EOSDIS Update

National Aeronautics and Space Administration

SPRING 2020

Earth Science Data and Information System (ESDIS) Project

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FEATURE ARTICLES

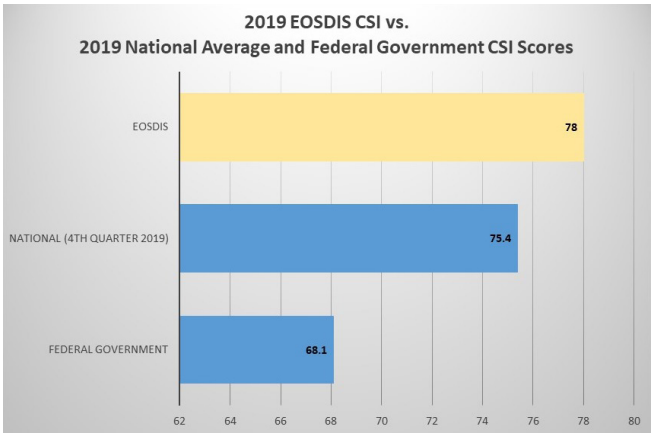
High Satisfaction with EOSDIS Products and Services Continues

The annual NASA EOSDIS customer satisfaction survey shows consistent, strong performance and high satisfaction with products and services, as well as with EOSDIS DAACs.

Earthdata URL: https://go.nasa.gov/3fl46yr

It's an old adage that the more things change, the more they remain the same. While NASA's Earth Observing System Data and Information System (EOSDIS) has evolved significantly since it became operational in 1994, one element remains consistent—high satisfaction with EOSDIS products and services by the global user community. This trend continues with another high aggregate score in the 2019 American Customer Satisfaction Index (ACSI) survey of EOSDIS data, products, and services.

The EOSDIS 2019 aggregate Customer Satisfaction Index (CSI) score of 78 out of 100 is only one point lower than the record-high score of 79 received on the 2018 survey, and indicates high satisfaction with products and services. Because the CSI score is based on aggregate weighted scores in several factors that are



NASA's EOSDIS has consistently outscored the Federal Government on the annual ACSI survey since the first EOSDIS survey was conducted in 2004. NASA ESDIS Project graphic.

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

calculated using the proprietary ACSI methodology, scores in the upper-70s can be considered an indication of "strong" performance, especially consistent scores in the 70s and 80s over multiple years.

In fact, NASA's EOSDIS has never received a CSI score lower than 74 since the first EOSDIS ACSI survey was conducted in 2004. As in all previous surveys, and over more than 15 years, NASA's EOSDIS outscored the federal government, which received an aggregate 2019 CSI score of 68.1. In addition, CSI scores for EOSDIS Distributed Active Archive Centers (DAACs) ranged from 74 to 83, with an average aggregate CSI of 78.

Results from the annual survey provide a roadmap for the DAACs and NASA's Earth Science Data and Information System (ESDIS) Project (which manages EOSDIS science operations, including data archiving and distribution) on ways these products and services can further be improved and enhanced along with insight into new products that might better serve user needs.

The ACSI survey is administered by the CFI Group, an independent organization contracted by the federal government to assess user satisfaction with products and services at numerous federal entities. Along with conducting the annual NASA EOSDIS survey, the CFI Group also conducts surveys for the National Weather Service, the General Services Administration, and the U.S. Department of Education, among others.

The ACSI model used by the CFI Group to conduct the annual survey is a set of causal equations linking customer expectations, perceived quality, and perceived value to customer satisfaction, which is reflected numerically in the CSI score. Satisfaction, in turn, is further linked to a customer's likelihood to recommend products and services and their willingness to use products and services in the future.

One expected result of high customer satisfaction with services is user trust and loyalty. This is accounted for in the ACSI algorithm and reflected by a number indicating the likelihood of a respondent to recommend the evaluated products and services to others coupled with the likelihood of a respondent to use the services in the future. Respondents' likelihood to recommend EOSDIS products and services (86 out of 100) and likelihood to use EOSDIS services in the future (87 out of 100) are both two points lower than in the 2018 survey, but remain very strong and are consistent with previous surveys.

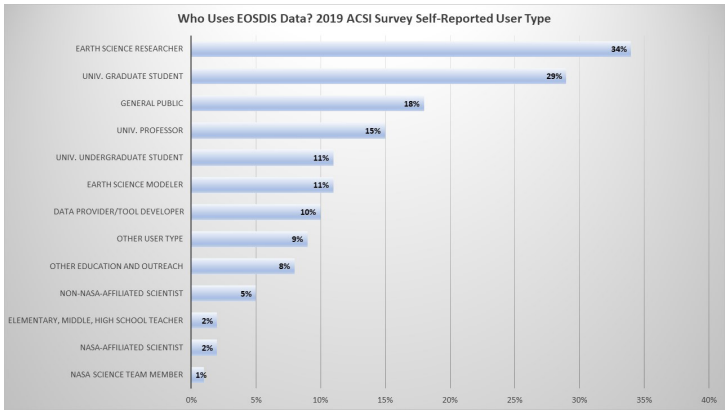
ESDIS, which coordinates and facilitates the annual ACSI survey, opted to use a "short-form" abridged version of previous survey questionnaires for the 2019 survey. One benefit of this shorter survey was a significantly larger pool of completed surveys (6,337 completed surveys were received in the 2019 survey vs. 2,778 completed surveys in 2018). This higher response pool lends further credence that the 2019 survey accurately reflects user satisfaction. Starting with the 2019 survey, the ESDIS Project will alternate short-form surveys with more detailed longer surveys as a way to maintain continuity with past questions from the longer survey (e.g., the 2020 survey will be a long-form survey; the 2021 survey will use the short-form, etc.).

The 2019 survey was conducted online between October 7 and November 1. The CFI Group emailed approximately 285,698 survey invitations to individuals who used EOSDIS data and/or products in the past year. The 6,337 completed surveys represent a 2.2% response rate and a large enough sample size for calculating a statistically valid CSI score, according to the CFI Group (the five-year average response rate for the EOSDIS ACSI survey is 2.64%).

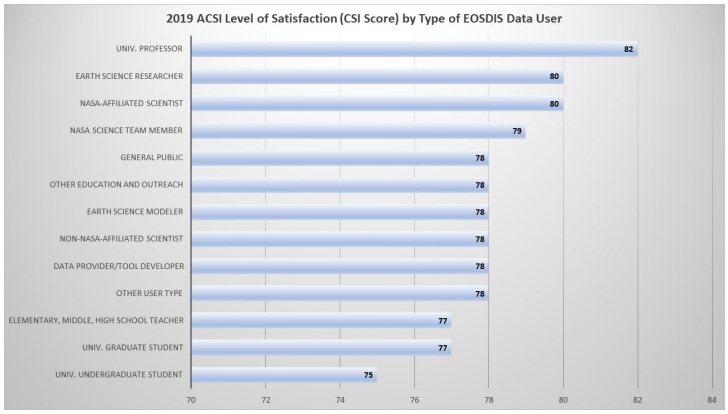
Outside of three survey questions required by the CFI Group asking respondents to rate their overall expectations, perceived quality, and perceived value of EOSDIS services and products on a 1 to 10 scale (which are used to calculate the CSI score), the remaining questions on the EOSDIS survey were developed collaboratively by the ESDIS Project, the DAACs, and the CFI Group. Respondents to the survey are asked to evaluate their experience with the specific DAAC or DAACs from which they receive data and products, and were allowed to skip questions not related to their specific experience with the specified DAAC.

The survey also allows respondents to provide open-ended comments. These are some of the most valuable areas of the survey since they enable respondents to candidly express their specific likes, dislikes, satisfactions, and suggested improvements.

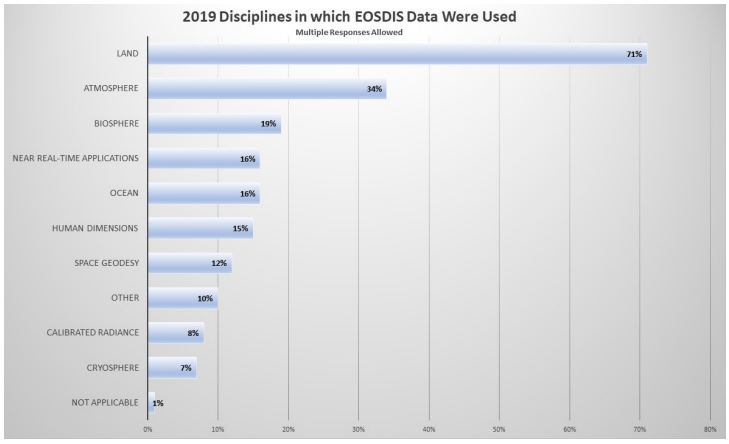
In the following summary tables, total percentages may not equal 100% due to survey questions allowing for multiple responses; all non-percentage values are out of 100.



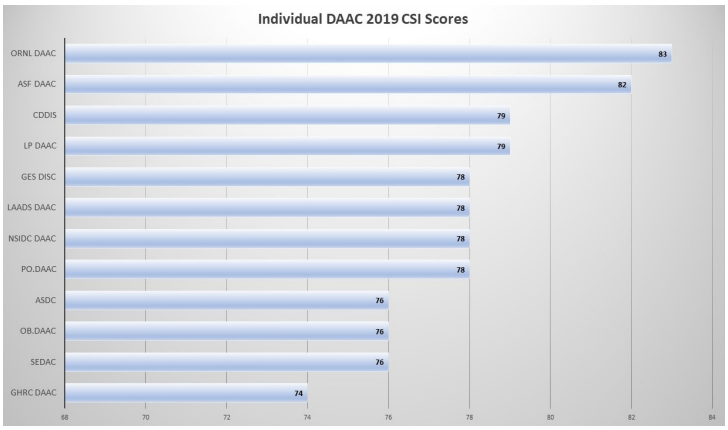
As in previous surveys, respondents self-identifying themselves as university students (40%)—which includes undergraduate (11%) and graduate (29%) students—and Earth science researchers (34%) are the most common EOSDIS data users. In a reversal from the 2018 survey, EOSDIS data users were followed by the general public (18%, up from 13% in the 2018 survey) then by university professors (15%, unchanged from the 2018 survey).



University professors report the highest satisfaction with EOSDIS products and services, with a 2019 CSI of 82, the highest of any user type. University undergraduate students indicate the lowest satisfaction with EOSDIS products and services, with a CSI score of 75 (which is still considered a "strong" score, based on the survey methodology).



The disciplines in which EOSDIS data were used in 2019 are consistent with previous years. Respondents indicating their use of EOSDIS data for land-related studies remains the overwhelming discipline in which EOSDIS data are used (71%), while other disciplines noted by survey respondents remain either unchanged or within 2% of 2018 values. As noted by the CFI Group, there is little variation in satisfaction (CSI score) among the different areas and disciplines in which EOSDIS data are used.



Each year, ACSI survey respondents are asked to evaluate their experience and satisfaction with the specific DAAC or DAACs from which they receive data, products, and services, and CSI scores were computed for each DAAC based on individual DAAC survey responses. All DAACs achieved CSIs between 74 and 83, with a strong average aggregate DAAC CSI of 78. NASA's Atmospheric Science Data Center (ASDC) and Oak Ridge National Laboratory DAAC (ORNL DAAC) both saw two-point CSI increases, the largest increase of any DAACs with at least 100 evaluations in the 2019 survey (while NASA's Ocean Biology DAAC [OB.DAAC] saw the largest change in CSI score between 2018 and 2019 [+9 points], it also had the fewest evaluations of any DAAC in the 2019 survey [77]).

Want to participate in future ACSI surveys? Anyone downloading data from an EOSDIS DAAC during the year will automatically be added to the survey list. You also can visit the DAAC or DAACs from which you acquire data and request your email address to be added to the list of survey recipients. Thanks to your participation, the evaluations and comments from the 2019 EOSDIS ACSI survey are being incorporated into enhancements to existing products and services as well as into the development of new products and services. While this might mean changes to products and services based on your indicated needs, the ESDIS Project and the DAACs

are confident that the high quality of these products and services will continue. In fact, there are more than 15 years of annual surveys proving this.

Read more

A summary of the 2019 EOSDIS ACSI report along with summaries of all EOSDIS ACSI surveys dating back to the first survey in 2004 are available on the ACSI Reports page in the System Performance and Metrics section of the Earthdata website. Full reports are available upon request to ESDIS. ■

Published February 24, 2020

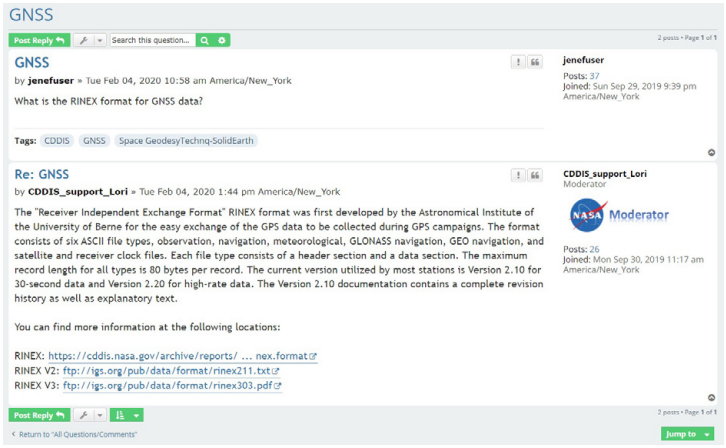
You Have Questions… the Earthdata Forum Has Answers

The new Earthdata Forum provides an interactive platform for data users to pose specific questions about data, tools, and services and receive answers from DAAC experts.

Earthdata URL: https://go.nasa.gov/2xwVwf1

With more than 34 petabytes (PB) of data, thousands of data products, and a plethora of applications and tools for working with these data, it's impossible to know all the ins and outs of data, products, and services in NASA's Earth Observing System Data and Information System (EOSDIS) collection or at EOSDIS Distributed Active Archive Centers (DAACs). Fortunately, experts at discipline-specific EOSDIS DAACs have the answers. The new Earthdata Forum provides a central location where data users can interact with subject matter experts from multiple DAACs to discuss general questions about research needs and data applications, and receive help on specific queries about accessing, viewing, and manipulating NASA Earth observing data.

Five EOSDIS DAACs currently are participating in the Earthdata Forum: the Atmospheric Science Data Center (ASDC), the Crustal Dynamics Data Information System (CDDIS), the Goddard Earth Sciences Data and Information Services Center (GES DISC), the Global Hydrology Resource Center DAAC (GHRC DAAC), and the Land Processes DAAC (LP DAAC). Experts from NASA's Oak Ridge National Laboratory DAAC (ORNL DAAC) and Socioeconomic Data and Applications Center (SEDAC) will soon join the Forum.

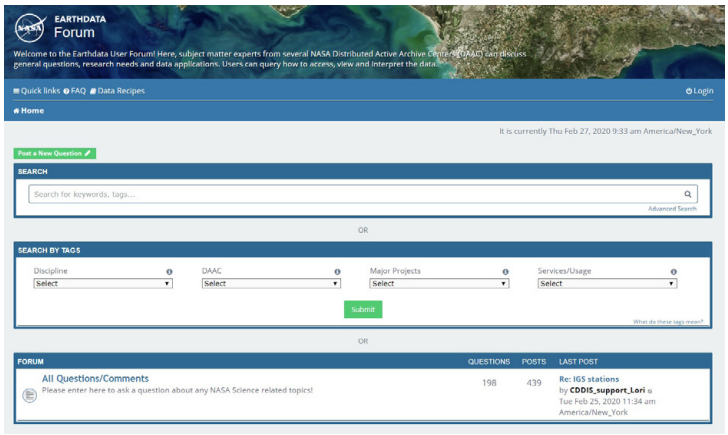


Example of an Earthdata Forum question and response. Anyone with an Earthdata Login account can post questions, reply to questions, edit posts they submit, delete posts they submit, and post attachments. NASA EOSDIS image.

Two other forums also are available for EOSDIS data users. For questions about ocean color or physical oceanography data and products, DAAC experts are available through the Ocean Color Forum at the Ocean Biology DAAC (OB.DAAC) and the Physical Oceanography Forum at the Physical Oceanography DAAC (PO.DAAC). In addition, many DAACs have tutorials, data recipes, and other educational products available through their individual websites that can help with questions about using data and applications.

DAAC experts supporting the Earthdata Forum are available Monday through Friday from 9am to 4pm, Eastern Time, although users can post a question at any time. An Earthdata Login is required to post questions to the Forum. Users without an account can set one up quickly and easily at the Earthdata Login registration page.

Once in the Forum, it's easy to post a new question by clicking on the green Post New Question button.



Post a new question by using the green button above the Search box. Users can search the Forum using keywords (top blue box), Tags (middle box, with dropdowns for Discipline, DAAC, Major Projects, or Services/Usage), or look at all Forum Questions/Comments (bottom blue box). NASA EOSDIS image.

A Search box directly under the Post New Question button allows users to search for other users' questions and responses by typing in keywords. Users also can search using dropdown menus for "Discipline," "DAAC," "Major Projects," and "Services/Usage," which narrow Forum posts based on specific tags.

For example, if you're interested in finding posts with the tag "Data Visualization," you can use the Services/Usage dropdown menu in the Search By Tags box to request all posts that have been tagged by Forum moderators as being relevant to visualizing data. To see all the latest user posts, simply click on "All Questions/Comments" in the Forum box at the bottom of the home page.

Users also can click on the Quick Links, FAQs, or Data Recipes buttons in the top left corner of the Forum home page for additional information. Clicking on Quick Links provides a dropdown to select Unanswered Questions, Active Questions, Search, and information about NASA EOSDIS DAACs. FAQ provides quick answers to some of the most common questions posted to the Forum. Finally, Data Recipes provides some common responses to questions related to using or manipulating specific data collections.

You have questions about EOSDIS data? EOSDIS DAACs have the answers. The Earthdata Forum puts a wealth of resources at your fingertips. Check it out! ■

Published March 3, 2020

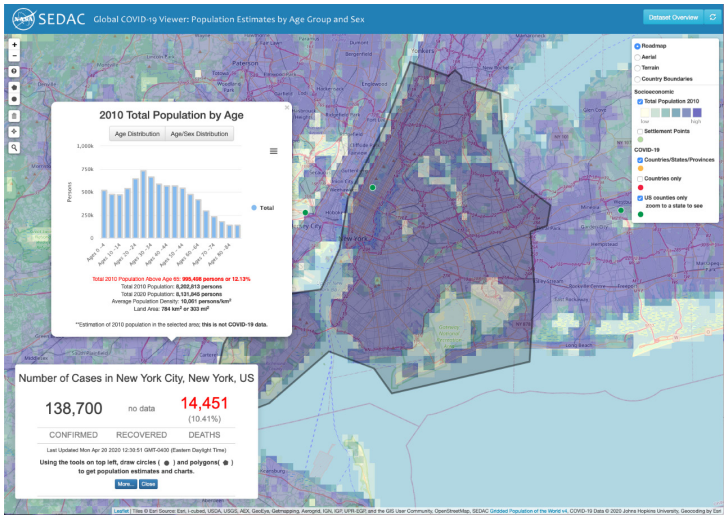
NASA SEDAC Application Puts Current Global COVID-19 Data at your Fingertips

A new global mapping tool shows the number of people affected by the COVID-19 pandemic down to the U.S.-county level, and provides data on age and sex categories that can help identify populations most at risk.

A simple-to-use mapping tool at NASA's Socioeconomic Data and Applications Center (SEDAC) shows both demographic data along with regularly updated information about reported global cases of the disease caused by the novel coronavirus (COVID-19). The Global COVID-19 Viewer: Population Estimates by Age Groups and Sex is unique in its ability to allow users to visualize age and sex data for any area, including areas that cut across country boundaries, through simple age-and-sex structure charts or age pyramids.

"We recognized that SEDAC has a unique set of data resources that are relevant to the COVID-19 pandemic, and that epidemiological modelers are using our global spatial population data to understand how rapidly the virus may spread," says Dr. Alex de Sherbinin, deputy manager of NASA's SEDAC. "Early on it became apparent that the elderly—namely people above age 65—were particularly at risk from the virus. We modified an existing SEDAC capability, the Population Estimation Service, which allows users to see the age structure of the population, to bring in data from Johns Hopkins on COVID-19 cases and mortality into a unique and simple interface."

Designed primarily for researchers, educators, and decision makers, the COVID-19 Viewer shows demographic data from SEDAC's Gridded Population of the World (GPW) Basic Demographic Characteristics,

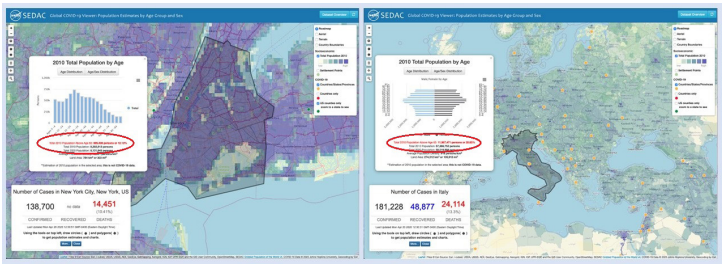


Screenshot from the Global COVID-19 Viewer showing Johns Hopkins University & Medicine Coronavirus Resource Center COVID-19 data for New York City as of 12:30 pm, EDT, on April 20, 2020. A table showing population demographics from SEDAC's GPW Basic Demographic Characteristics dataset for the area within the dark polygon on the base map is displayed above the COVID-19 data. The high percentage of the population in the working age groups (20-40 years of age; longer blue bars in population table) and the relatively small percentage of population above age 65 (about 12 percent) are features of New York City's demographic profile. Control panel in upper right enables users to pick and choose base map and population displays as well as the spatial range of COVID-19 data (shown as colored dots). NASA SEDAC image.

v4.11 along with regularly-updated COVID-19 information from the Johns Hopkins University and Medicine Coronavirus Resource Center. The demographic data are separate from the COVID-19 data and do not represent COVID cases per se. Rather, the demographic data enable users to see the population distribution of different demographic groups and help identify susceptible populations. "The information in the Viewer is relevant to anyone, but could be particularly relevant to public health and local decision makers," says de Sherbinin.

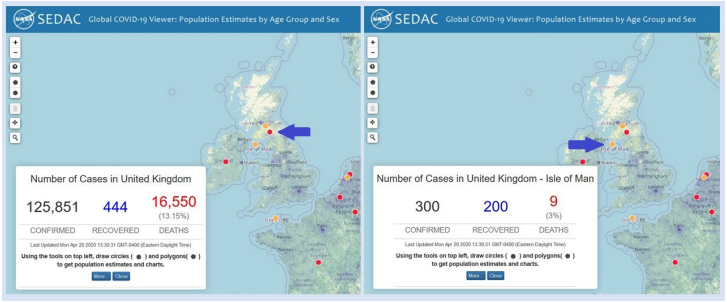
At the click of a button, users of the COVID-19 Viewer can receive global information compiled by the Johns Hopkins University & Medicine Coronavirus Resource Center about the number of confirmed COVID-19 cases, the number of people who have recovered from COVID-19, and the number of deaths attributed to COVID-19 for specific countries and, where available, sub-national areas (such as states or provinces). Users also can generate separate population estimates for defined areas of interest. The population data are for the year 2010, with estimates to 2020, and are derived from global census data and population registers.

Demographic data in the Viewer are from SEDAC's GPW Basic Demographic Characteristics dataset. When a circle or polygon is drawn, a box showing demographic data by age or by sex for the selected area appears. A buffer tool is available to generate population estimates and charts using specific latitude/longitude coordinates.



*COVID-19 data for New York City (**left image**) and for Italy (**right image**) as of 12:30 pm, EDT, on April 20, 2020. The New York City image shows an age distribution table; the image for Italy shows an Age/Sex Distribution pyramid. Red text below demographic data in both images (circled in red) highlights Total 2010 Population Above Age 65, an age demographic that has been determined to be more susceptible to severe COVID-19 health impacts. NASA SEDAC image.*

Upon launching the application, users see a map of the world with colored circles indicating areas with available COVID-19 data. The color of the circle represents the spatial extent of the COVID-19 data displayed: Yellow = COVID-19 cases in countries/states/ provinces; Red = COVID-19 cases by countries only; Green = COVID-19 cases in U.S. counties (U.S. county data are displayed only when the map is zoomed in on the U.S.). Clicking on a colored circle brings up a box displaying the most recently updated COVID-19 Johns Hopkins Coronavirus Resource Center data for the country, state, province, or U.S. county selected.



*Screenshot from the SEDAC Global COVID-19 Viewer acquired at 1:30 pm, EDT, on April 20, 2020, showing the differences between selecting Red (Countries Only) COVID-19 data **(left image, blue arrow)** versus the Yellow (Countries/ States/Provinces) COVID-19 data **(right image, blue arrow)**. NASA SEDAC image.*

SEDAC is the NASA Earth Observing System Data and Information System (EOSDIS) Distributed Active Archive Center (DAAC) responsible for archiving and distributing socioeconomic data in the EOSDIS collection, and is hosted at Columbia University's Center

for International Earth Science Information Network (CIESIN). SEDAC synthesizes Earth science and socioeconomic data and information in ways useful to a wide range of decision makers and other applied users, and serves as an "Information Gateway" between the socioeconomic and Earth science data and information domains.

The underlying data from the Global COVID-19 Viewer are available through open data services that other groups are free to use in their own COVID-19 applications and viewers. SEDAC is currently working with a number of groups to expand the range and accessibility of relevant socioeconomic and remote sensing data and to facilitate their use not only for near-term public health decision making, but also for the medium-term challenge of reopening the world's economy and dealing with future complex emergencies.

As SEDAC manager and CIESIN director Dr. Robert Chen observes, "Open sharing of data supported by organizations like Johns Hopkins and NASA is vital to improving widespread understanding and effective response to major crises like the COVID-19 pandemic that require data and knowledge from many disciplines and regions." ■

Explore the Global COVID-19 Viewer at NASA's SEDAC: https://bit.ly/3c4UHt5

Published April 23, 2020

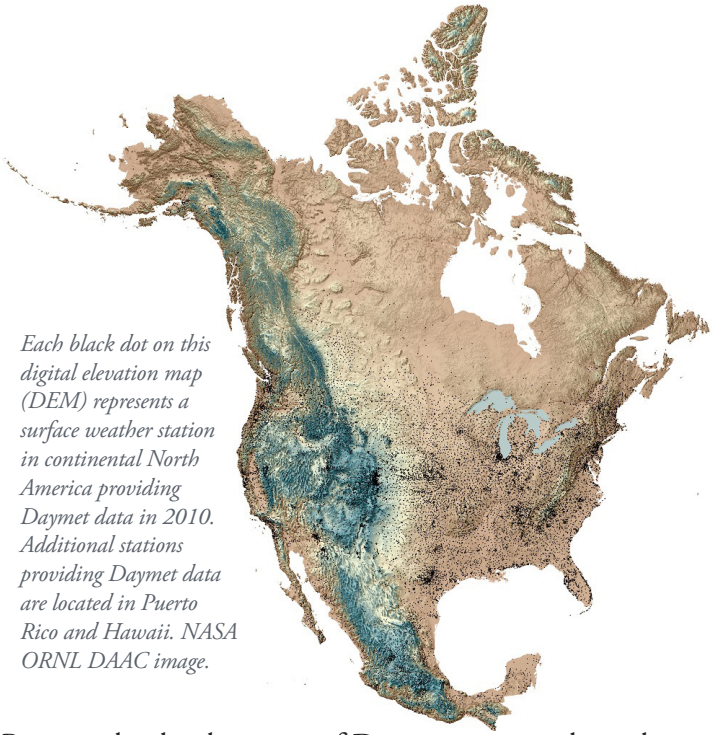
Daily Daymet Data mean More Meteorological Metrics

The Daymet data collection at NASA's ORNL DAAC provides daily meteorological data for the entire North American continent spanning 1980 to 2019 (and counting).

Earthdata URL: https://go.nasa.gov/2WuYOb4

If rain falls in the forest and no one is around to record that it fell, do the data exist? If this rain falls anywhere from the far southern tip of Mexico to the extreme northern reaches of the Canadian Arctic (or in Puerto Rico and Hawaii), these data are part of a collection called Daymet, and are only a mouse-click away.

Accessible through NASA's Oak Ridge National Laboratory Distributed Active Archive Center (ORNL DAAC), Daymet provides near-surface meteorological information in remote areas or in areas with limited instrumentation. Daymet Version 2 data were first made available through the ORNL DAAC in 2013, and meteorological data are available dating back to 1980. "Daymet was created to support research on some specific types of ecological models," says Dr. Bruce Wilson, ORNL DAAC manager. "However, the usage has gone way beyond that original niche."



Each black dot on this digital elevation map (DEM) represents a surface weather station in continental North America providing Daymet data in 2010. Additional stations providing Daymet data are located in Puerto Rico and Hawaii. NASA ORNL DAAC image.

Prior to the development of Daymet, meteorological data were acquired from individual weather stations. These point data were then extrapolated to estimate meteorological conditions in study areas that did not have weather stations. This technique was relatively straightforward for variables like temperature and precipitation, but required advanced relationships for more complex variables like humidity and radiation. The Daymet algorithm incorporates a varying search radius

that enables the integration of data from multiple weather stations for each predicted grid cell. "Daymet filled the need to have a gridded, continuous dataset of near-surface meteorological conditions to provide inputs for driving terrestrial ecosystem models," explains ONRL DAAC Daymet lead Michele Thornton.

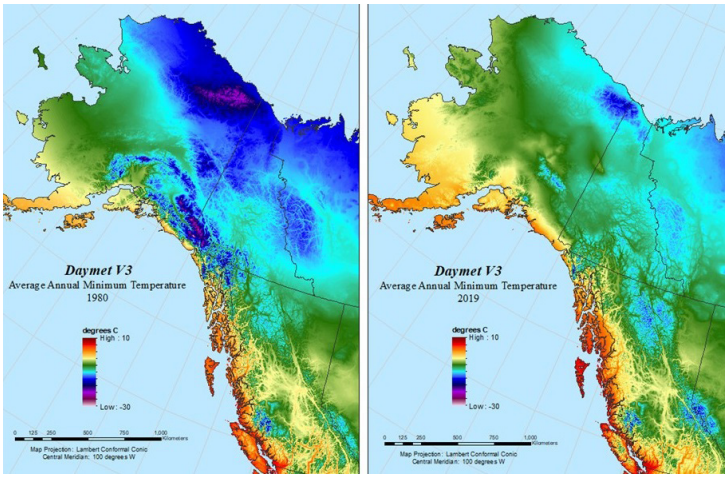
Seven weather parameters are available through Daymet: daily high and low temperature, precipitation, vapor pressure, shortwave radiation, snow water equivalent, and day length. These daily data are produced on a 1 km x 1 km gridded surface, which provides an exceptionally high level of detail. With data available for every square kilometer of the continent, this makes for a dataset of approximately 500 million data points for each year in the series.

Daymet remains one of the most popular data collections at the ORNL DAAC, which is a partnership between NASA and the U.S. Department of Energy (DOE) and responsible for archiving and distributing data in NASA's Earth Observing System Data and Information System (EOSDIS) collection related to biogeochemical dynamics, ecology, and environmental processes. According to metrics from NASA's Earth Science Data and Information System (ESDIS) Project, more than 112 terabytes of Daymet data were distributed during the 2019 Fiscal Year (October 1, 2018 through September 30, 2019).

Ongoing development of Daymet, its archiving, and its distribution are supported by the ESDIS Project and NASA's Terrestrial Ecology Program. Daymet algorithm development and processing also are supported by the Biological and Environmental Research program within the DOE's Office of Science.

Daily meteorological data for 2019 recently were incorporated into the current Daymet Version 3. "We produce annual updates of Daymet after a full calendar year," says Thornton. "I wait until weather station inputs are of 'archive quality' (about mid-February) and it takes a few weeks to process all the data and standardize the file formats for our various access methods. Researchers are always anxious to have these data."

The initial response to the addition of 2019 data validates Thornton's point. In the span of just one week, from March 22 to March 28, 2020, more than one million individual queries for 2019 data were made using



Two Daymet images showing changes in average annual minimum temperature in Alaska and western Canada between 1980 ***(left image)*** *and 2019* ***(right image)****. Temperature is in degrees Celsius, with purple/blue indicating colder average annual minimum temperatures and yellow/red indicating warmer average annual minimum temperatures. NASA ORNL DAAC Daymet images.*

Daymet's Single Pixel Extraction Tool, according to ORNL DAAC metrics. The Single Pixel Extraction Tool enables users to acquire daily data from the nearest 1 km x 1 km Daymet grid cell for a single geographic point by latitude and longitude in decimal degrees, and is one of several tools for using Daymet data at the ORNL DAAC. The Daymet data delivery tools also include the option to download comprehensive cross-validation statistics, so users can evaluate the uncertainty associated with Daymet data and decide if the quality is acceptable for use in their particular application. "Many of our users ask if we can update the data more often," says Dr. Wilson. "We are working on this, and we recognize that there are many applications where more up-to-date Daymet data will provide even more value to our users."

The value of Daymet data is evident in the many investigations and applications in which Daymet data are being used. "Daymet data are used in a wide variety of studies: hydrology, vegetation and crop modelling, wildlife research, even pathogen distribution," Thornton says.

Almost 325 peer-reviewed papers have used some aspect of Daymet data since 2012, according to ORNL DAAC records as of April 27, 2020. An ORNL DAAC-written article published on the NASA Earthdata website spotlights some recent uses of Daymet data. These include peer-reviewed research into the potential effects of climate change on common milkweed plants and responses of vegetation to climate variability across Yellowstone

National Park along with the incorporation of Daymet data into USGS hydrologic modeling applications. The popularity of Daymet also has led to the creation of community-developed open source scientific software such as daymetr (an R package) and daymetpy (a Python package), both of which are available through the ORNL DAAC Daymet Resources Learning page.

Daymet development continues, and generation of Daymet Version 4 data products already is underway with a target release date at the ORNL DAAC of Fall 2020. As Thornton notes, Daymet Version 4 enhancements will help improve the overall accuracy and precision of the Daymet continuous surfaces, and will include attention to weather station time-of-observation bias, improved constraints on horizontal interpolation coefficients, and modification of core model algorithms to improve interpolation in regions with low station density and during conditions of extreme precipitation, such as hurricanes.

"There are so many studies that benefit from knowledge of historic daily weather drivers and the influence of these drivers on the study area or the species being studied," says Thornton. "Having access to daily data also means that researchers can derive any multitude of climatic variables based on their time frame of interest."

Thanks to Daymet, if precipitation falls, snow accumulates, or radiation inputs change in North America—from Tapachula, Mexico, to Alert, Canada, or anywhere in-between—these data will not only be collected, but will be added to a nearly 40-year data collection enabling a wide range of ecological studies. ■

Explore Daymet data at ORNL DAAC: https://daac.ornl.gov/daymet

Learn how to use Daymet and Daymet data analysis tools: https://daymet.ornl.gov/learning

Published April 29, 2020

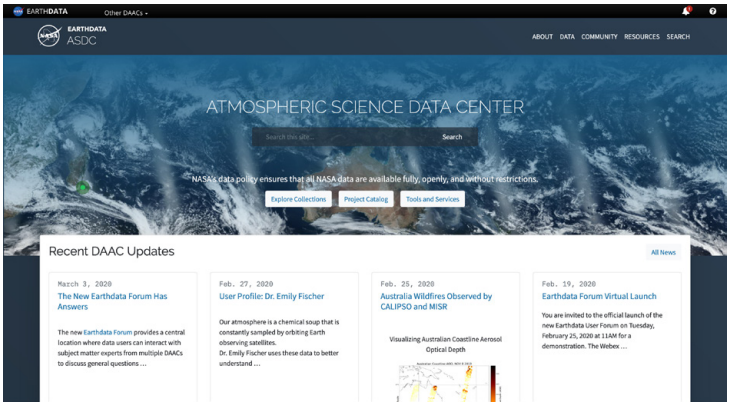
Updated Website Showcases New Features and Ways to Use Atmospheric Data

An updated website at NASA's Atmospheric Science Data Center (ASDC) makes it even easier to discover, access, and use NASA atmospheric data.

Written by Danielle Groenen, Senior Research Scientist and Farley Reynolds, Developer, NASA's ASDC

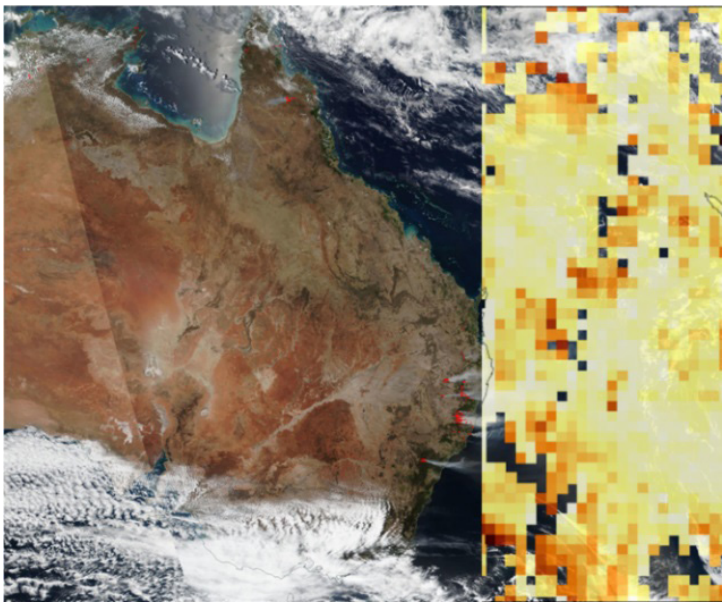
Earthdata URL: https://go.nasa.gov/2SzP5PL

NASA's Atmospheric Science Data Center (ASDC) has a redesigned website to better serve the needs of the atmospheric science data community. Along with making it easier to search for data, new educational features provide a wealth of opportunities for learning more about atmospheric data.



On the home page, a prominently displayed search field and several links take users directly to data exploration and download options. NASA ASDC image.

Located at NASA's Langley Research Center in Hampton, Virginia, ASDC is the discipline-specific Distributed Active Archive Center (DAAC) responsible for data related to aerosols, clouds, radiation budget, and tropospheric composition in NASA's Earth Observing System Data and Information System (EOSDIS) collection. A lot of time and research went into making sure that the updated website will be a great experience for users and provide resources to enable users to more efficiently use data and services.



An example of data-driven storytelling with the 2019 Australian wildfires is shown here. ***Right image*** *is a composite image of the Australian wildfires on November 7, 2019, showing aerosol optical depth (AOD) using monthly MISR AOD data from November 2019.* ***Left image*** *shows thermal anomalies (indicated by red dots) detected by the Visible Infrared Imaging Radiometer Suite (VIIRS) instrument aboard the joint NASA/NOAA Suomi National Polar-orbiting Partnership (Suomi NPP) satellite overlaid on a Suomi NPP true-color image of central and eastern Australia. NASA ASDC image.*

In addition to making data easily searchable, the website also aims to be a hub for education and outreach through the efforts of ASDC's Science Outreach Team. The goal of this recently formed team is to de-mystify atmospheric science data and inspire people to use these data in new, innovative ways. For example, a microarticle and Jupyter Notebook about the Australian wildfires were recently published on the new website. The microarticle introduces the topic and datasets while the attached Jupyter Notebook contains Python code users can run on their own computer to reproduce a gif that uses aerosol optical depth (AOD) data from the Multi-angle Imaging Spectroradiometer (MISR) instrument aboard NASA's Terra satellite. The Jupyter Notebook also acts as a template, enabling users to easily change the datasets or dates to suit their needs.

The ASDC Science Outreach Team is also developing new ways to tell stories using atmospheric science data through the use of Esri ArcGIS Story Maps. Story Maps allow users to interact with a compelling narrative through data-driven maps, videos, and charts. In addition, Story Maps can help train people in using the data and serve as inspirational tools to showcase the possibilities for visualizing data. The Science Outreach Team recently made a Story Map on Arctic wildfires.

Several other upcoming projects will be available through the updated website. The ASDC Geographic Information System (GIS) team has been researching innovative ways to use Esri's ArcGIS software to visualize and interact with atmospheric data, and airborne data users will have access to the new Sub-Orbital Order Tool (SOOT) that will enable users to easily search for and download gas and aerosol data.

NASA ASDC's updated website makes it easier than ever to find the atmospheric science data and educational resources you need. Check it out! ■

Explore the NASA ASDC website: https://asdc.larc.nasa.gov/

Published March 23, 2020

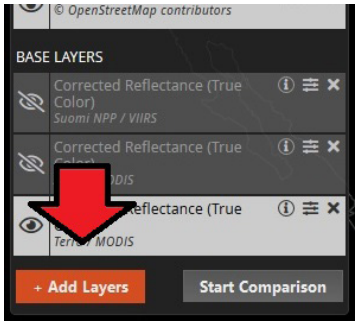
Layer by Layer, NASA Worldview Continues to Improve

New features and enhancements to NASA Worldview make it even easier to interactively work with imagery layers to see your world, your way.

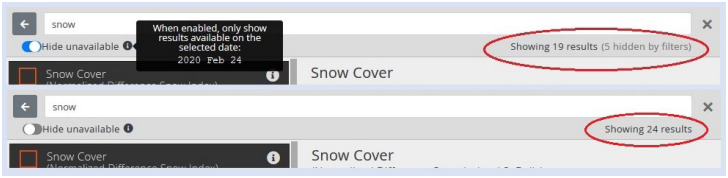
Earthdata URL: https://go.nasa.gov/2yr38QO

Enhancements to the NASA Worldview interactive data visualization application over the next few months will provide new ways to work with the more than 900 data imagery layers available in Worldview through NASA's Global Imagery Browse Services (GIBS). These improvements are rolling out in two phases. The first enhancements have just been released, and add many new features designed to improve data layer discovery, search, and filtering. The second round of new features will be released in March.

Some of the most visible improvements are to the Layer Picker, which appears when you click on the orange "Add Layers" button at the bottom of the Layer List (below red arrow in image at right). The Layer Picker enables users to search through more than 900 imagery layers using key words (such as aerosol optical depth, Terra, or dust) and find imagery layers related to these words. With a simple click, users can select the layer or layers they want and immediately have these selections added to the Layer List (which sits on the left side of the main Worldview screen).

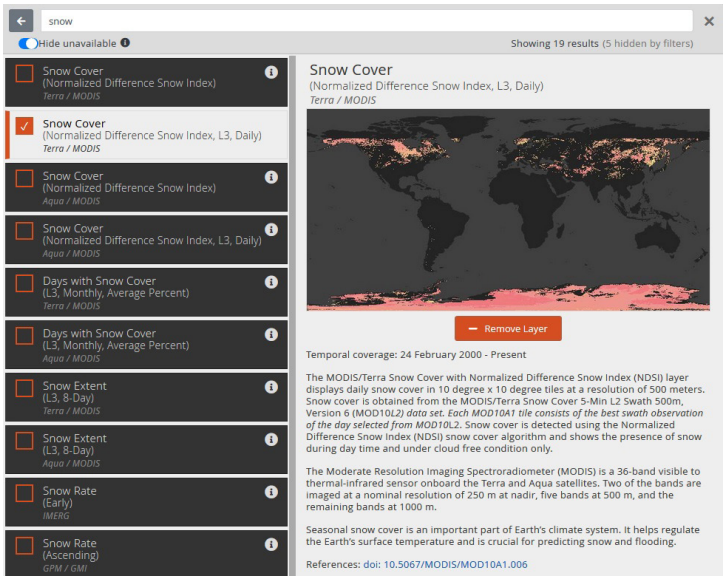


Updates to the Layer Picker include a new "Hide unavailable" toggle button that makes it easy to see imagery that is available for the date you're seeking. Let's say you want to add a Moderate Resolution Imaging Spectroradiometer (MODIS) snow cover layer from NASA's Terra Earth observing satellite acquired on February 24, 2020. After first setting the image date in the lower left corner of the Worldview screen to read "2020 Feb 24," click the "Add Layers" button and type "snow" in the search box at the top of the Layer Picker. With "Hide unavailable" selected, which is the default setting, the search results return only imagery layers that are available for February 24, 2020 (or whichever date you select). Toggling off "Hide unavailable" shows all results, including imagery that is not available for the date you selected.



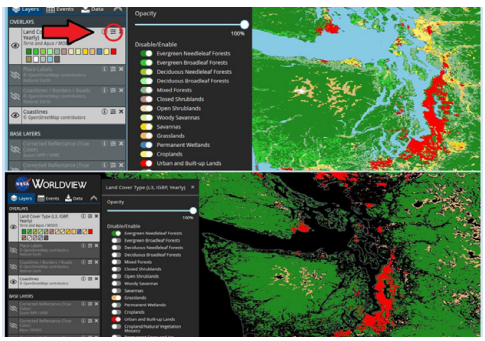
With "Hide unavailable" layers selected (the default setting), only imagery available on the date you want to see will be displayed (19 results in this example). Turning off this feature shows all imagery search results (24 results in this example). NASA Worldview image.

Clicking on the row for a layer pulls up another new enhancement: the ability to see a preview of the selected layer. This layer preview includes a layer description, a preview image, and the option to add the layer to the Worldview Layer List (or remove the layer) by clicking on the orange "Add Layer"/"Remove Layer" button under the preview thumbnail.



Another new Worldview feature improves the usability of imagery layers that feature classification types, such as Land Cover Type, Anthropogenic Biomes, and Human Built-up and Settlement Extent. Users can now select the specific classification types in which they are interested by turning classification values on or off while interactively exploring an image.

For example, if you're specifically interested in looking at the extent of evergreen needleleaf forests and grasslands and the proximity of these land cover types to urban areas you can turn off all the classification layers not related to these criteria. Type "Land Cover Type" in the Layer Picker search box and select the Land Cover Type layer (L3, IGBP, Yearly) to add it to your Layer List (note that the Land Cover Type layer is only available from 2001 to 2018, so you may need to adjust the year on the bottom of the screen to display this layer).



In the Land Cover Type layer, click on the layer options icon in the upper right corner (red arrow and circle in upper image) and a box appears

with toggles allowing you to turn a land type classification layer on or off. Disable all layers except for Evergreen Needleleaf Forests, Grasslands, and Urban and Built-up Lands. The image is now updated to display only the three classification types you just selected (lower image). You easily can add or hide classification types using the toggles as you interactively explore the image.

The next round of enhancements to NASA Worldview are scheduled to go live in late-March, and will feature additional new layers and features. These include further enhancements to the Layer Picker and a new timeline feature to enable users to easily assess the temporal availability of all loaded imagery layers. Stay tuned for more details about these exciting enhancements that will make it even easier for you to see your world, your way using NASA Worldview! ■

Published February 26, 2020

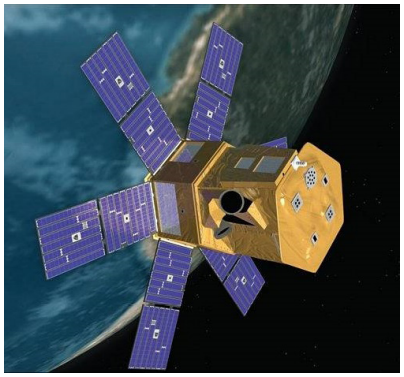
NASA's Solar Radiation and Climate Experiment (SORCE) Mission Ends

NASA's SORCE mission provided an invaluable data record about solar irradiance and the impact of the Sun's energy on Earth's weather, climate, and life.

Earthdata URL: https://go.nasa.gov/2THyhXK

Written by Eric Moyer, Deputy Project Manager, NASA Earth Science Mission Operations (ESMO) Project

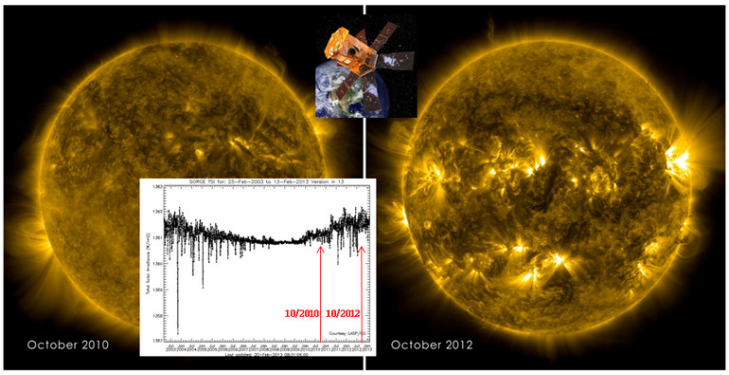
After 17 years in orbit, NASA's Solar Radiation and Climate Experiment (SORCE) mission ended as planned on February 25, 2020. This highly successful NASA Earth Observing System (EOS) mission provided a groundbreaking data record of total solar irradiance (TSI) and spectral solar irradiance (SSI), two key inputs for atmosphere and climate modeling. The mission length also enabled valuable measurements during two of the Sun's 11-year cycles. SORCE data provide a unique understanding of how the flow of energy from the Sun varies and how these variations impact Earth's weather, climate systems, and, ultimately, all life on Earth that depends on solar irradiance.



SORCE measured x-ray, ultraviolet, visible, near infra-red, and total solar radiation to study long-term climate change, natural variability and enhanced climate prediction, and atmospheric ozone and UV-B radiation. NASA image.

Launched on January 25, 2003, aboard a Pegasus launch vehicle, SORCE was designed as a five-year mission. After completing its nominal mission, NASA Headquarters extended mission operations to maintain data continuity. Eight years into the mission, SORCE battery degradation started to impact operations, and insufficient power was available to support consistent data collection by the time the mission had been in orbit 10 years. The mission operations team redesigned their operation concept and eventually switched to daytime-only operations in February 2014. This power-saving plan enabled the spacecraft to continue for a full six additional years, allowing sufficient time for NASA to build and launch a replacement instrument to maintain TSI and SSI data continuity.

The spacecraft bus was built by Orbital Sciences Corporation (now known as Northrop Grumman Space Systems) and the spacecraft payload was built by the Laboratory for Atmospheric and Space Physics (LASP) at the University of Colorado. SORCE carried four instruments: the Solar Stellar Irradiance Comparison Experiment (SOLSTICE), the Spectral Irradiance Monitor (SIM), the Total Irradiance Monitor (TIM), and the X-ray ultraviolet Photometer System (XPS). The SORCE spacecraft and instruments were operated by LASP, which also was responsible for the acquisition, management, processing, and distribution of the science data.



SORCE TSI data demonstrate the daily and cyclic variability of solar irradiance. TSI is slightly lower during solar minimum periods and higher during solar maximum periods, with higher variability evident during solar maximum periods. Solar flares and sunspots, which occur more frequently during solar maxima, cause measurable variability in TSI. Image and caption text courtesy of NASA/LASP and James Acker/Rob Gutro/NASA's Earth Observer at NASA's Goddard Space Flight Center.

After processing, SORCE data were delivered to NASA's Goddard Earth Sciences Data and Information Services Center (GES DISC) at NASA's Goddard Space Flight Center in Greenbelt, Maryland, for archiving and distribution. GES DISC is the NASA Earth Observing System Data and Information System (EOSDIS) Distributed Active Archive Center (DAAC) responsible for data related to atmospheric composition, atmospheric dynamics, global precipitation, and solar irradiance.

SORCE was a highly successful mission. Its TSI measurements extended continuity of the now four-decade-long TSI climate data record. SORCE provided the foundation for the visible and infrared portions of the SSI record, and comparisons of SORCE SSI measurements to similar measurements have led to the production of reference SSI spectra for different phases of the solar cycle.

Other SORCE accomplishments include:

- Implementing next-generation instrumentation of spaceflight radiometers for solar irradiance monitoring with the highest accuracy and precision yet achieved
- Observing two Venus transits and three Mercury transits of the Sun, demonstrating exoplanet detection capabilities and limitations
- Providing total and spectral irradiance inputs to the climate and atmospheric communities, with these inputs used in a wide variety of simulations and models
- Acquiring the first solar flare measurements in TSI and accompanying spectral variations
- Advancing and validating models of the Sun's total and spectral irradiance variability
- Establishing a new level of TSI that is 4.6 W/m^2 (0.34%) lower than prior space-based observations
- Acquiring the first continuous measurements of SSI in the 115- to 2400-nm spectral range
- Defining an accurate reference spectrum of the Sun's spectral irradiance from 0.1 to 2400 nm during very quiet solar conditions
- Seamlessly extending NOAA's Mg II index of chromospheric activity with greatly improved spectral resolution
- Validating the white dwarf flux scale for absolute calibration of instruments for ultraviolet (UV) astronomy and making the first absolute measurement of disk integrated lunar UV reflectance

SORCE also achieved its final goal of acquiring a minimum of 12 months overlap with NASA's Total and Spectral Solar Irradiance Sensor 1 (TSIS-1; launched December 15, 2017). The TSI and SSI climate record is now being continued using TSIS-1 measurements.

SORCE's orbit will slowly decay until it safely re-enters the atmosphere in 2032 after more than 30 years in space. NASA's Orbital Debris Program Office has determined that only a few small spacecraft components are likely to reach Earth's surface upon re-entry, and these components will not be capable of causing significant damage or injury. ■

Learn more about SORCE and explore SORCE data:

NASA SORCE page: https://go.nasa.gov/3fiR5Wa

LASP SORCE page: https://bit.ly/3drvKIH

SORCE data at NASA's GES DISC: https://go.nasa.gov/2zPOanF

Published February 28, 2020

Data 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. Eric Sproles

Assistant Professor of Earth Sciences and Director, Geospatial Snow and Water Resources Lab (GEOSWRL), Montana State University, Bozeman, MT

Water is a finite resource, and the availability of freshwater can have major social impacts. Dr. Eric Sproles uses Earth observing data as part of his studies into water's eco-social effects.

https://go.nasa.gov/2Yvh5HU

Dr. Emily Fischer

Associate Professor, Department of Atmospheric Science and School of Global Environmental Sustainability; Colorado State University, Fort Collins, CO

Our atmosphere is a chemical soup that is constantly sampled by orbiting Earth observing satellites. Dr. Emily Fischer uses these data to better understand how pollutants move in the lower atmosphere.

https://go.nasa.gov/3d8Xame

Dr. Faisal Hossain

Professor, Department of Civil and Environmental Engineering, University of Washington, Seattle, WA

For the people of Asia and Southeast Asia, water is integral to their livelihood. Dr. Hossain uses NASA Earth observing data to improve water management and accelerate economic development in these regions.

https://go.nasa.gov/2SwWG1C

DATA CHATS

Dr. Kurt Thome

NASA Terra Mission Project Scientist

Talking about 20 years of NASA's Terra mission and its significance with Terra Project Scientist Dr. Kurt Thome.

https://go.nasa.gov/3fm2fth

Dr. Christopher Lynnes

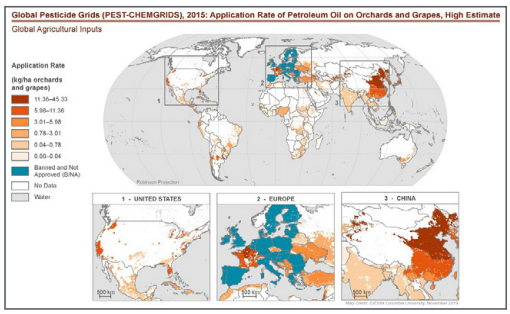
NASA EOSDIS System Architect

The volume of data in NASA's EOSDIS collection is on the verge of exponential expansion. Dr. Lynnes is helping develop not only new ways of working with these data, but also new paradigms for thinking about what data are.

https://go.nasa.gov/2YwoSFr

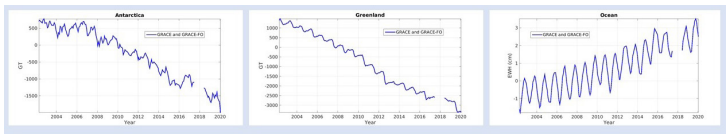
ANNOUNCEMENTS

New Agricultural Pesticide Use Dataset at NASA's SEDAC: https://go.nasa.gov/2Wpc9BZ



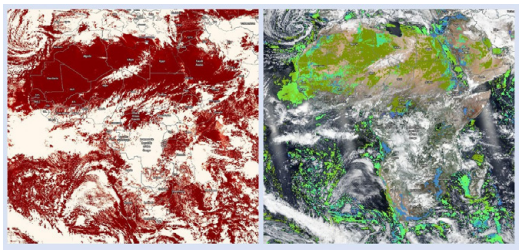
The new Global Pesticide Grids dataset provides information about a range of commonly-used agricultural pesticides, and is designed to help enable assessment of human and ecosystem exposure to these pesticides along with related research.

New GRACE/GRACE-FO Datasets at NASA's PO.DAAC: https://go.nasa.gov/2z8LFN7



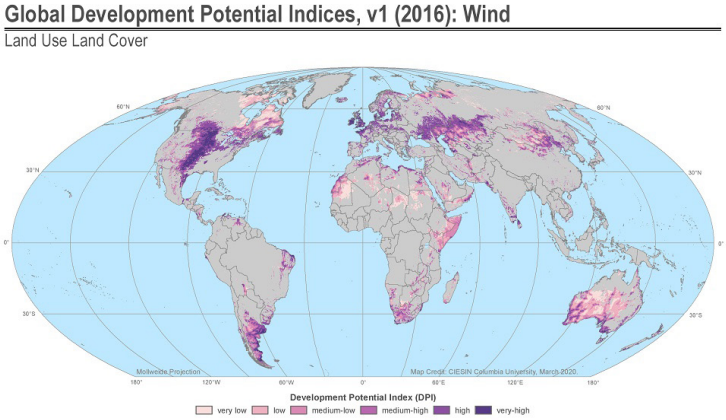
Three new datasets show more than 17 years of variations in ice mass and ice mass changes from Antarctica and Greenland as well as global ocean mass change.

New VIIRS Atmosphere Imagery Products in LANCE: https://go.nasa.gov/35vszwB



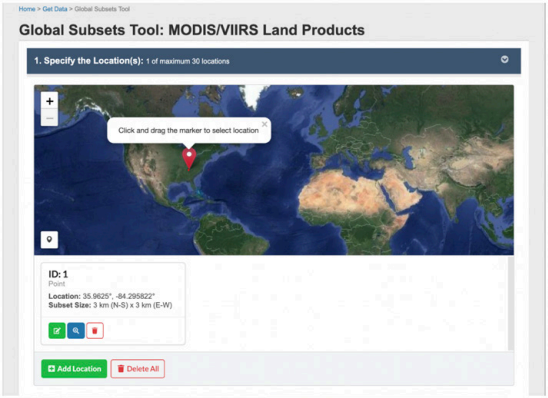
New products for determining atmospheric aerosol loading for daytime cloud-free, snow-free scenes and for determining confidence in cloud-free views of Earth are the two newest near real-time (NRT) products available in NASA's Land, Atmosphere Near real-time Capability for EOS (LANCE).

New Global DPI Dataset at SEDAC: https://go.nasa.gov/2L4nNN3



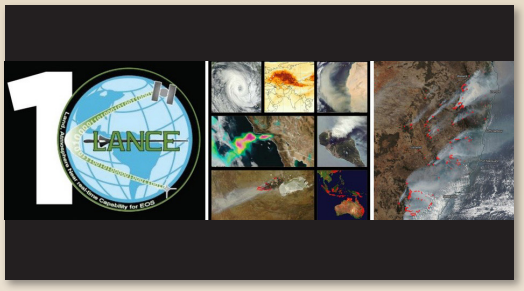
The Global Development Potential Index dataset at NASA's Socioeconomic Data and Applications Center (SEDAC) makes it easier to assess areas susceptible to industrial and agricultural development in 13 discrete sectors.

Improved Global Subsets Tool for MODIS/VIIRS Land Products: https://bit.ly/2TumFau



A new responsive design and mobile-friendly interface with multiple products and site ordering features are now available in the Global Subsets Tool for MODIS/VIIRS Land Products at NASA's Oak Ridge National Laboratory Distributed Active Archive Center (ORNL DAAC).

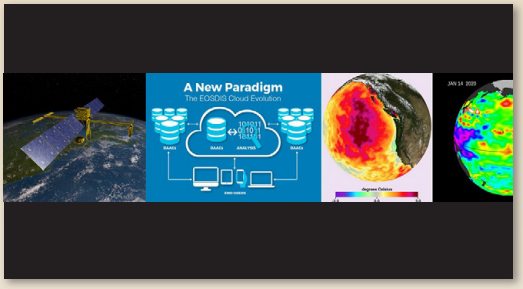
WEBINARS
NASA EARTHDATA



2/14/2020

Discover NASA's Near Real-Time Data using LANCE

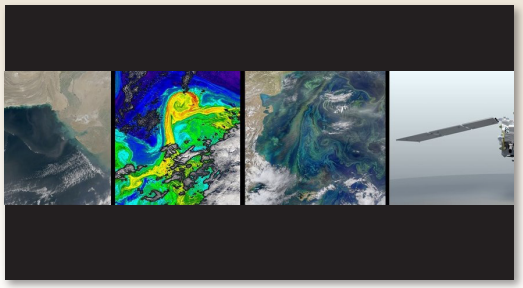
https://youtu.be/bMunftvU4r0



3/18/2020

Making Waves: PO.DAAC's Journey from Servers to a Cloud Environment

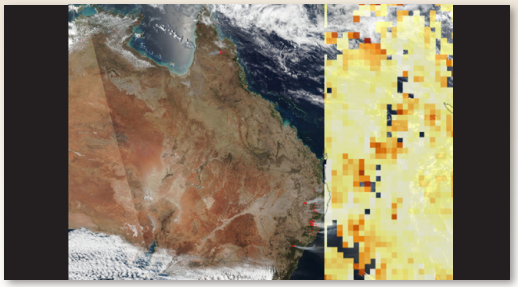
https://youtu.be/MTW8sjdA1jw



2/26/2020

The History and Evolution of Satellite Remote Sensing Ocean Color Science

https://youtu.be/5-_wMG9I5iM

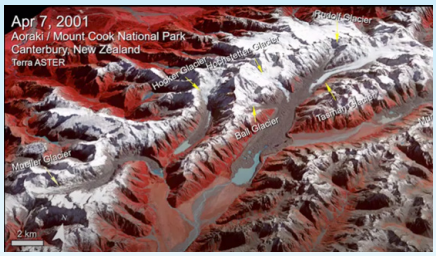


3/25/2020

Data-Driven Storytelling: Using Atmospheric Data to Share Your Science

https://youtu.be/LE4uXxs6yTY

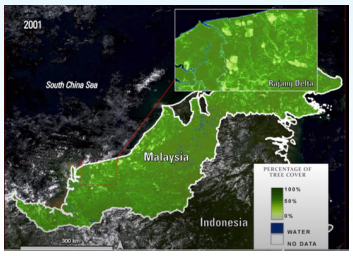
SPECIAL FEATURE VIDEOS



2/6/2020

NASA's Terra/ASTER Observes Glacial Retreat in Aoraki/Mount Cook National Park, New Zealand

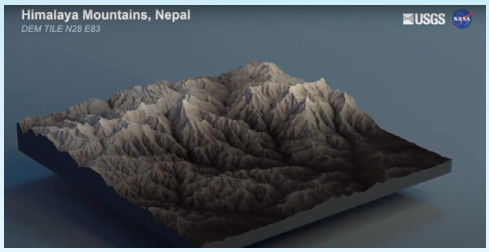
https://youtu.be/Msz6PoaR6GM



2/25/2020

Visualizing Native and Agricultural Tree Cover in the Rajang River Delta

https://youtu.be/W6Fe4qw4l-k



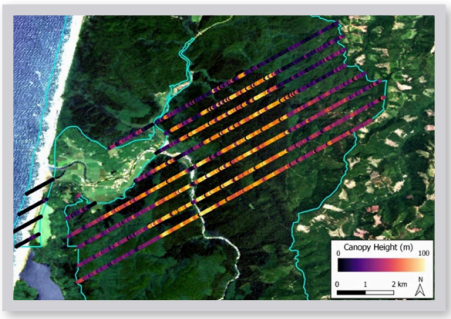
3/3/2020

Looking to Fill the Voids? NASADEM is Here!

https://youtu.be/DTzyxdcbxy0

DATA Recipes & Tutorials

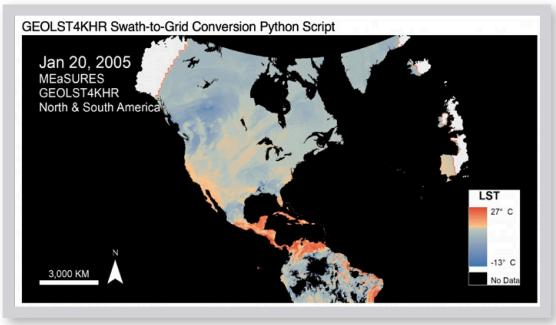
GEDI Spatial and Band/layer Subsetting and Export to GeoJSON (GEDI Subsetter) Script



The Global Ecosystem Dynamics Investigation (GEDI) instrument aboard the International Space Station (ISS) provides high-resolution laser ranging observations of the 3D structure of Earth including forest canopy height, canopy vertical structure, and surface elevation. GEDI is a collaborative effort between the University of Maryland (UMD) and Goddard Space Flight Center (GSFC). This GEDI_Subsetter.py script allows users to subset GEDI L1B-L2 lidar data to their region of interest, and converts files stored in Hierarchical Data Format version 5 (HDF5, .h5) into GeoJSON files that can be loaded into GIS and remote sensing software.

Download recipe at NASA's LP DAAC:
https://go.nasa.gov/3gfzfEi

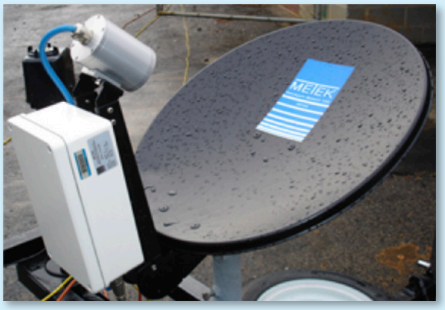
GEOLST4KHR Swath-to-Grid Conversion Python Script



This recipe, developed by NASA's LP DAAC, provides a swath-to-grid conversion Python script that converts the Geostationary Earth Orbit Land Surface Temperature Hourly North and South America 4 km (GEOLST4KHR) swath data products, stored in Hierarchical Data Format version 5 (HDF5, .h5) into projected GeoTIFFs. The GEOLST4KHR data products were produced under NASA's Making Earth System Data Records for Use in Research Environments (MEaSUREs) Program.

Download recipe at NASA's LP DAAC:
https://go.nasa.gov/2LLpxLG

New Instrument Micro Articles at NASA's GHRC DAAC



In preparation for the arrival of the Interagency Implementation and Advanced Concepts Team (IMPACT) field campaign data, NASA's Global Hydrology Resource Center Distributed Active Archive Center (GHRC DAAC) has developed several new instrument articles for instruments deployed for IMPACTS. Discover and access instrument micro articles:
https://ghrc.nsstc.nasa.gov/home/micro-articles

DATA PATHFINDERS

BIOLOGICAL DIVERSITY
ECOLOGICAL FORECASTING

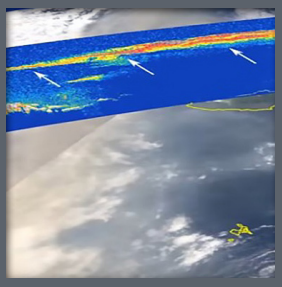
Our newest Data Pathfinder focused on Biological Diversity and Ecological Forecasting directs you to NASA ecological datasets related to vegetation characteristics and processes, biodiversity-related spectroscopy, human impacts, and species distribution modeling, and provides guidance on tools for accessing, visualizing, and using the data.
Explore this pathfinder: https://go.nasa.gov/3c34yiH

EARTHDATA TOOLKIT

Find data and helpful resources on a variety of biological diversity topics, including vegetation, habitat suitability, aquatic ecology, species distribution, and human interactions with the environment, in our new Biological Diversity Data Toolkit.

Access this toolkit: https://go.nasa.gov/2VMEjrN

Latest NASA Earthdata Images



CALIPSO Shows Australian Smoke Plumes

https://earthdata.nasa.gov/mastheads

(Published 2/3/20)

Iceberg B49 Calves from Pine Island Glacier, Antarctica

https://go.nasa.gov/2STlYpP

Cold Wake Signatures from 2019 Atlantic Storms

https://earthdata.nasa.gov/mastheads

(Published 2/18/20)

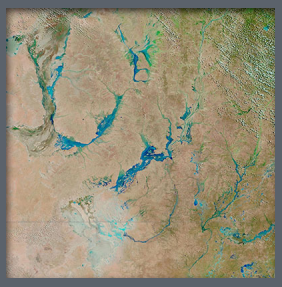
Smoke Emanating from Fires in Cuba

https://go.nasa.gov/2zclKV1

Slow Transition to Spring

https://earthdata.nasa.gov/mastheads

(Published 3/9/20)



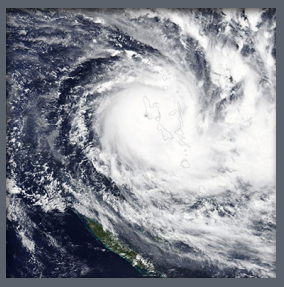
Floodwaters in South West Queensland, Australia

https://go.nasa.gov/2Xalq0V

Chinese Quarantines and NO2 Concentrations

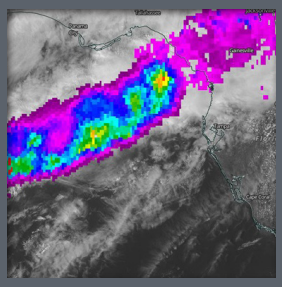
https://earthdata.nasa.gov/mastheads

(Published 3/16/20)



Tropical Cyclone Harold over Vanuatu

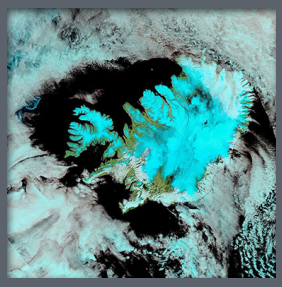
https://go.nasa.gov/2UP9WzZ



Heavy Precipitation in the Gulf of Mexico

https://earthdata.nasa.gov/mastheads

(Published 3/23/20)



Snow Covering Iceland

https://go.nasa.gov/3bLKvWb

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