

# SPoRT R2O Paradigm:

bridging the gap between experimental and operational phases

---

EMILY BERNDT & AARON NAEGER

SHORT-TERM PREDICTION RESEARCH AND  
TRANSITION CENTER

NASA MARSHALL SPACE FLIGHT CENTER

A solid blue horizontal bar at the bottom of the slide.

# SPoRT Mission

---

**Mission:** Transition unique NASA and NOAA observations and research capabilities to the operational weather community to improve short-term weather forecasts on a regional and local scale

SPoRT prepares the **community** of **end users and mission scientists** for next generation satellite missions and capabilities through an interactive R2O/O2R paradigm

## **Current/Future Activities:**

Successful partnerships to prepare NWS forecasters for GOES-R and JPSS through use of experimental proxy products

Expanding partnerships to other government agencies and new NASA missions

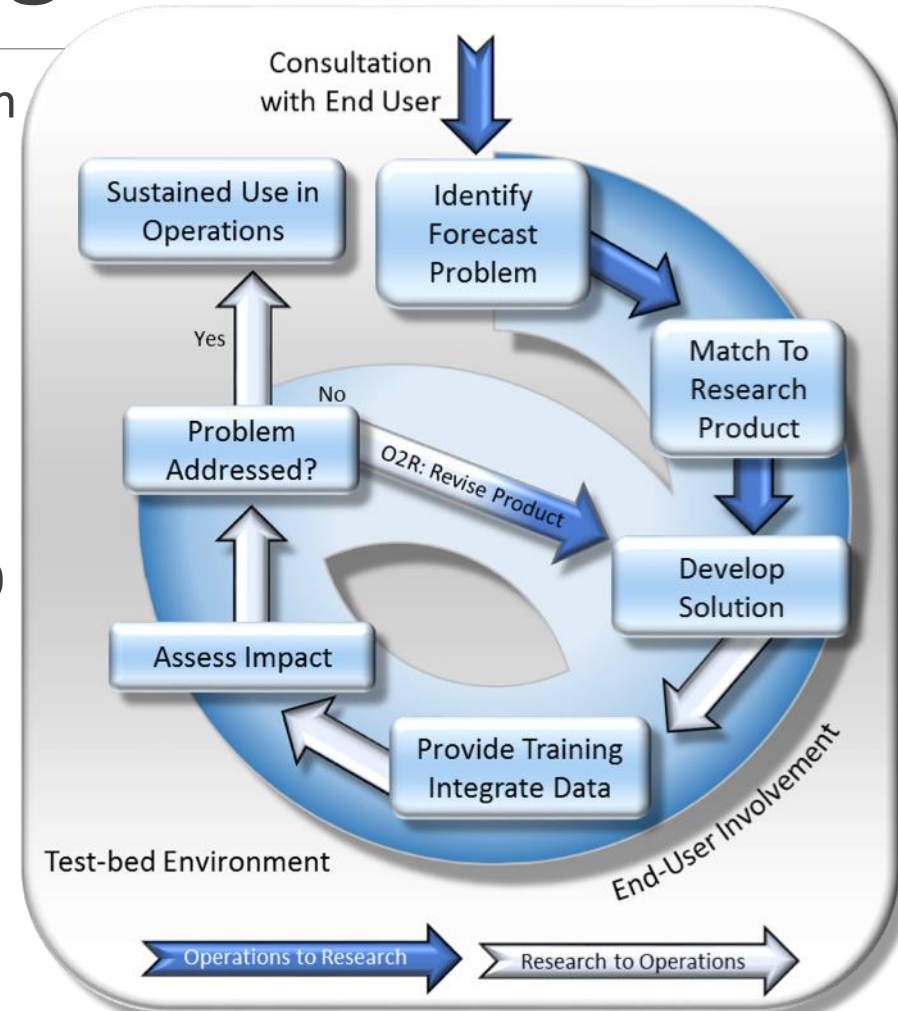
# R2O/O2R Paradigm

Bridge the “Valley of Death” through interactive partnership with end users and product or algorithm developers

- Integrate data into user decision support tools
- Create product training
- Conduct product assessments

Concept has been used to successfully transition more than 40 satellite datasets to operational users for nearly 15 years

Other groups in the community have adopted this paradigm



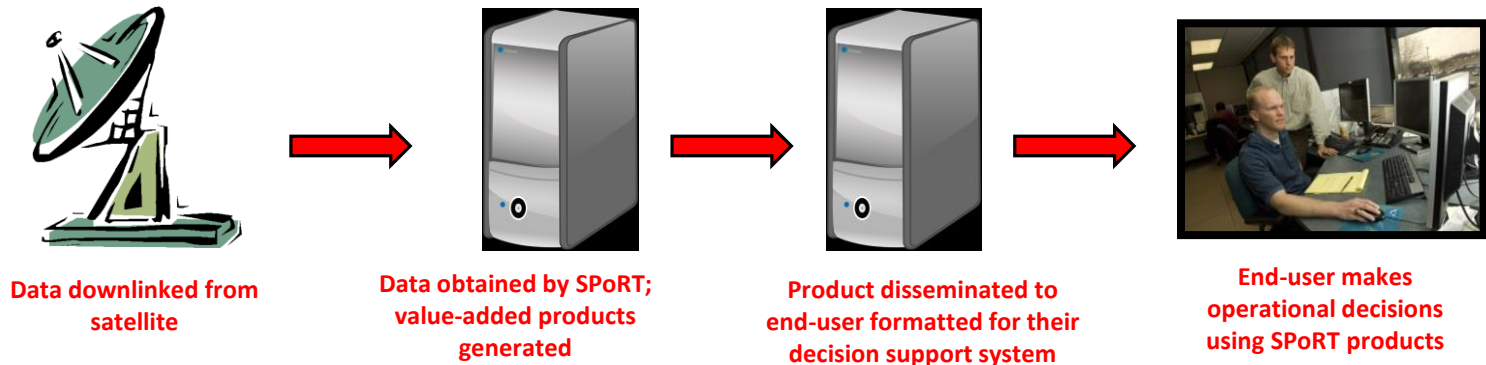
# Data Approach

---

SPoRT provides experimental data to end users by LDM, FTP, and WMS depending on application

While NASA is not an “operational” data provider, team members strive to provide 24/7 data feeds, knowing that product reliability is key to use by operational forecasters and decision makers

Monitor our product ingest and status for all experimental products going to a customer



# Training Approach

Targeted, applications based training

Multiple flavors of training are needed to reach all learning styles

- Site visits
- Microlessons
- User-based, interactive modules
- Quick Guides

## SPoRT Applications Library

- 1-minute examples
- Short videos
- 21 total cases (and counting)

Collaborate with end users for operational/decision maker perspective

The collage illustrates the SPoRT training approach through various components:

- SPoRT Web Interface:** A screenshot of the SPoRT website showing a list of training modules under the heading "micro\_lesson\_RGB\_Fog\_20130823\_NASA\_SPoRT (01:30 / 08:20)". The modules include: 1. RGB Imagery for Aviation and Cloud Analysis, 2. Forecast Issue and Solution, 3. Night-time Microphysics RGB, 4. Fog vs Low Clouds Application, 5. Hybrid Conceptual Diagram, 6. Fog Case: Hybrid 11-3.9um loop, 7. VIIRS 11-3.9um vs NTmicro, 0621 UTC, 8. MODIS 11-3.9um vs NTmicro, 0746 UTC, 9. VIIRS 11-3.9um vs NTmicro, 0805 UTC, 10. VIIRS Day-Night Band RGB, and 11. Summary / Resources.
- Night-time Microphysics RGB:** A detailed view of the "Night-time Microphysics RGB" application. It features a satellite image of a cloud system with various features labeled: "Low stratus (bluish green)", "Mid-level Cumulus, Cumulonimbus (tans, browns)", "Mid/Upper level stratus (purples)", "Fog in Squatchie and TN valleys (grayish aqua)", "Fog in elevated valleys (grayish aqua)", "Mid/Upper level stratocumulus (red tones)", and "Upper level cirrus (dark blue tones)". A text box on the left lists the following differences: "Utilizes MODIS & VIIRS channels/channel differences:", "12.0um-10.8um (optical depth)", "Thicker = more red", "10.8um-3.9um (particle size & phase)", "Small water droplets = more green", "10.8um (thermal)", and "Warmer = more blue".
- Day Convective RGB:** A screenshot of the "Day Convective RGB" application, showing a map of the United States with convective activity highlighted in red and yellow. The application is titled "Application Library: Day Convective RGB" and "Changing Convective Activity Across Georgia".
- Site Visit:** A photograph of a person standing in front of a NASA building, illustrating the "Site visits" component of the training approach.

# Assessment Approach

Targeted product assessments with the end user to evaluate utility of product and give feedback to developers

## Methods for feedback

- Online form
- Email/phone calls
- Blog

## Assessment follow-up

- Wrap-up telecon with participants
- Summarize results in a report for the developers



The screenshot shows a web interface for a survey. At the top, there's a header with 'QUESTIONS' and 'RESPONSES' tabs. Below the header, a green bar indicates 'Section 1 of 3'. The main title of the survey is 'Evaluation of JPSS Satellite Products for Extratropical Transition (National Centers, 2016)'. The text below the title states: 'This trial period will evaluate the utility of NUCAPS Soundings and SPoRT Ozone Product in operations with National Center forecasters at NHC, OPC, and SAB.' It then says: 'This trial is conduct by NASA SPoRT and the JPSS Proving Ground as part of research funded by the JPSS PG/RR Program to assess the utility of JPSS products for hurricane tropical to extratropical transition events.' Finally, it asks: 'Please fill out the two-minute feedback form below to provide NASA-SPoRT and product developers with your experience using the products in operations. Only answer questions that are relevant to the event.'

# “Bridging the gap” between experimental and operational

---

SPoRT prepares the **community** of **end users and mission scientists** for next generation satellite missions and capabilities through an interactive R2O/O2R paradigm

Keys to successful day 1 readiness include:

- Data in the end users’ display system
- Targeted training
- Assessments to gather feedback from users for the mission scientists

Pre-launch R2O/O2R activities can provide valuable input to data processors, mission scientists, algorithm developers, and guide baselining of products/capabilities

# LANCE/WorldView:

NASA operational capabilities for data delivery,  
display, and analysis

---



# NASA LANCE

The screenshot shows the NASA LANCE website. The header includes the NASA logo, 'EARTHDATA Powered by EOSDIS', and navigation links for ABOUT, DATA, COMMUNITY, and RESOURCES. The main banner features a satellite image of Earth with the text 'LANCE: NASA NEAR REAL-TIME DATA AND IMAGERY'. Below the banner is a search bar and a section titled 'Land, Atmosphere Near real-time Capability for EOS (LANCE)'. This section includes a globe icon, a description of the LANCE mission, and links to 'Data' and 'Imagery'. Annotations with arrows point to the 'Data' link under 'Not sure what you are looking for?' (labeled 'Near-real time data') and the 'Overview of Near Real-Time Imagery' link under 'Imagery' (labeled 'Worldview'). At the bottom, there is a section for 'Fire Information for Resource Management System (FIRMS)'.

Earth Observation Data • LANCE: NASA Near Real-Time Data and Imagery

Land, Atmosphere Near real-time Capability for EOS (LANCE)

The Land, Atmosphere Near real-time Capability for EOS (LANCE) supports users interested in monitoring a wide variety of natural and man-made phenomena. Near Real-Time (NRT) data and imagery from the AIRS, AMSR2, LIS (ISS), MISR, MLS, MODIS, MOPITT, OMI, OMPS, and VIIRS instruments are available much quicker than routine processing allows. Most data products are available within 3 hours from satellite observation. NRT imagery are generally available 3-5 hours after observation.

More about LANCE

Data Imagery FIRMS

Not sure what you are looking for?

Hazards and Disasters

Data

Download Near Real-time Data  
Near Real-Time versus Standard Products  
External Near Real-Time Data  
FIRMS/Fire/Hotspot data | Email Alerts

Imagery

Overview of Near Real-Time Imagery  
Worldview  
Global Imagery Browse Services (GIBS)  
Rapid Response

<https://earthdata.nasa.gov/earth-observation-data/near-real-time>

Fire Information for Resource Management System (FIRMS)

FIRMS distributes Near Real-Time (NRT) active fire data within 3 hours of satellite overpass from both the Moderate Resolution Imaging Spectroradiometer (MODIS) and the Advanced Very High Resolution Radiometer (AVHRR).

- The Land, Atmosphere Near real-time Capability for EOS (LANCE) provides data from AIRS, AMSR2, LIS (ISS), MISR, MLS, MODIS, MOPITT, OMI, and VIIRS instruments within 3 hours of satellite overpass
- Near-real time data meets application needs such as numerical weather prediction, **forecasting and monitoring natural hazards**, ecological/invasive species, disaster relief, and **air quality**

# NRT Products

www.earth-observation-data/near-real-time/download-nrt-data

weather, discover and access  
NASA's Earth Science Data with  
Earthdata Search

Reverb is Retiring

**More Resources**

Visualize NRT imagery in Worldview

Global Imagery Browse Services (GIBS)

Hazards and Disasters

FIRMS

Support and Mailing Lists

## LANCE Near Real-Time Products

| Instrument  | Product Categories   | Average Latency     |
|---|--|---------------------|
| Atmospheric Infrared Sounder (AIRS)                                 | Radiances, Temperature, Moisture Profiles, Precipitation, Dust, Clouds and Trace Gases   | 75 - 140 minutes    |
| Advanced Microwave Scanning Radiometer 2 (AMSR2)                    | Global Total Precipitation, Global Rainfall, Total Precipitable Water (TPW), Ocean Wind Speed (OWS), Columnar Cloud Liquid Water (CLW) over ocean, Columnar Water Vapor (CWW) 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) | Lightning, Atmospheric Electricity, Weather Events   | 2 minutes           |
| Multi-angle Imaging SpectroRadiometer (MISR)                        | Cloud motion vectors (Winds), Radiances  | 90 - 120 minutes    |
| Microwave Limb Sounder (MLS)  | Ozone, Temperature, Carbon Monoxide (CO), Water Vapor, Nitric Acid, Nitrous Oxide (N <sub>2</sub> O), Sulfur Dioxide (SO <sub>2</sub> )  | 75 - 140 minutes    |
| Moderate Resolution Imaging Spectroradiometer (MODIS)               | 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)               | Retrieved CO (Thermal Infrared Radiances)  | 180 minutes***      |
| Ozone Mapping and Profiler Suite (OMPS)                             | Total Column Ozone and Aerosol Index, SO <sub>2</sub> , Ozone Profile  | 180 minutes***      |
| Ozone Monitoring Instrument (OMI)                                   | Ozone, SO <sub>2</sub> , Aerosols, Cloud Top Pressure  | 100 - 165 minutes** |
| Visible Infrared Imaging Radiometer Suite (VIIRS)                   | 375 m Active Fire, Corrected Reflectance Imagery, Land Surface Reflectance<br>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

**Latency of 3 hours or less for all L1 and L2 products**

- The instruments and NRT products are listed and average latency is provided
- MODIS aerosol products have average latencies of 2 hours or less
- Air quality instruments (OMPS and OMI) have higher latencies approaching 3 hours
- Can we achieve average latencies of 2 hours or less for TEMPO L1 and L2 products?
- Links to additional details and NRT products by clicking on specific instrument
- Link to visualize NRT imagery in Worldview

# OMPS and OMI

/earth-observation-data/near-real-time/download-nrt-data/omps-nrt

**Data**

Disciplines:

**Download Near Real-Time Data**

Advanced Microwave Scanning Radiometer 2 (AMSR2)

Atmospheric Infrared Sounder (AIRS)

Lightning Imaging Sensor on ISS (ISS LIS)

Microwave Limb Sounder (MLS)

Moderate Resolution Imaging Spectroradiometer (MODIS)

Measurements of Pollution in the Troposphere (MOPITT)

Multi-angle Imaging SpectroRadiometer (MISR)

Ozone Mapping and Profiler Suite (OMPS)

Ozone Monitoring Instrument (OMI)

Visible Infrared Imaging Radiometer Suite (VIIRS)

**More Resources**

Visualize NRT Imagery in Worldview

Global Imagery Browse Services (GIBS)

Hazards and Disasters

FIRMS

Support and Mailing Lists

**Ozone Mapping and Profiler Suite (OMPS)**

- Register to download
- Use the hyperlinks below or download directly from either FTP server:
  - <ftp://omips1.omisips.eosdis.nasa.gov>
  - <ftp://omirt2.omisips.eosdis.nasa.gov>
- The directory path is `/<data type>`, where `<data type>` is the specific data type, e.g. NMTO3-L2-NRT, NMSO2-PCA-L2-NRT. (We recommend you copy and paste the ftp link in to your browser as some users experienced issues not being able to download data if they click on the link.)
- Ozone Near Real Time Processing System (SIPS) mailing list [📧](#)
- Data outages and known issues
- Near Real-Time (NRT) versus Standard Products
- Data provider: Ozone SIPS

**OMPS / Suomi-NPP**

| Product (FTP download link) | Description (Common Metadata Repository (CMR) description link) | Volume (GB/day) | Browse                           |
|-----------------------------|---|-----------------|----------------------------------|
| NMTO3NRT                    | OMPS-NPP L2 NM Ozone (O3) Total Column swath orbital NRT        | 0.129           | <a href="#">Worldview Browse</a> |
| NPBUVO3-L2-NRT              | OMPS-NPP L2 NP Ozone (O3) Vertical Profile swath orbital NRT    | 0.007           | N/A                              |
| NMSO2-PCA-L2-NRT            | OMPS/NPP PCA SO2 Total Column 1-Orbit L2 Swath 50x50km NRT      | 0.016           | <a href="#">Worldview Browse</a> |

Back to top

Last Updated: Mar 6, 2018 at 6:27 PM EST

Hyperlink to  
Worldview

/earth-observation-data/near-real-time/download-nrt-data/omi-nrt

**Data**

Disciplines:

**Download Near Real-Time Data**

Advanced Microwave Scanning Radiometer 2 (AMSR2)

Atmospheric Infrared Sounder (AIRS)

Lightning Imaging Sensor on ISS (ISS LIS)

Microwave Limb Sounder (MLS)

Moderate Resolution Imaging Spectroradiometer (MODIS)

Measurements of Pollution in the Troposphere (MOPITT)

Multi-angle Imaging SpectroRadiometer (MISR)

Ozone Mapping and Profiler Suite (OMPS)

Ozone Monitoring Instrument (OMI)

Visible Infrared Imaging Radiometer Suite (VIIRS)

**More Resources**

Visualize NRT Imagery in Worldview

Global Imagery Browse Services (GIBS)

Hazards and Disasters

FIRMS

Support and Mailing Lists

**Ozone Monitoring Instrument (OMI)**

OMI went in to "survival mode" on March 12. It has been restored but the Science Team is reviewing the data before it can be released to the public.

- Register to download
- Use the hyperlinks below or download directly from either FTP server: [omips1.omisips.eosdis.nasa.gov](ftp://omips1.omisips.eosdis.nasa.gov) or [omirt2.omisips.eosdis.nasa.gov](ftp://omirt2.omisips.eosdis.nasa.gov). The directory path is `/<data type>`, where `<data type>` is the specific data type, e.g. OMTO3, OMSO2NRTb.
- OMI Science Investigator-led Processing System (SIPS) mailing list [📧](#)
- Data outages and known issues
- Near Real-Time (NRT) versus Standard Products
- Data provider: OMI SIPS

**OMI / Aura**

| Product (FTP download link) | Description (Global Change Master Directory link)  | Volume (GB/day) | Browse                 |
|-----------------------------|--|-----------------|------------------------|
| OMCLDRR                     | L2 Effective Cloud Pressure and Fraction (Raman Scattering) Swath 13x24 km <a href="#">📧</a>   | 0.01            | N/A                    |
| OMTO3e                      | L3 TOMS-Like Ozone and Radiative Cloud Fraction Daily Global 0.25x0.25 deg <a href="#">📧</a>   | 0.003           | <a href="#">Browse</a> |
| OMTO3                       | L2 Ozone (O3) Total Column Swath 13x24 km <a href="#">📧</a>                                    | 0.71            | <a href="#">Browse</a> |
| OMAUERUV                    | L2 Near UV Aerosol Optical Depth and Single Scattering Albedo Swath 13x24 km <a href="#">📧</a> | 0.07            | N/A                    |
| OMSO2NRTb                   | L2 Sulphur Dioxide (SO2) Total Column Swath 13x24 km   | 0.58            | N/A                    |

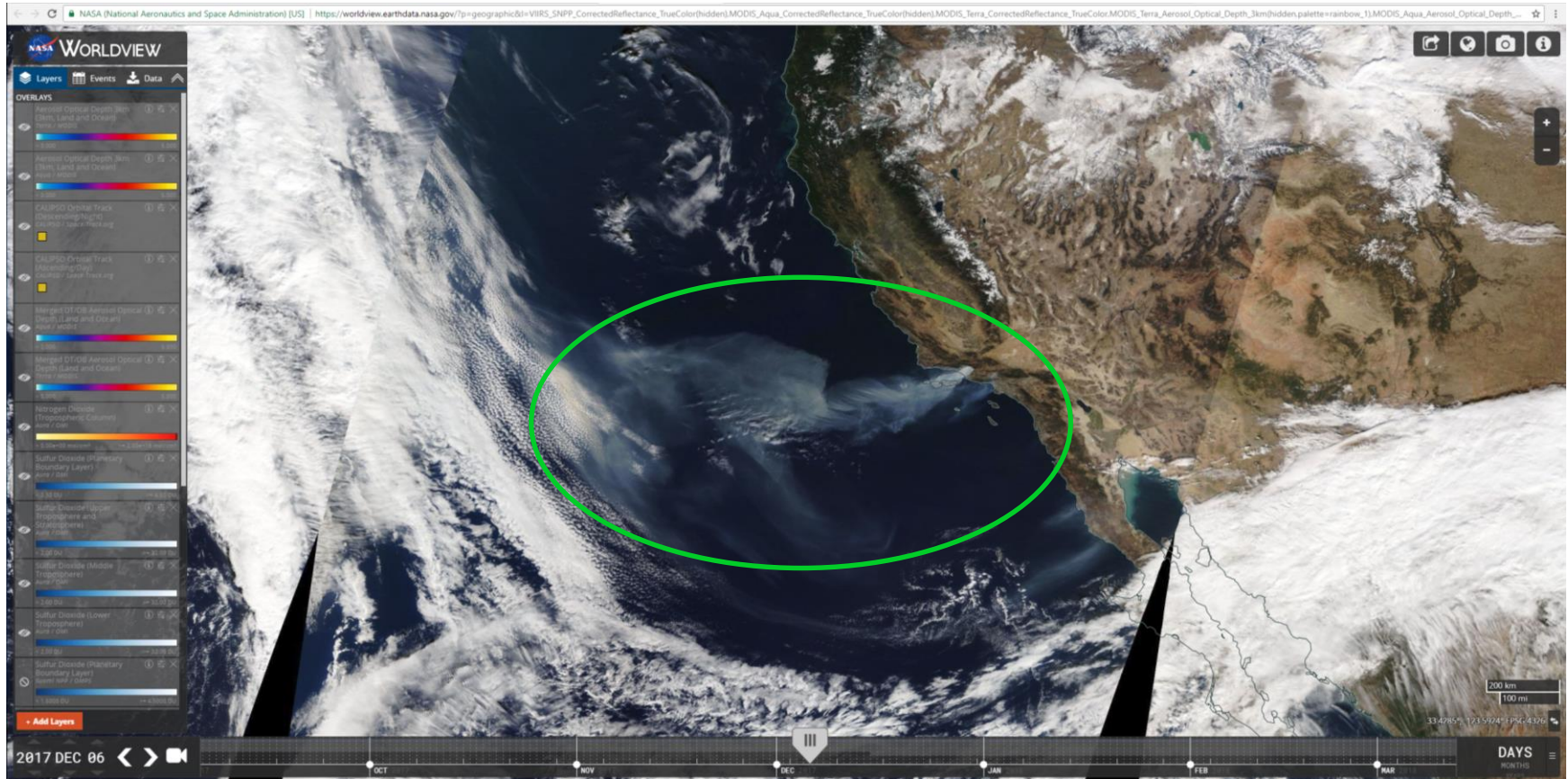
Back to top

Last Updated: Mar 6, 2018 at 6:23 PM EST

Notification on OMI "survival mode" status

- Hyperlinks to download NRT OMPS and OMI data products
- Provides product descriptions and notifications on instrument and data issues
- Hyperlinks to Worldview

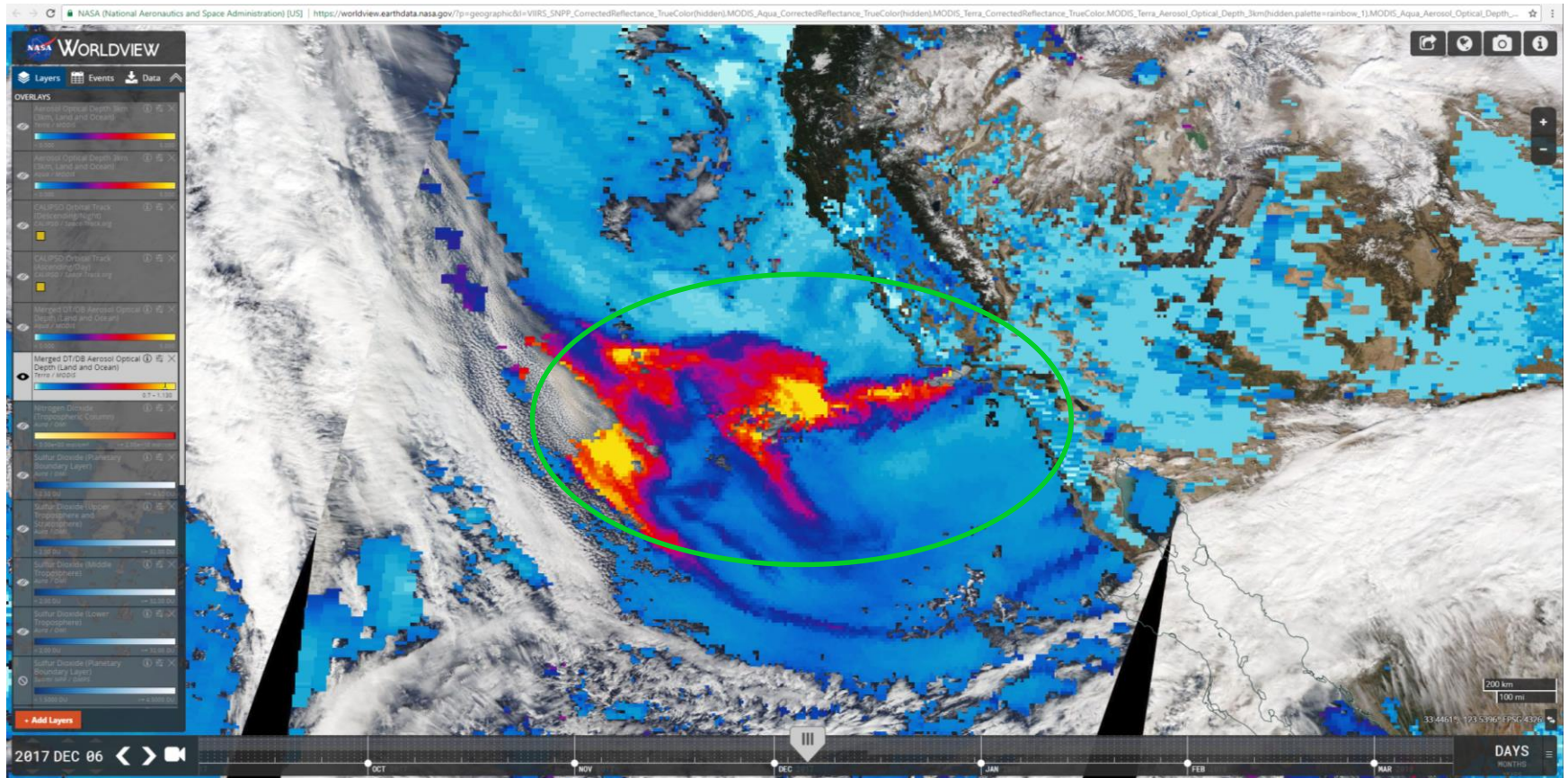
# NASA Worldview – 2017 Dec Fire/Smoke



- MODIS Aqua True Color Red-Green-Blue imagery (generated from L1B product) depict approximate fire location and smoke plume



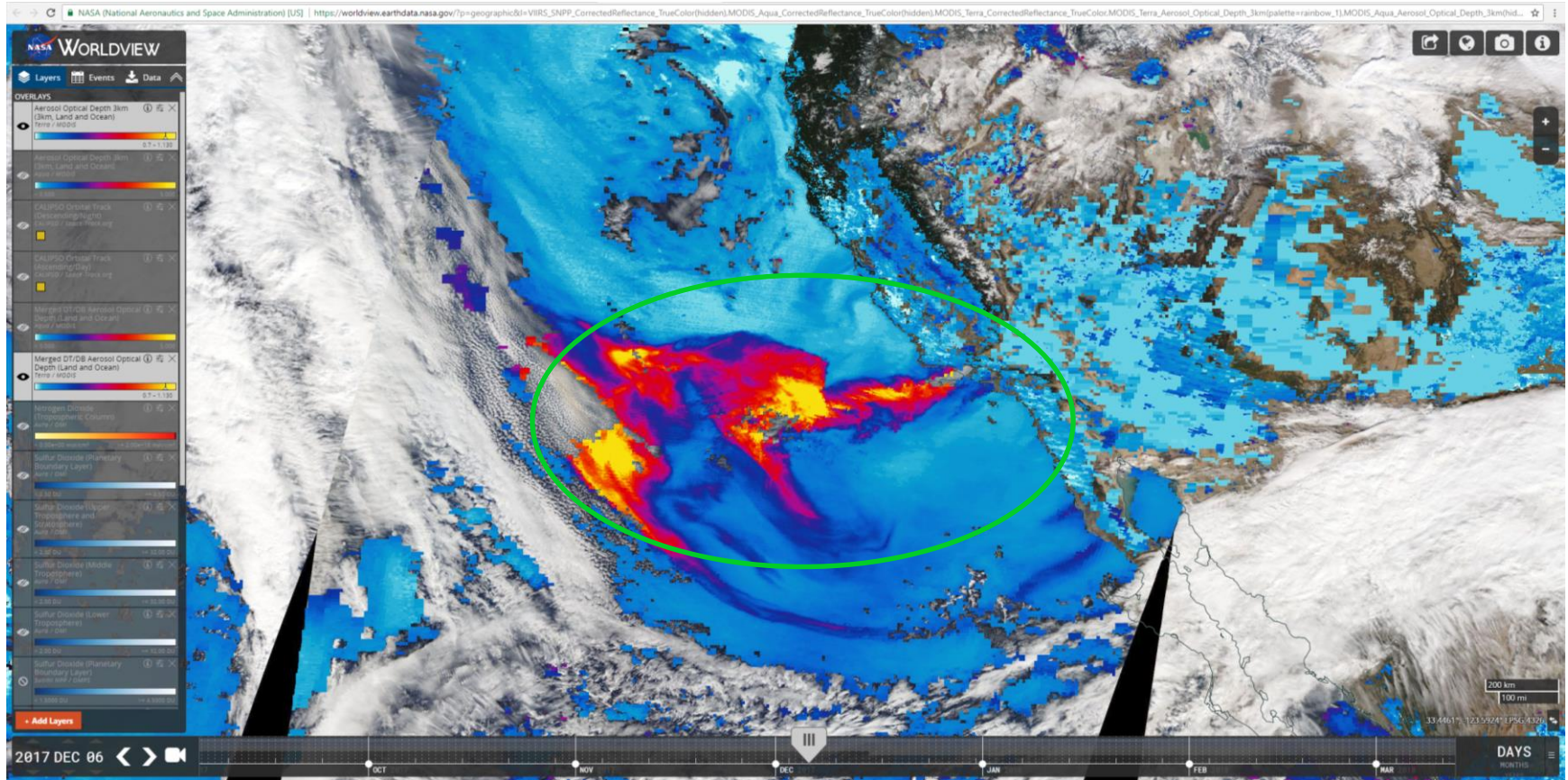
# NASA Worldview – 2017 Dec Fire/Smoke



- MODIS L2 10 km AOD product shows AOD exceeding 1 in portions of plume



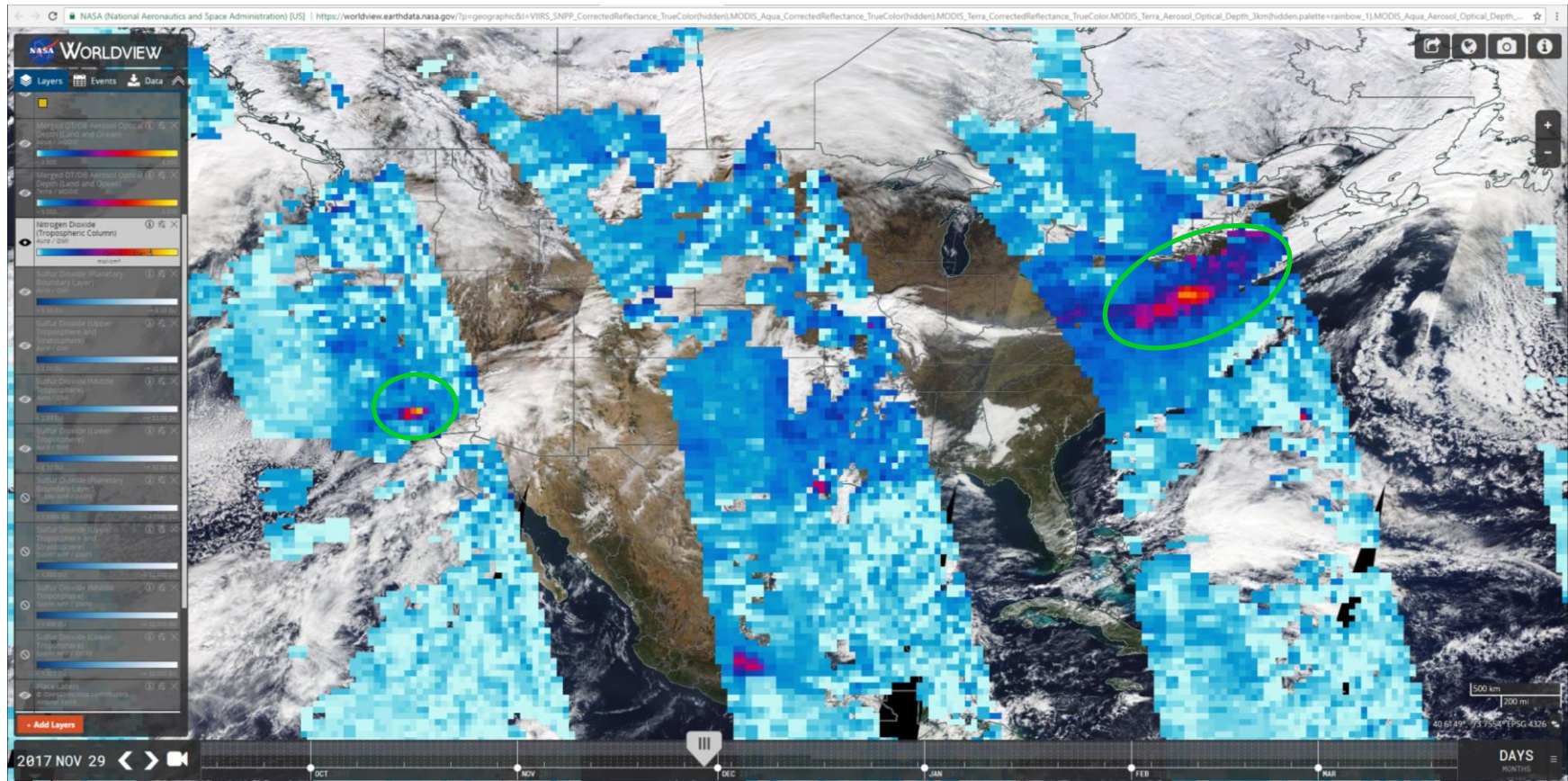
# NASA Worldview – 2017 Dec Fire/Smoke



- MODIS L2 3 km AOD product resolves finer features within smoke plume, which highlights potential for high resolution TEMPO products



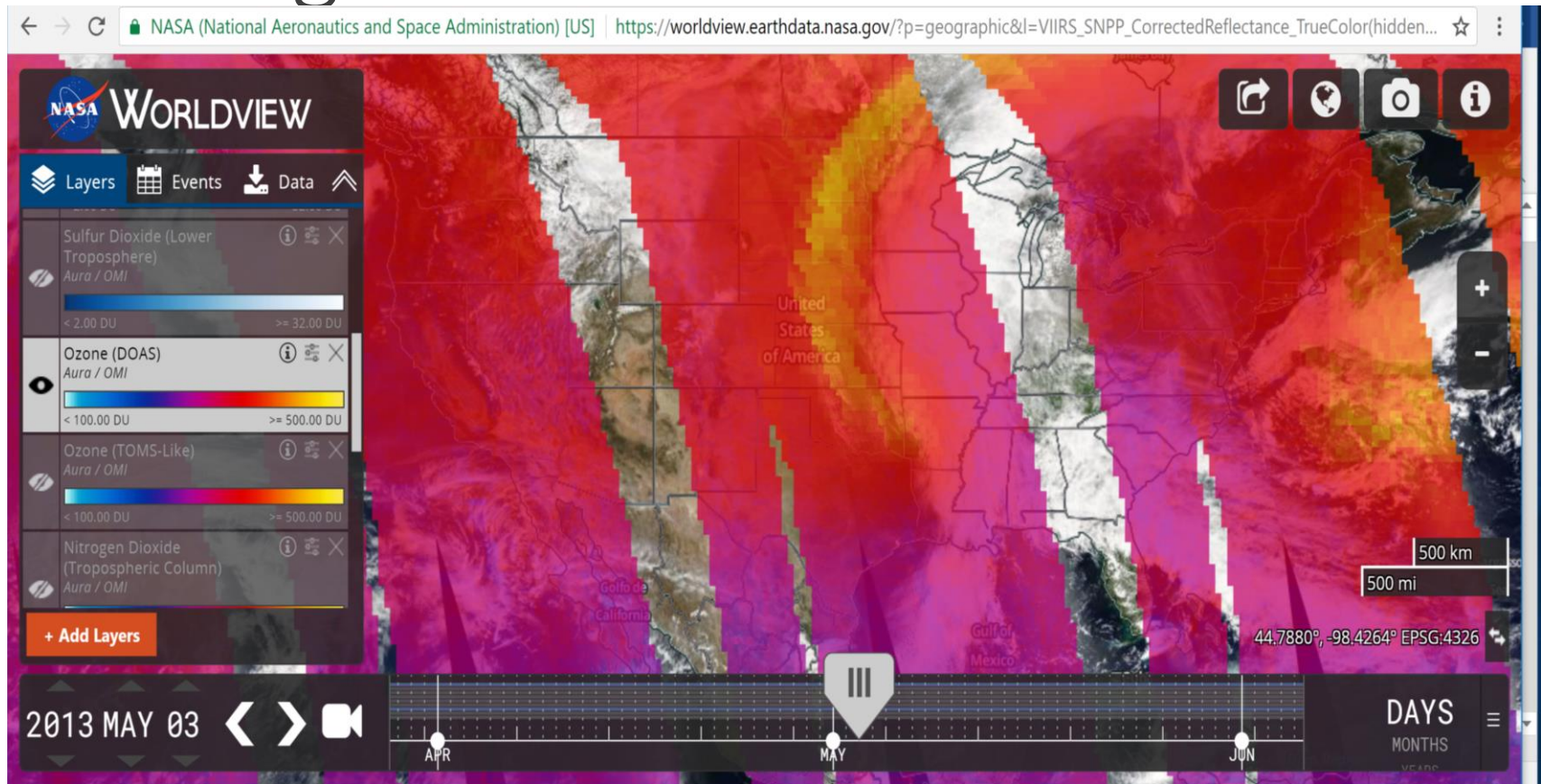
# NASA Worldview – 2017 Nov High Emissions over U.S.



- OMI NO<sub>2</sub> tropospheric columns shows possible locally high emissions over southern California, along with a regional event over northeast U.S.



# NASA Worldview – 2013 May High Ozone over Central U.S



- OMI L2 product shows high ozone over central U.S. identified as a stratospheric intrusion
- Unusually high ozone was observed at surface during this event



# NASA LANCE/Worldview

- NASA LANCE and Worldview provide an excellent framework for distributing and displaying future NRT TEMPO L1 and L2 products
- Operational and research user communities would greatly benefit from providing TEMPO data products in LANCE and Worldview

