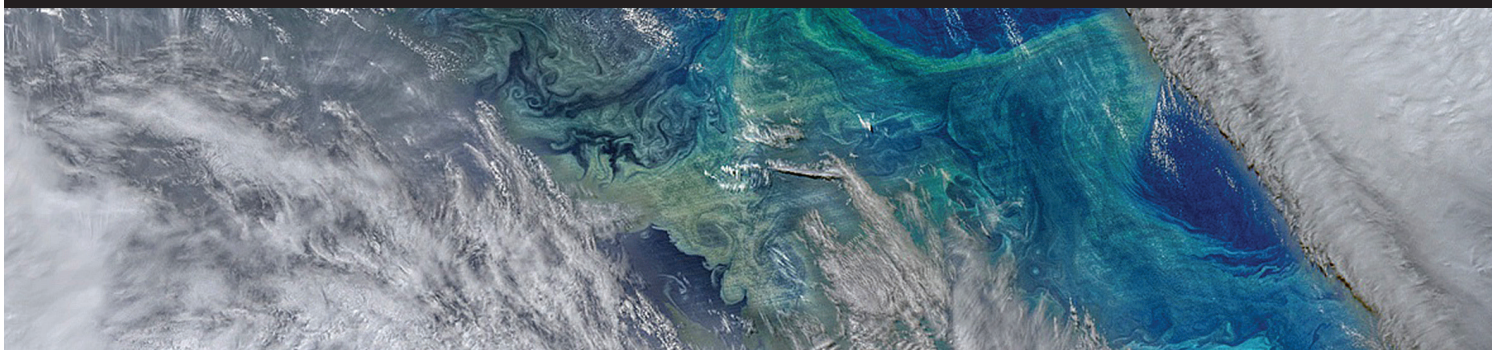
EOSDIS Update

National Aeronautics and Space Administration

FALL 2019

Earth Science Data and Information System (ESDIS) Project

A PUBLICATION OF THE EARTH OBSERVING SYSTEM DATA AND INFORMATION SYSTEM (EOSDIS), CODE 423



TOP STORIES

LANCE Top 10 at 10

NASA's Land, Atmosphere Near Real-time Capability for EOS, better known as LANCE, is 10 years old. Here's a look at 10 LANCE milestones over the past decade.

Since 2009, the Land, Atmosphere Near real-time Capability for NASA's Earth Observing System (EOS), or LANCE, has been providing data and data products generally within three hours of a satellite observation. The products, services, and data distribution strategies developed by the LANCE team have helped transform not only how Earth observing data are used, but also the worldwide accessibility of these data. As LANCE enters its second decade, it's worth looking back at some LANCE milestones. While this list is not meant to be all-inclusive, it provides an overview of how this major initiative evolved to provide data from instruments aboard Earth observing satellites rapidly, accurately, and consistently.

1. Development of the NRTPE and Rapid Response, the precursors to LANCE

The evolution of what would become known as LANCE began in 2001 with the development of the NASA/NOAA/Department of Defense Near Real-Time Processing Effort (NRTPE). At the request of the U.S. Forest Service (USFS), NASA's Earth Science Data and Information System (ESDIS) Project collaborated with the USFS and the University of Maryland Department of Geography to create a system called Rapid Response using the NRTPE feed as a foundation. Rapid Response provided access to near real-time imagery from the Moderate Resolution Imaging Spectroradiometer (MODIS) instrument

IN THIS ISSUE:

Unless otherwise noted, all articles written by Josh Blumenfeld, EOSDIS Science Writer.

aboard NASA's Terra and Aqua Earth observing satellites to support wildfire suppression and response.

2. Establishment of LANCE in 2009

By 2008, a growing demand for near real-time data spurred a NASA Headquarters-led effort to build a new, more robust system to process and distribute near real-time data. In July 2009, the ESDIS Project led the development of a new near real-time system serving data from not only the MODIS instrument, but also the Atmospheric Infrared Sounder (AIRS) aboard NASA's Aqua satellite, the Microwave Limb Sounder (MLS) and Ozone Monitoring Instrument (OMI) aboard NASA's Aura satellite, and, soon afterward, the Advanced Microwave Scanning Radiometer for EOS (AMSR-E) aboard Aqua. This new system was formally established by NASA in September 2009 and named "LANCE."

3. User/Community Feedback Mechanisms Established

In December 2009 the ESDIS Project held a workshop to better understand the needs of LANCE users and to nominate the first members of a new LANCE User Working Group (UWG). This advisory group provides guidance and recommendations concerning topics related to the LANCE system, capabilities, and services and represents the needs of the LANCE applications user communities. The ESDIS Project conducted an informal survey of LANCE users in 2012 to better understand user needs and solicit feedback on improvements to better serve near real-time applications. Formal user surveys were conducted in 2013 and 2016.

4. Rapid Response Integrated with LANCE in 2011

After its establishment in 2001, Rapid Response remained a stand-alone system. Between 2004 and 2011, new MODIS spectral band combinations were implemented to enhance snow/ice, floods, and burn scars. Recognizing the importance of near real-time imagery for users who lived in areas with low internet bandwidth service, the MODIS Rapid Response system was incorporated into LANCE in February 2011. The Rapid Response system was phased out in 2019 and replaced with Worldview Snapshots.

5. The Development of GIBS and NASA Worldview Powered by LANCE (2011)

MODIS Rapid Response demonstrated not only the ability to provide near real-time imagery, but also the value of quick and simple access to this imagery. The next step in LANCE's development was the creation of a way for data users to easily download near real-time imagery, interactively explore this imagery, and download the underlying data behind this imagery. The results of these efforts were the development of the LANCE-powered Global Imagery Browse Services (GIBS) and the NASA Worldview interactive data visualization application in 2011. GIBS and NASA Worldview were game-changers in the way near real-time imagery were distributed and used, and provided users with quick and easy access to daily, global imagery in near real-time.

Screenshot of the first Worldview test home page on December 3, 2011. NASA Worldview image.

6. Development of FIRMS

Each dot in this FIRMS Fire Map image acquired on October 23, 2019, is a MODIS-detected hotspot, which may be a wildfire. NASA FIRMS image.

The Fire Information for Resource Management System (FIRMS), initially developed at the University of Maryland, was transitioned to LANCE in May 2010, and became formally operational in LANCE in May 2012. FIRMS provides near real-time thermal anomaly data (including an approximate location of a detected hotspot) from the MODIS and Visible Infrared Imaging Radiometer Suite (VIIRS) instruments. Global active fire detections can be viewed interactively using the FIRMS Fire Map application, and FIRMS users can sign up to receive email Fire Alerts notifying them of potential fires detected in specific areas of interest. Through this free service, alerts can be received in near real-time or as daily or weekly

summaries. Every week approximately 240,000 FIRMS alerts (including daily alerts, Rapid Alerts, and weekly alerts) are sent to users in more than 160 countries, according to the FIRMS team.

7. Improvements in Near Real-Time Data Latency and Reliability

The overall LANCE objective is to provide near real-time data and imagery generally within three hours of an instrument observation. NASA's Earth Observing System (EOS) Data and Operations System (EDOS) is the primary provider of all LANCE instrument data directly downloaded from NASA EOS satellites like Terra, Aqua, and Aura. In 2011, EDOS made significant enhancements to the way these data were streamed from ground stations and also improved the way these data were processed and prioritized, which helped reduce the latency for data delivered to LANCE. Today, most LANCE products are available to data users less than three hours after an observation, with some products being available less than two hours after acquisition.

8. First non-EOS mission instrument data added to LANCE in 2015

The addition of Advanced Microwave Scanning Radiometer 2 (AMSR2) data from the Japan Aerospace Exploration Agency Global Change Observation Mission-Water (GCOM-W1) satellite in March 2015 was the first non-EOS mission data added to LANCE. Currently, six unique AMSR2 data products are available through LANCE.

9. Significant growth in data available through LANCE

The addition of AMSR2 near real-time data was followed by the addition of data from several more instruments, including:

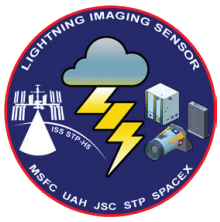
- Multi-angle Imaging SpectroRadiometer (MISR) aboard NASA's Terra satellite; June 2016
- Measurement of Pollution in the Troposphere (MOPITT) aboard Terra; October 2017
- VIIRS aboard the joint NASA/NOAA Suomi National Polar-orbiting Partnership (Suomi-NPP) satellite; first of several data products added February 2016
- Ozone Mapping Profiler Suite (OMPS) aboard Suomi-NPP; December 2017
- VIIRS aboard the joint NASA/NOAA NOAA-20 satellite; August 2019

Along with new instrument data, new data products are constantly being added to the system. Recent additions include:

- VIIRS Nighttime Imagery product; January 2017
- MODIS Global Near Real-Time Flood Product; approved in April 2017
- OMPS Pyrocumulonimbus product (PyroCb); October 2018
- MODIS Thermal Alert System (MODVOLC); produced in 2019 by LANCE from MODIS data to serve the volcano monitoring community and distributed primarily through the University of Hawaii
- MODIS Multi-Angle Implementation of Atmospheric Correction (MAIAC); produced in 2019 by LANCE to support the air quality and climate/atmospheric modeling communities

10. Addition of first International Space Station mission data in 2018

The Lightning Imaging Sensor (LIS) was installed on the International Space Station in February 2017. LANCE LIS near-real time data are available within two minutes of observation and provide total lightning measurements between +/- 48 degrees latitude, a geographic range that includes nearly all global lightning. ■



Published October 30, 2019

NASA Earth Observing Data and Tools Aid International Education

Dr. Don McNeil at Prince of Songkla University in Thailand uses NASA Earth observing data and tools to teach his students about the natural world.

Dr. Jessica Welch, Science Communication Lead; NASA's Oak Ridge National Laboratory Distributed Active Archive Center (ORNL DAAC)

Danielle Golon, Science Communications Specialist, Innovate!, Inc.; U.S. Geological Survey contractor for NASA's Land Processes DAAC (LP DAAC)

When most people think about Thailand, they probably picture the serene beaches at Phuket or the majestic Temple of the Emerald Buddha (Wat Phra Kaew) in Bangkok. They might not be aware that Thailand launched its first Earth observing satellite—the Thai Earth Observation System, or THEOS (also known as THAICHOTE-1)—in 2008 and has plans for future Earth observing missions.

Dr. McNeil (center in blue shirt) with students and staff at Prince of Songkla University on a balcony overlooking the Gulf of Thailand. Image courtesy of Dr. McNeil.

Data from NASA's Earth Observing System Data and Information System (EOSDIS) are an important resource for training new generations of Thai scientists and engineers not only about the engineering behind the remote sensing of Earth, but also about Earth processes and cycles. Dr. Don McNeil, Research Coordinator for the PhD Program in Research Methodology at Prince of Songkla University, Pattani Campus, in southern Thailand, uses data from NASA's Moderate Resolution Imaging Spectroradiometer (MODIS) instrument to show his students how remotely-sensed Earth observing data can be used to study climate science. "Given that remote sensing climate data covering the whole world are freely available from NASA, our goal is to learn from these data," says Dr. McNeil (or "Ajarn Don," as he is called by his students using the Thai word for "teacher").

The university has a firm stance on using only free and open-source data and software to conduct research. Dr. McNeil notes several aspects of NASA Earth observing data that make them ideal: they have global coverage, they are freely distributed, and all the algorithms used to produce and analyze the data are openly available. In addition, tools necessary for analyzing the data, along with the application programming interfaces (APIs) behind the tools, are all available through EOSDIS Distributed Active Archive Centers (DAACs).

Dr. McNeil's specific area of interest is temperature change and the drivers behind it. He has been using MODIS products such as Land Surface Temperature and Emissivity (MOD11A2) to investigate how daily land surface temperature has changed across the globe. His source for these data is NASA's Land Processes DAAC (LP DAAC). LP DAAC is a partnership between NASA and the U.S. Geological Survey (USGS) and is responsible for archiving and distributing EOSDIS data related to land processes.

Dr. McNeil and his students analyzing data in the classroom. The projected wall image on the left shows the result of a MODIS data subset using the ORNL DAAC's Global Subsets Tool. The projected wall image on the right shows thematic maps of daily land surface temperature increase in North and South America and Antarctica using a laterally rotated Mollweide Earth projection. Image courtesy of Dr. McNeil.

For processing and transforming these MODIS data, Dr. McNeil and his students use the Global Subsets Tool. The Global Subsets Tool was developed by NASA's Oak Ridge National Laboratory DAAC (ORNL DAAC), which is the home for NASA EOSDIS data and information related to biogeochemical dynamics, ecological data, and

environmental processes critical for understanding the biological, geological, and chemical components of Earth's environment.

Dr. McNeil's students have published a variety of papers that used MODIS data and analysis tools. These include a 2017 study by Wongsai, et al., (doi: 10.3390/rs9121254) that used a natural cubic spline function to examine land surface temperature seasonality and a 2018 study from I. Sharma (doi: 10.22034/IJHCUM.2018.04.02) that examined trends in vegetation and temperature around Nepal.

Through the use of NASA Earth observing data and open-source products like the Global Subsets Tool, Dr. McNeil hopes to widen his students' research efforts and create a strong and sustainable program that will continue to attract students who want to use science to improve the world. "We are not just interested in local events," he observes. "Climate and its impact on life on our planet is obviously one of the most important issues in today's world, so it's quite important that appropriate methods are used to learn what to do about it." ■

Published October 9, 2019

Now Available in NASA Worldview: Earth Every 10 Minutes

The addition of GOES-East, GOES-West, and Himawari-8 geostationary imagery updated every 10 minutes lets you view Earth as it is "right now."

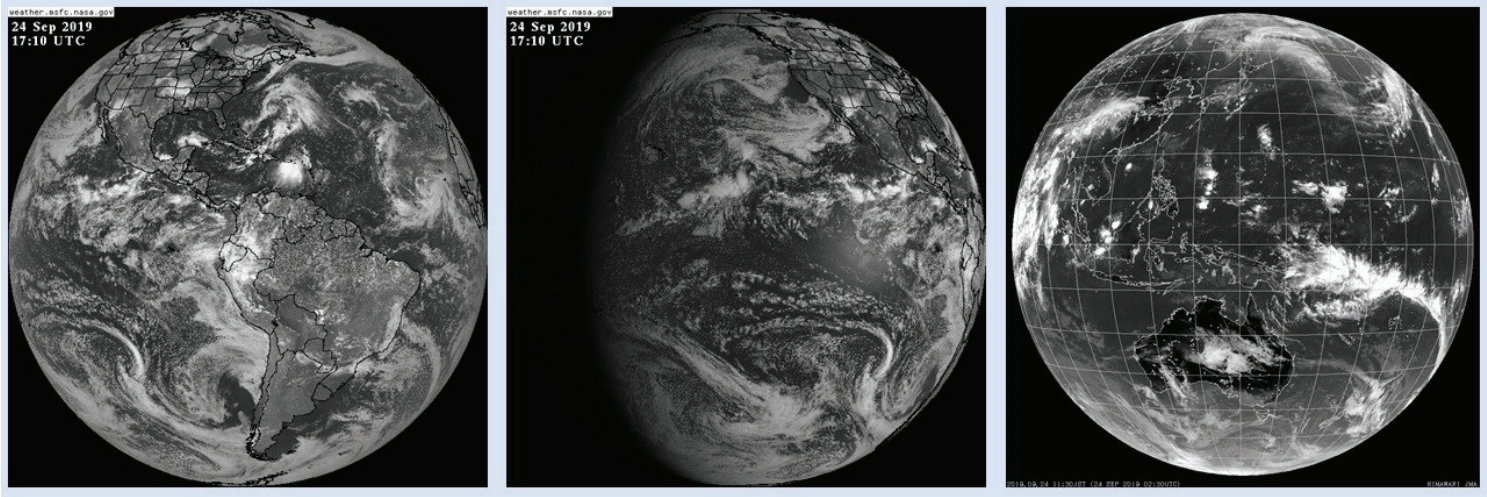
Imagery from the Moderate Resolution Imaging Spectroradiometer (MODIS) instrument aboard NASA's Terra and Aqua Earth observing satellites is great for tracking the movement of natural events over several days, like a hurricane churning across the ocean or a wildfire spreading through a forest. However, the one or two daily images provided by polar-orbiting satellites like Terra and Aqua are not the best resource for tracking rapidly-developing events as they happen in real-time, like a line of late-day severe storms popping or a wildfire's sudden change in direction. For these situations you need imagery of the same location that is constantly-updated.

This geostationary imagery of Earth—updated every 10 minutes—is now available through NASA's Global Imagery Browse Services (GIBS) for viewing using NASA's Worldview interactive data visualization application.

Full-disk Earth imagery products from the joint NASA/NOAA Geostationary Operational Environmental Satellite-East (GOES-East) and GOES-West satellites along with full-disk imagery from the Japan Meteorological Agency Himawari-8 satellite enable storms, wildfires, and other events to be tracked as they are occurring across most of the globe (the only areas not covered are Europe, Africa, and the North and South Poles).

GOES-16, the first satellite in the GOES-R Series, launched on November 19, 2016, and is operational as GOES-East. GOES-17, the second satellite in the GOES-R Series, launched on March 1, 2018, and is operational as GOES-West. Himawari-8 launched on October 7, 2014. GOES-R logo courtesy of NOAA; Himawari-8 logo courtesy of the Japan Meteorological Agency.

The same three imagery products are available for each satellite as part of this initial release: Red Visible, which can be used for analyzing daytime clouds, fog, insolation, and winds; Clean Infrared Product, which provides cloud top temperature and information about precipitation; and Air Mass RGB, which enables the differentiation between air mass types (e.g., dry air, moist air, etc.). "The geostationary field of view is always the same and the satellite sensor collects an entire hemispheric view every 10 minutes," says Ryan Boller, the Data Visualization Lead for NASA's Earth Science Data and Information System (ESDIS) Project. "This enables you to see things move in pretty much real-time and monitor changes much more closely than you can with an instrument aboard a polar-orbiting satellite."

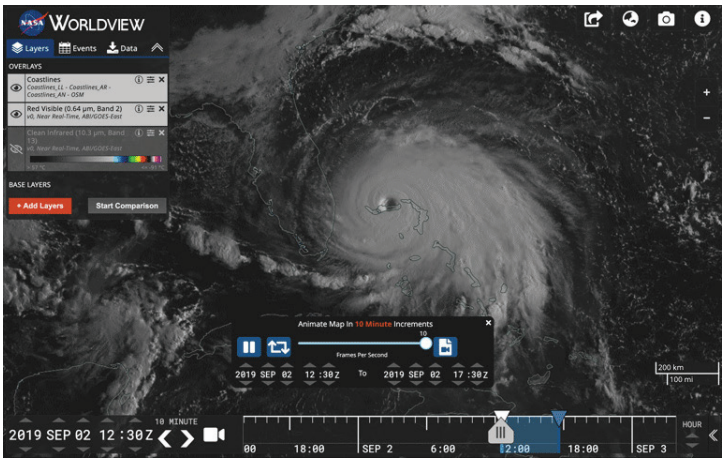


*Examples of full disk hemispheric imagery available in NASA Worldview from GOES-East (**left image**), GOES-West (**center image**), and Himawari-8 (**right image**). All three images were acquired on September 25, 2019, and show Earth on September 24, 2019. Both GOES images are Red Visible; the Himawari-8 image is from the Infrared channel. GOES imagery courtesy of NOAA and available through NASA's Marshall Space Flight Center, Earth Science Branch; Himawari-8 image courtesy of the National Institute of Information and Communications TecÜology (NICT) Science Cloud Project, Japan, and available through the Japan Meteorological Agency.*

The availability of geostationary imagery in Worldview is the result of almost a year of collaborative work between NASA's Short-term Prediction Research and Transition Center (SPoRT) located at NASA's Marshall Space Flight Center in Huntsville, Alabama, and the ESDIS Project. SPoRT is a NASA- and NOAA-funded activity that develops ways for the operational weather community to use satellite observations and research capabilities to improve short-term regional and local weather forecasts. "Our goal in this effort was to help facilitate the use of geostationary data," says Dr. Christopher Hain, the SPoRT Project Scientist. "The ability for these data to be displayed in Worldview is a real success story for our Earth Science Branch [at Marshall] and for SPoRT."

The two GOES satellites and Himawari-8 are logical choices for providing this imagery. The instruments aboard all three satellites are built by the same company, so they are similar in construction. All three satellites acquire a full-disk image of Earth at the same time every 10 minutes during normal operation, which enables the imagery to easily be compared and analyzed.

Getting this imagery into GIBS for interactive viewing using Worldview is another instance of the long-running NASA/NOAA partnership. NASA provides launch capabilities to put NOAA satellites into orbit while NOAA manages and controls the satellites and produces the data and imagery. SPoRT acquires GOES data directly from a ground receiving station at Marshall and provides this data feed to GIBS for integration into Worldview. Himawari data are provided to NOAA through a data-sharing agreement with the Japan Aerospace Exploration Agency, and NOAA provides this imagery to SPoRT.



This animation of Hurricane Dorian over the Bahamas on September 2, 2019, was created using seven hours of GOES-East Red Visible imagery. NASA Worldview enables animations to be created quickly and shared easily. Animation courtesy of NASA Worldview.

The addition of geostationary imagery opens up a new way of using Worldview. "With geostationary imagery you can really look at the evolution of things like convection and tropical cyclones—especially when they're undergoing rapid intensification," says Dr. Hain. "Worldview is so nice and easy to use that it was a no-brainer for us when they showed interest in integrating the geostationary data into the system."

Boller agrees that Worldview is a good interface for this imagery. "Worldview was designed to be highly responsive

for interactive browsing, plus it has the capability to do playbacks and loops and then export these loops to video," he says. "I think it was a perfect match of [SPoRT] wanting to have a newer interface for this imagery and us wanting to add this type of imagery. It's a good fit for everybody."

Worldview also enables geostationary imagery to be used with polar-orbiting imagery. For example, it is possible to overlay MODIS-detected thermal anomaly and hotspot location markers onto a GOES image and then go through a series of GOES 10-minute images to see how active fires develop and change over several hours.

While having full-disk geostationary imagery updated every 10 minutes is a boon to data users, it also represents a lot of data coming into GIBS/Worldview, and data storage will be used up quickly if every 10-minute image is kept. To manage this issue, at least initially, Boller and his team plan keep only the most recent month of imagery and are considering developing files related to specific large events, such as Hurricane Dorian in August and September 2019. Hosting this imagery in the cloud is definitely an option, and one Boller says will be explored in the future.

For the present, though, being able to view and interactively explore geostationary imagery in Worldview is a real game-changer in how this application can be used. "It's an easy case to make as to why you need geostationary data," says Dr. Hain. "I know it required a bit of work at their end to deal with 10-minute data, but for Worldview users it will really be worth it."

Ryan Boller couldn't agree more. "I'm very excited to have Worldview show off this imagery," he says. "It's a real milestone to combine the strengths of geostationary and polar-orbiting spacecraft onto a single interactive map where you can see almost the entire world updated every 10 minutes!"

Learn more:

Interactively explore Hurricane Dorian using geostationary imagery in NASA Worldview.

Read more about this effort in the GIBS Blog. ■

Published October 21, 2019

USER **PROFILES:**

NASA Earth Science Data User Profiles highlight our diverse end-user community worldwide and show you not only how these data are being used for research and applications, but also where these data are being used – from the plains of West Texas to the Sea of Oman and everywhere in between. You'll also learn where you can download the datasets in each feature.

https://earthdata.nasa.gov/learn/user-resources/who-uses-nasa-earth-science-data-user-profiles

Dr. Kristy Tiampo

More than half of Earth's population lives in urban environments. NASA Earth science data help Dr. Kristy Tiampo explore the hazards that can impact these areas.

Director, Earth Science & Observation Center, Cooperative Institute for Research in Environmental Sciences (CIRES) and Professor, Geological Sciences, University of Colorado, Boulder, CO

Research interests: Using high-resolution satellite data and imagery to study natural (and human-created) hazards in order to help mitigate and respond to events caused by these hazards.

https://earthdata.nasa.gov/learn/user-resources/who-uses-nasa-earth-science-data-user-profiles/user-profile-dr-kristy-tiampo

Dr. Philip Thompson

The global average sea level is rising. Dr. Philip Thompson uses NASA Earth science data to explore how—and when—this will affect vulnerable communities.

Professor, Department of Oceanography, School of Ocean and Earth Science and Technology, University of Hawai'i at Mānoa; Director, University of Hawai'i Sea Level Center, Honolulu, HI

Research interests: Studying the drivers and impacts of sea level variability along with the impact of future sea level rise on the frequency of high-tide flooding events and water level extremes.

https://earthdata.nasa.gov/learn/user-resources/who-uses-nasa-earth-science-data-user-profiles/user-profile-dr-philip-thompson

Dr. Monica Papeş

Knowing where species live in a particular region is only one piece of an ecological puzzle. You also need to know why they live where they do. Dr. Monica Papeş uses NASA Earth science data to find out.

Assistant Professor, Department of Ecology and Evolutionary Biology, University of Tennessee, Knoxville

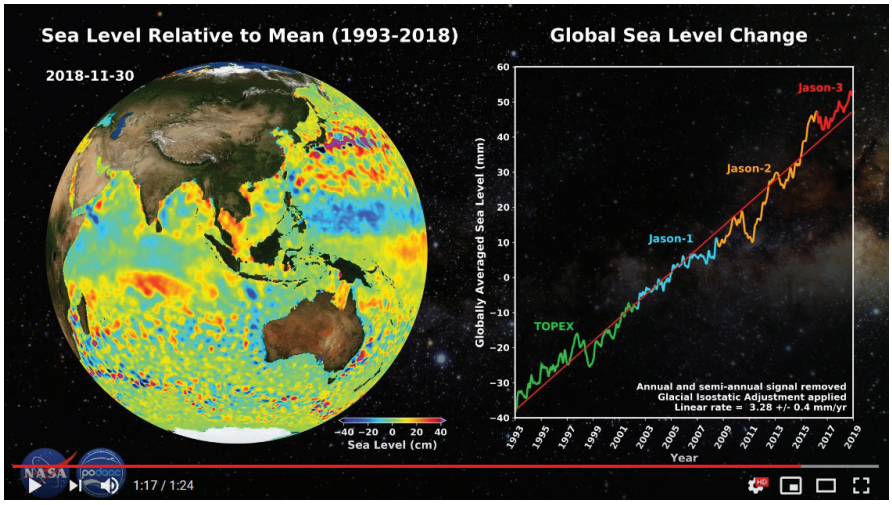
Research interests: Using remotely-sensed satellite data combined with ecological niche modeling techniques and GIS to study the geographic distributions of plant and animal species.

https://earthdata.nasa.gov/learn/user-resources/who-uses-nasa-earth-science-data-user-profiles/user-profile-dr-monica-papes

New Global Sea Level Change Animation at NASA's PO.DAAC

Using data from four ocean altimetry missions, a new PO.DAAC animation shows more than a quarter-century of global average sea level change.

The global average sea level is rising, and this trend has been tracked since 1993 using instruments aboard Earth observing satellites. A new animation created by NASA's Physical Oceanography Distributed Active Archive Center (PO.DAAC) combines data from four satellite-borne instruments to dramatically show 26 years of sea level change (note that there is no audio with this animation).



Watch the video on YouTube at https://youtu.be/xgj2OHxGB5g.

The data in the animation come from the following missions: the joint NASA/French Space Agency (CNES) Ocean Surface Topography Experiment (TOPEX/Poseidon; operational 1992 to 2006); the joint NASA/CNES Jason-1 (operational 2001 to 2013); the joint NASA/CNES/NOAA/European Organisation for the Exploitation of Meteorological Satellites (Eumetsat) Ocean Surface Topography Mission/Jason-2 (OSTM/Jason-2; operational 2008 to 2019); and the joint NASA/CNES/NOAA/Eumetsat Jason-3 (operational 2016 to present). The primary instrument aboard these satellites is an altimeter that measures ocean surface height.

NASA's PO.DAAC archives and distributes data in NASA's Earth Observing System Data and Information System (EOSDIS) collection related to the physical processes and conditions of the global oceans.

Learn more:

Explore global average sea level trend and sea surface height anomaly data at NASA's PO.DAAC:

- Global Mean Sea Level Trend from Integrated Multi-Mission Ocean Altimeters TOPEX/Poseidon Jason-1 and OSTM/Jason-2 Version 4.2 (doi: 10.5067/GMSLM-TJ142)
- MEaSUREs Gridded Sea Surface Height Anomalies Version 1812 (doi: 10.5067/SLREF-CDRV2)

A recent Data User Profile shows how Dr. Philip Thompson, Director of the University of Hawai'i Sea Level Center (UHSLC), uses these data in his work and research.

Learn more about NASA sea level observations: https://sealevel.nasa.gov/ ■

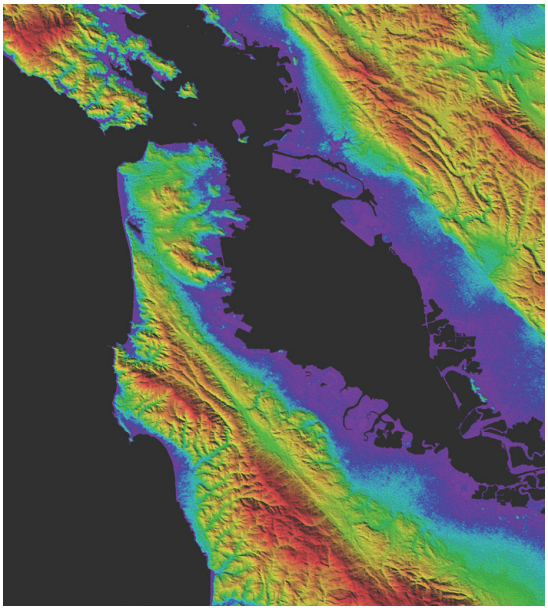
Published October 8, 2019

New Version of the ASTER GDEM

Version 3 of the ASTER Global Digital Elevation Model (GDEM) provides new features and sharper imagery.

Version 3 of the Advanced Spaceborne Thermal Emission and Reflection Radiometer (ASTER) Global Digital Elevation Model (GDEM) is now available from NASA's Land Processes Distributed Active Archive Center (LP DAAC). The ASTER GDEM covers land surfaces between 83°N and 83°S, and was produced through automated processing of 2.3 million scenes from the ASTER archive.

The first ASTER GDEM was released in 2009, with Version 2 being released in 2011. The ASTER GDEM Version 3 maintains the GeoTIFF format and the same gridding and tile structure as in previous versions, with 30-meter spatial resolution and 1°x1° tiles.



ASTER GDEM Version 3 shaded relief topography of San Francisco, California, USA. Image: NASA/METI/AIST/Japan Space Systems, and U.S./Japan ASTER Science Team.

Version 3 also features a new global product: the ASTER Water Body Dataset (ASTWBD). This raster product identifies all water bodies as either ocean, river, or lake, and each GDEM tile has a corresponding Water Body tile.

ASTER GDEM and ASTWBD tiles may be downloaded directly from NASA's LP DAAC Data Pool. In addition, the data are available with transformation services via the LP DAAC's Application for Extracting and Exploring Analysis Ready Samples (AρρEEARS).

ASTER is one of five instruments aboard NASA's Terra spacecraft (launched in 1999) and was built in Japan for the Ministry of Economy, Trade, and Industry (METI). A joint U.S./Japan Science Team is responsible for instrument design, calibration, and data validation.

Read more about the new version of the ASTER GDEM at NASA's LP DAAC. ■

Published August 5, 2019

New PO.DAAC Saildrone Data Animation

Data collected by the Saildrone unmanned surface vehicle have been turned into a new animation at NASA's Physical Oceanography DAAC (PO.DAAC).

A new animation showing sea surface salinity (SSS) and sea surface temperature (SST) data collected by the Saildrone unmanned surface vehicle (USV) is available at NASA's Physical Oceanography Distributed Active Archive Center (PO.DAAC). The data were collected in a low-salinity, high precipitation region in the eastern tropical Pacific Ocean between August 2016 and November 2017 as part of the Salinity Processes in the Upper Ocean Regional Study-2 (SPURS-2) field campaign, which was a follow-on to the original SPURS project. SPURS, which is funded principally by NASA with support from other U.S. agencies and European partners, is a series of science process studies and associated oceanographic field campaigns exploring the mechanisms responsible for near-surface salinity variations in the oceans. (Note that there is no audio with the animation.)

The two graphs in the animation show comparisons between Saildrone-collected SSS and SST data with SSS data from NASA's Soil Moisture Active Passive (SMAP) satellite (upper graph) and SST data from the Multi-scale Ultra-high Resolution (MUR) Analysis dataset

(lower graph). The animation highlights the good agreement between data collected by Saildrone and satellite-derived SMAP and MUR data.

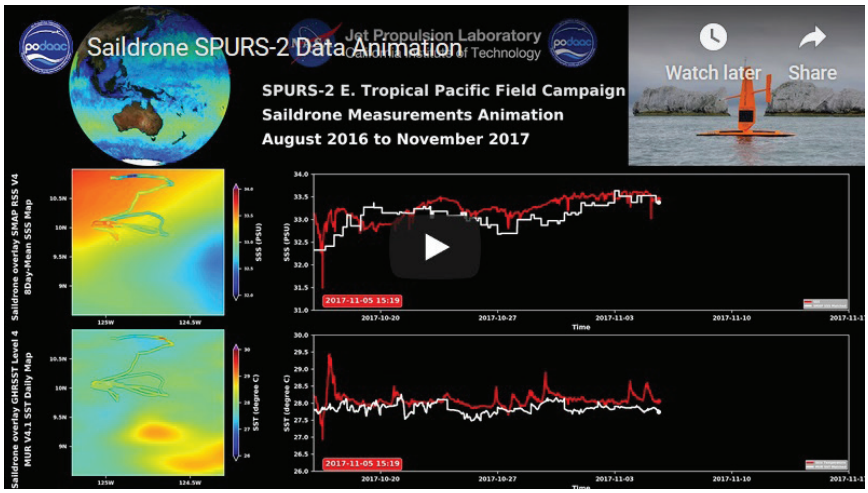
Explore the data at NASA's PO.DAAC:

SPURS-2 field campaign: doi: 10.5067/SPUR2-SDRON

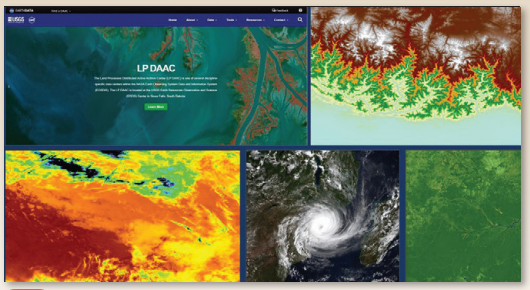
SMAP SSS: doi: 10.5067/SMP40-3SPCS

MUR SST: doi:10.5067/GHGMR-4FJ04 ■

Published October 17, 2019



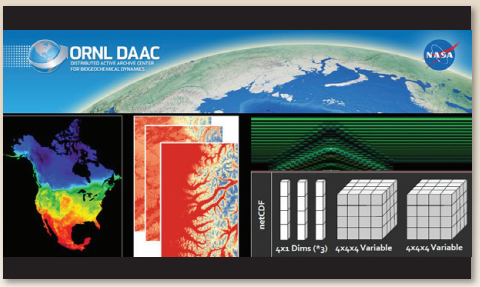
Watch the video on YouTube at https://youtu.be/dfpcmr6zFb0.



8/22/19

Navigating the LP DAAC to Find Answers to your Deepest Land Data Questions

https://youtu.be/wVBXgueHdus

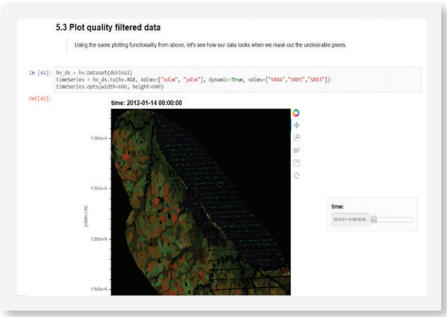


9/4/19

NetCDF Why and How: Creating Publication-Quality NetCDF Datasets

https://youtu.be/7YYTXa4qyfo

DATA Recipes & Tutorials



Using the NASA Using the AppEEARS API in a Landsat ARD Workflow - Getting Started

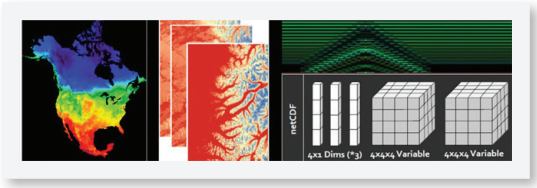
This tutorial is designed to familiarize Landsat Analysis Ready Data (ARD) users with the NASA AppEEARS application programming interface (API) with demonstrations on how the API, and the services it provides, can be leveraged in an analysis workflow. This tutorial was developed by the NASA Land Processes Distributed Active Archive Center (LP DAAC).

View Tutorial: https://lpdaac.usgs.gov/documents/501/ARD_AppEEARS_API.html

Jupyter Notebook: https://go.nasa.gov/3372Ac9

For additional learning resources at NASA's LP DAAC: https://lpdaac.usgs.gov/resources/

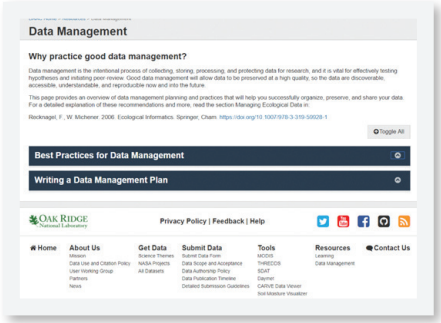
NetCDF Why and How: Creating Publication Quality NetCDF Files



These tutorials introduce step-by-step methods, software, and tools used to create, visualize, and standardize netCDF files to archive ready formats. In the tutorials, daily geoTIFF files are converted to a single multidimensional netCDF file that follows Climate and Forecast (CF) Conventions. Separate tutorials demonstrate command line utilities as well as popular programming software. This tutorial was developed by NASA's Oak Ridge National Laboratory DAAC (ORNL DAAC).

View Tutorial: http://bit.ly/34juBPf

For additional learning resources at ORNL DAAC: https://daac.ornl.gov/resources/learning/

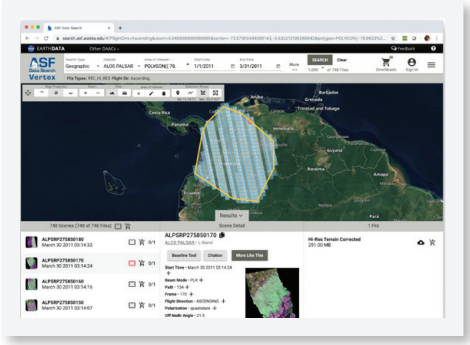


Workshop: Data Management Publishing for NASA Terrestrial Ecology Projects

This workshop provides guidance on fundamental data management practices for field, airborne, and model-derived data, including data structure, quality control, documentation, and publication. By following the practices taught in this workshop, your data will be more efficiently structured for analysis, easier to publish, and more readily understandable for future investigations. This workshop was developed and produced by NASA's ORNL DAAC.

View Workshop Resources: https://daac.ornl.gov/resources/workshops/nasa-te-workshop/

Getting Started with Vertex Guide

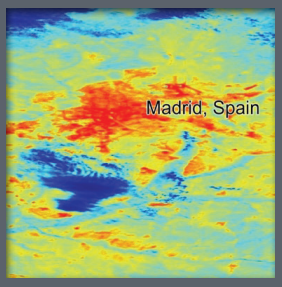


This guide shows you how to discover and access synthetic aperture radar (SAR) data using the NASA Alaska Satellite Facility DAAC's Vertex tool. Through this Getting Started Guide users will learn about the key features and functionalities of Vertex, including search and filtering options and how to download data.

View Getting Started Guide: https://www.asf.alaska.edu/other-data/vertex-getting-started-user-guide/

For additional SAR learning resources at ASF DAAC: https://www.asf.alaska.edu/data-recipes/data-recipe-tutorials/

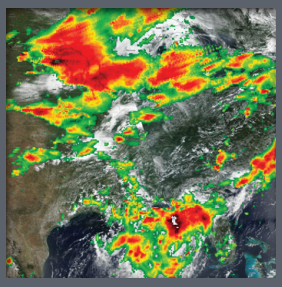
Latest NASA Earthdata Images



Sensing Land Surface Temperature

https://earthdata.nasa.gov/mastheads

(Published 8/5/19)



Severe Storms Across the United States

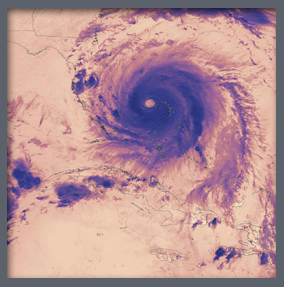
https://earthdata.nasa.gov/worldview/worldview-image-archive

(Published: 8/19/19)

Greek Fire

https://earthdata.nasa.gov/mastheads

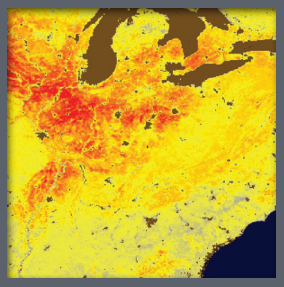
(Published 9/3/19)



Hurricane Dorian Over the Bahamas

https://earthdata.nasa.gov/worldview/worldview-image-archive

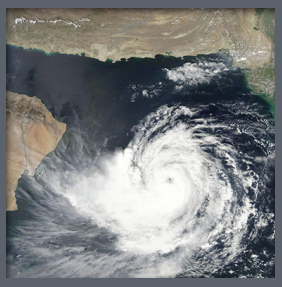
(Published: 9/3/19)



Predicting Plant Productivity

https://earthdata.nasa.gov/mastheads

(Published 9/16/19)



Tropical Cyclone Hikaa approaching Oman

https://earthdata.nasa.gov/worldview/worldview-image-archive

(Published: 9/23/19)

The Porcupine River as Seen By SAR

https://earthdata.nasa.gov/mastheads

(Published 10/7/19)

Flooding Near Tokyo, Japan

https://earthdata.nasa.gov/worldview/worldview-image-archive

(Published:10/14/19)

Satellite Laser Ranging Around the World

https://earthdata.nasa.gov/mastheads

(Published 10/21/19)

Fires in the Northern Territory, Australia—October 2019

https://earthdata.nasa.gov/worldview/worldview-image-archive

(Published: 10/21/19)

About Us

Discover EOSDIS data, information, services, and tools. Tap into our resources! To learn more, visit our website: https://earthdata.nasa.gov

Connect with Us

Follow NASA Earthdata for Earth science data, services and tools, news, and updates on social media:

https://twitter.com/NASAEarthdata

https://www.facebook.com/NASAEarthdata

Subscribe to EOSDIS News

https://lists.nasa.gov/mailman/listinfo/eosdis-news

Feedback?

Email: support@earthdata.nasa.gov

Webinars, Tutorials, and Recipes

Watch Earth science data discovery and data access webinars, and short data tutorials on YouTube: http://www.youtube.com/c/NASAEarthdata

View our webinar schedule and sign-up to receive webinar announcements: https://earthdata.nasa.gov/learn/user-resources/webinars-and-tutorials

EXPLORE EARTH

LEARN MORE: EARTHDATA.NASA.GOV