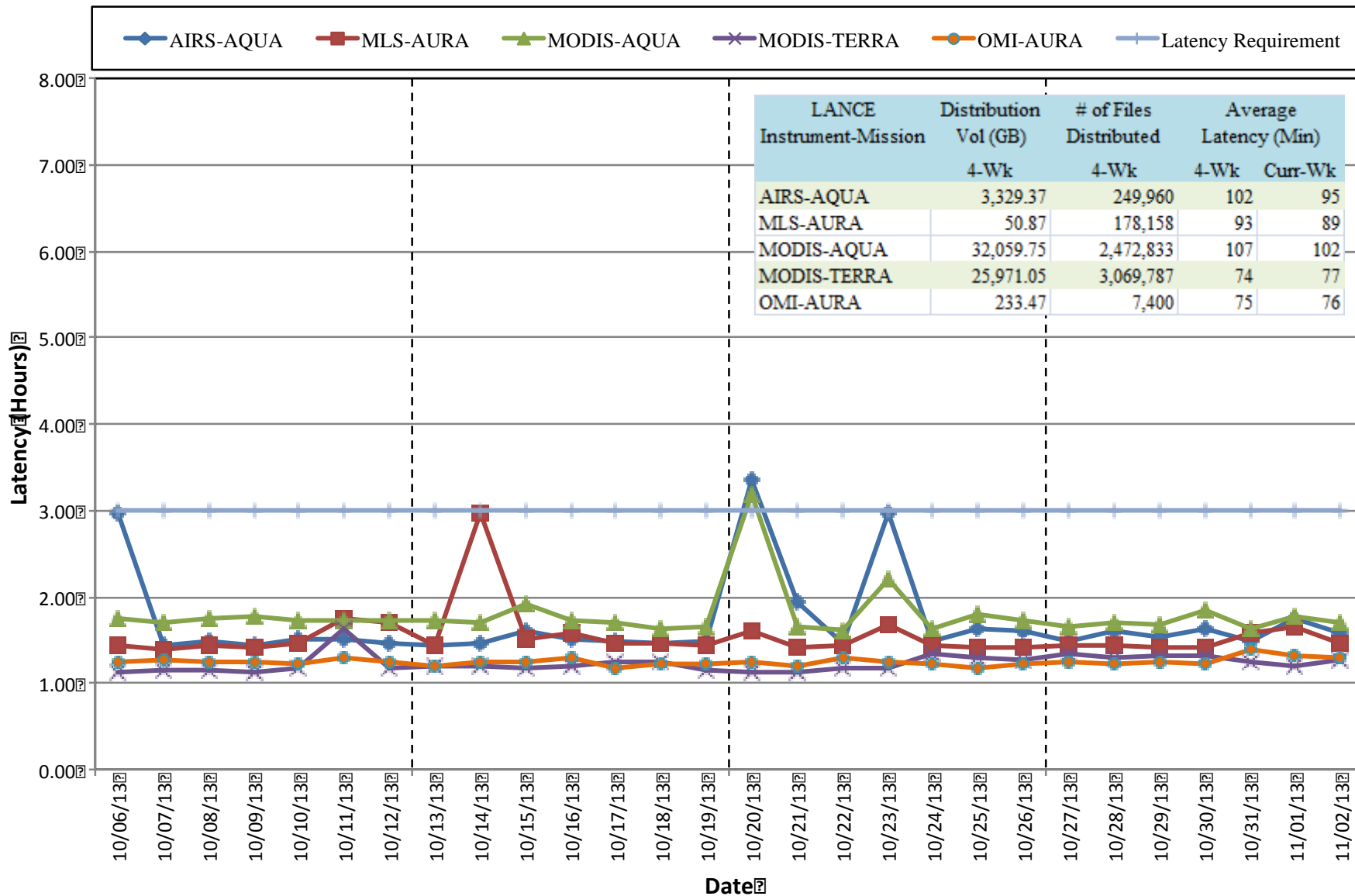


Weekly MODIS-Terra LANCE Latency Trend for Orbital Products (1 January 2010 to 30 December 2012)



Four-Week LANCE-Wide Latency and Distribution Trend for Level 0, 1, & 2 Products

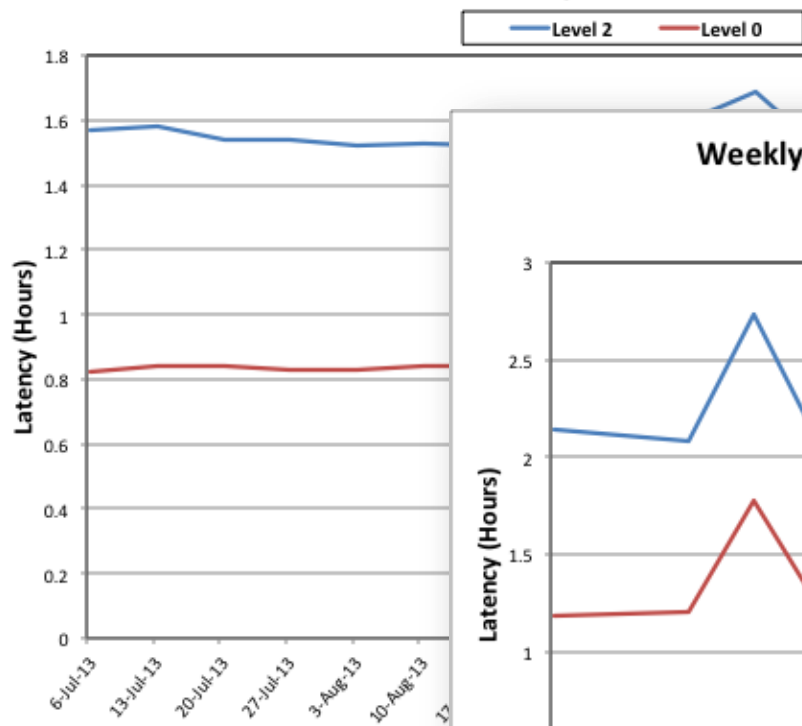
(6 October - 2 November, 2013)





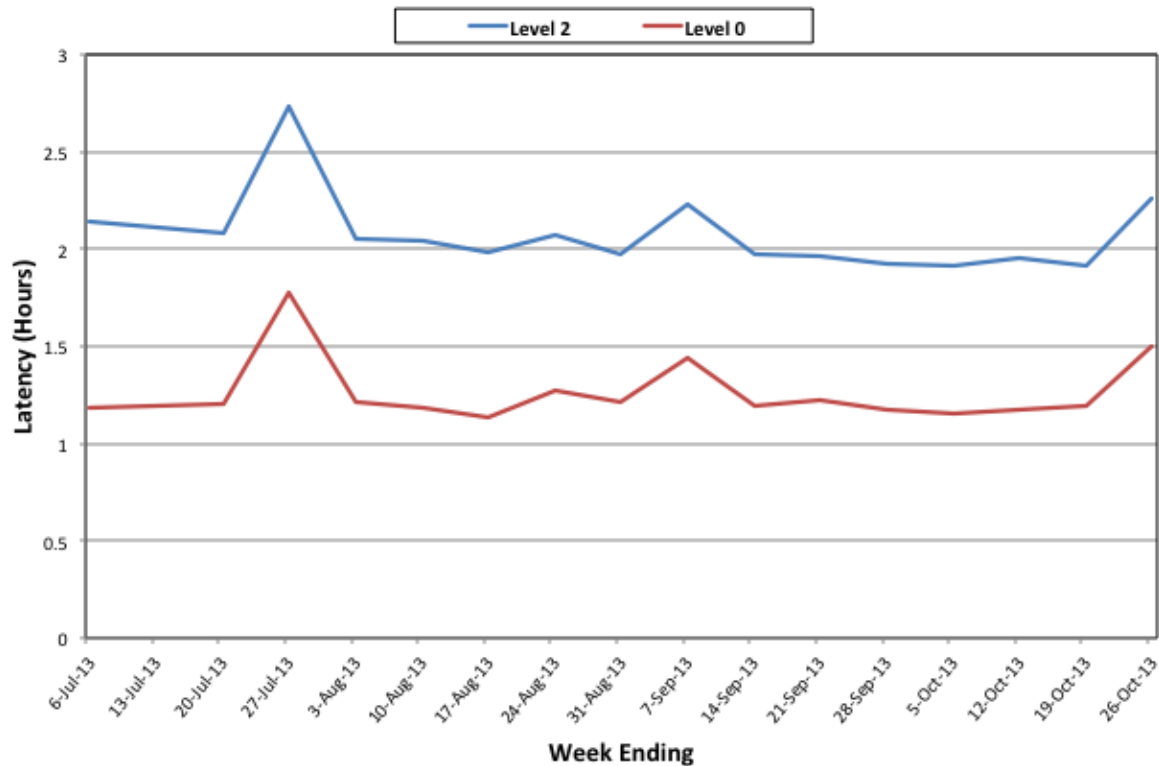
Weekly MODIS (Terra) LANCE Average Hours to Archive

July 6 - October 26, 2013



Weekly MODIS (Aqua) LANCE Average Hours to Archive

July 6 - October 26, 2013





Potential Future Latency Enhancements



- Upgrades to the NASA McMurdo ground station capability in Antarctica or use of nearby commercial stations (such as TrollSat) will provide increased half-orbit opportunities for polar missions to decrease latency from observation time by as much as 45-50 minutes.
- Increases of WAN bandwidth to a minimum of 150 Mbps to all ground stations will essentially eliminate the WAN transfer latency to GSFC – data will be available at GSFC for EDOS distribution at the end of the spacecraft contact.
- On board enhancements for new missions to prioritize the downlink of science data so that high-priority low-latency data is transmitted first, and further enhancements to perform on-board processing so that the data downlinked is already in a format needed by low-latency users (e.g. first responders) without further ground processing.
- Upgrades to EDOS level Zero processing can be made to prioritize both the processing and distribution of selected science data to expedite EDOS delivery of low-latency data.
- Use of a new WAN accelerator protocol to optimize effective use of the WAN bandwidth (ground station to GSFC) will improve science data WAN transfer latency by removing the round trip delay for acknowledgements inherent in the standard TCP protocol. [in progress]
- For future high volume/high rate missions, use of a decentralized EDOS architecture that permits low-latency data to be transmitted to the level zero user directly from the ground station removes the time required to transmit the data to the central site. Requires high-rate network availability.





Global Imagery Browse Services (GIBS)



Access Interfaces

- Web Map Tile Service (WMTS)
- Tiled Web Map Service (TWMS)
- Keyhole Markup Language (KML)
- Web Map Service (WMS)
 - Not externally visible at present.

More Information: <https://earthdata.nasa.gov/gibs>

The screenshot shows the Earthdata Collaboration Environment (ECE) interface. The main content area is titled "GIBS Access Methods" and lists various service types: Introduction, OGC Web Map Tile Service (with sub-items: Get Capabilities, Sample Execution, Service Endpoints), Tiled Web Map Service (with sub-item: Service Endpoints), Google Earth KML Access (with sub-items: Limitations/Notes, Service Endpoints), and Important Notes. Below this is an "Introduction" section stating that GIBS are standard services for delivering global satellite imagery. It also lists the components of GIBS: servers that ingest and convert data, mosaic layers, and servers that serve tiles to clients. The page also mentions that GIBS is built on the "OnEarth" server system at NASA/JPL.

The screenshot shows a news article from Mapbox titled "A Cloudless Atlas - How MapBox Aims to Make the World's Most Beautiful Map". The article discusses how Mapbox is using satellite imagery to create a more accurate and beautiful map of the world, specifically mentioning the use of satellite data to fill in gaps and improve the accuracy of the map. It also mentions that Mapbox is a mapping startup that offers a platform for creating custom maps based on OpenStreetMap and other open data.

The screenshot shows an iTunes review for the "The World Daily" app. The review is from "Neil Fine" and describes the app as a "beautiful and informative" daily news app. It mentions that the app features "beautiful satellite imagery" and "high-quality news content". The review also includes a screenshot of the app's interface, showing a map of the world with various news items overlaid.





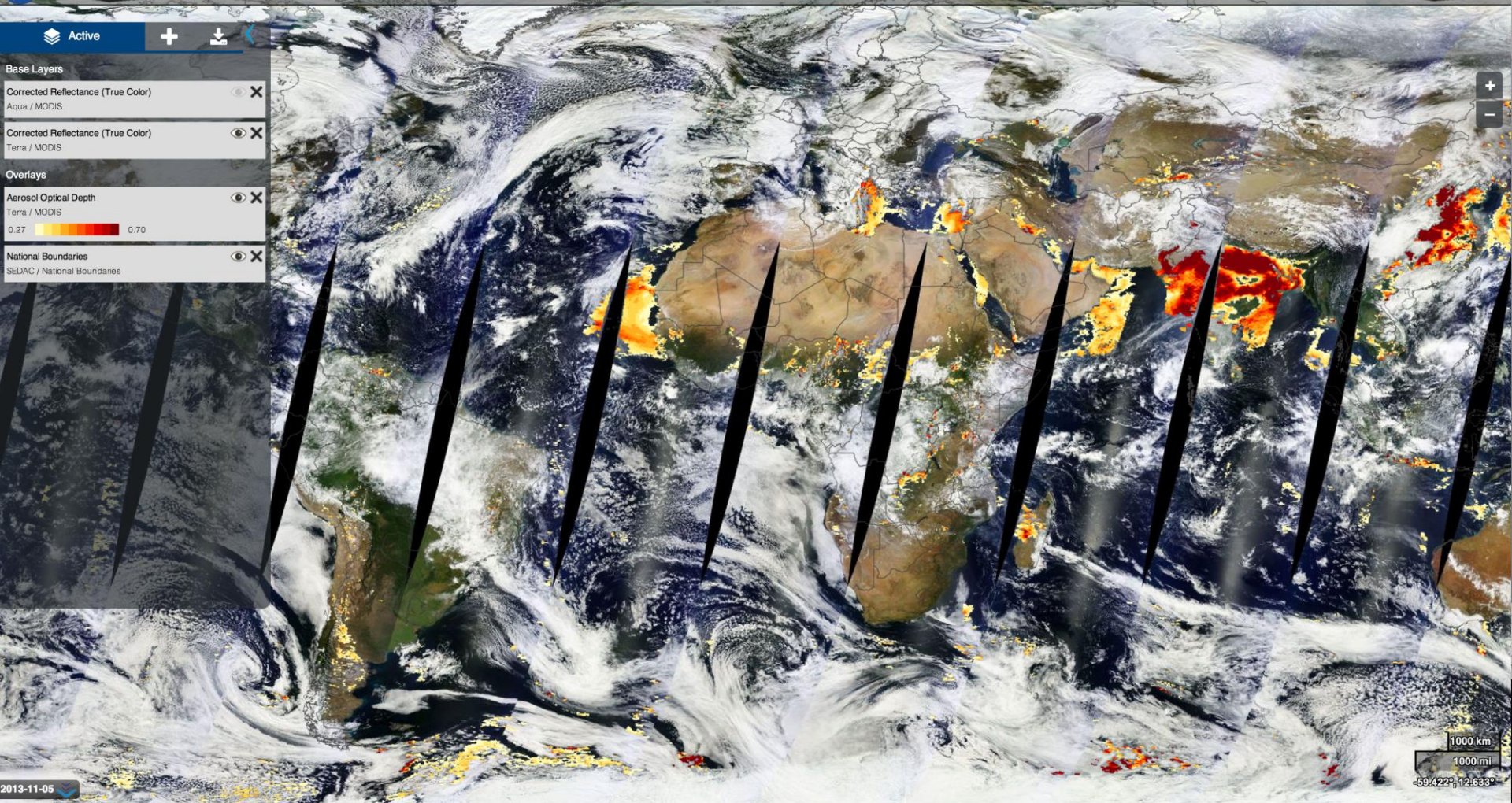
Active + ↓

Base Layers

- Corrected Reflectance (True Color)
Aqua / MODIS
- Corrected Reflectance (True Color)
Terra / MODIS

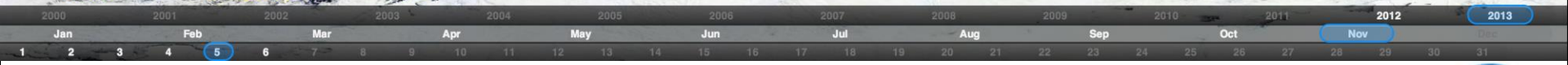
Overlays

- Aerosol Optical Depth
Terra / MODIS
0.27 0.70
- National Boundaries
SEDAC / National Boundaries



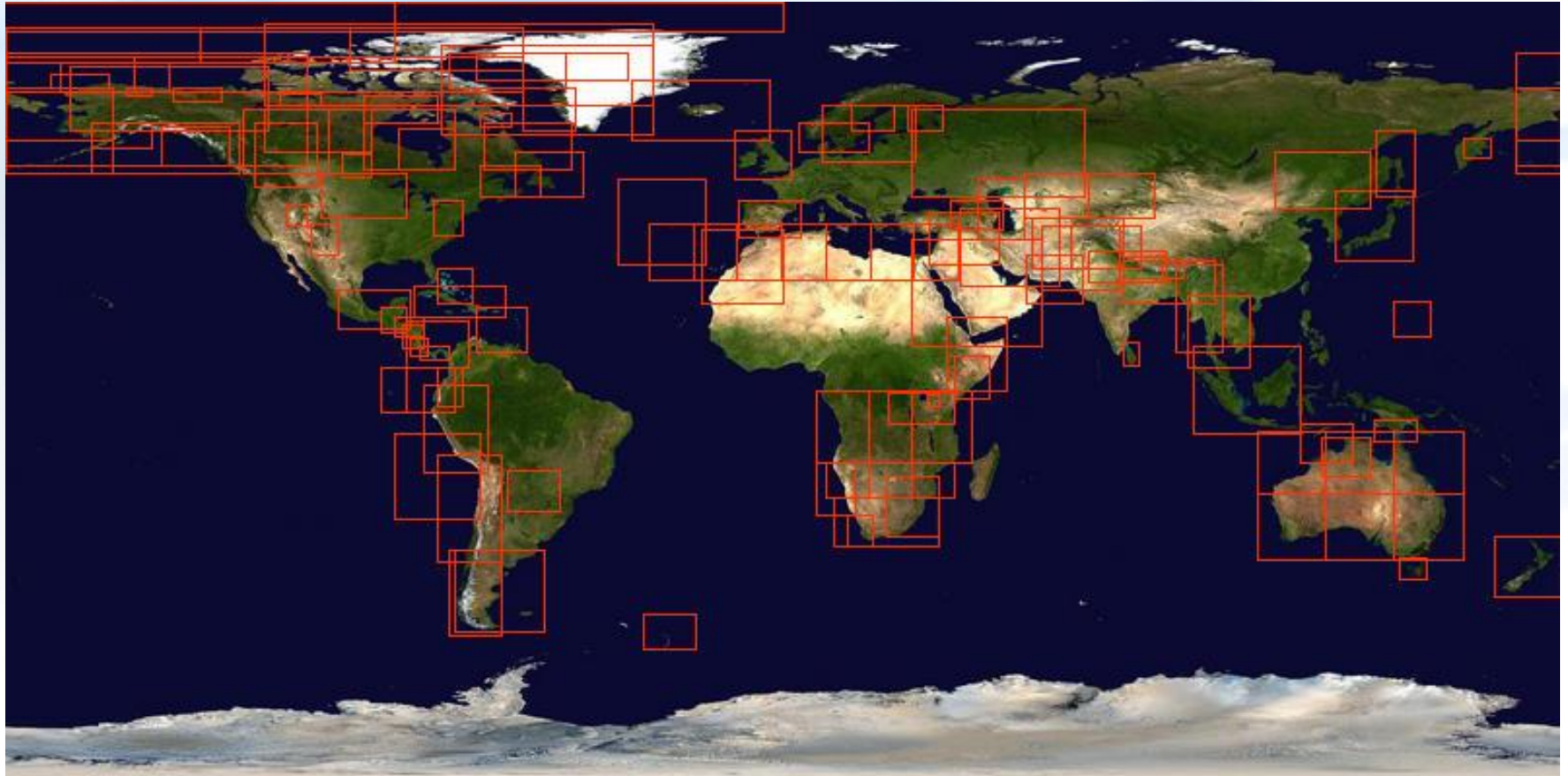
2013-11-05

1000 km
1000 mi
-59.422°, 12.633°





Rapid Response



The Rapid Response component of LANCE allows MODIS images to be downloaded for swaths and user-specified geographic subsets.





Fire Information for Resource Management



FIRMS became operational in LANCE on May 1st 2012

Users can interactively view and query the fire hotspot data in Web Fire Mapper, download data (text, shape or KML files) or subscribe to fire email alerts for their area of interest.

- There are over 6000 fire email alert subscriptions
- Approximately 2000 fire email alerts are sent daily to users in over 120 countries.

NASA FIRMS: Daily Fire Alert (Indonesia)

NASA FIRMS [noreply@earthdata.nasa.gov]

Sent: 27 October 2012 09:55

To: Davies, Diane K. (GSFC-6180)(SIGMA SPACE CORPORATION)

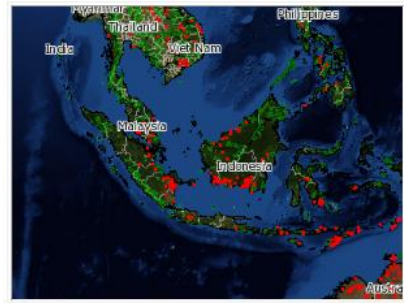
Attachments: FirePoints-102712-13030.csv (10 KB)

NASA FIRMS: Fire Email Alert

[View Your Subscriptions](#) • [NASA FIRMS HOME](#) • [FAQ](#)

Please do not reply to this email. If you have questions/comments, please contact support@earthdata.nasa.gov

Should you wish to cancel or modify your email subscription please go to <http://earthdata.nasa.gov/data/nri-data/firms/email-alerts>



[View map image on NASA FIRMS server](#)

Your Area of Interest (Coordinates) : 87.19, -10.68, 132.19, 11.73

Fires detected over the past 24 hours in your area-of-interest : **302**

(NOTE: Cloud cover might obscure active fire detections. The fire points will be listed only when the total number of active fires detected is less than or equal to 50)

This email was generated on 2012-10-27, 08:55:58 UTC

Disclaimer: The LANCE system is operated by the NASA/GSFC Earth Science Data Information System (ESDIS). The information presented through the LANCE Rapid Response system and the LANCE FIRMS are provided 'as is' and users bear all responsibility and liability for their use of data, and for any loss of business or profits, or for any indirect, incidental or consequential damages arising out of any use of, or inability to use, the data, even if NASA or ESDIS were previously advised of the possibility of such damages, or for any other claim, damage or loss, or any other action, ESDIS neither...

75%

FIRMS Fire Email Alert





End Users of LANCE products



- LANCE products are routinely used by **direct users**, who access data for their own purposes, and by **brokers** who add value to the data by combining it with other specialist knowledge and serve it to targeted end users.
- The beneficiaries include natural resource managers, those working with hazards and disasters and scientists and researchers monitoring and analyzing natural and man-made phenomena.
- In excess of 1.3 TB of data products are distributed each day and approximately 50000 images are downloaded daily





New Capabilities



- Products being added to LANCE – Endorsed by LANCE UWG
 - MODIS Rolling 8-Day NDVI
 - MODIS Rolling Surface Albedo - Level 3 filtered, corrected, and aggregated product when collection 6 processing begins
- Products/Instruments under consideration for inclusion in LANCE:
 - Lighting Imaging Sensor (LIS) - Products generated at the GHRC since the launch of TRMM. Proposal is to provide the near-real time LIS products for LANCE within 2 hours (~90 min) of data observation, thereby reducing the delay in generating science-quality lightning products by 16 hours. In addition to the existing LIS on TRMM, there are plans underway to fly the LIS flight spare for TRMM on the International Space Station (ISS) - Continuity.
 - MISR – Under investigation (Winds and AOD)





Questions

