



Changing Earth education resources



NASA: Expanding Scientific Understanding of the Earth

Earth is a dynamic system that, like the human body, includes diverse parts interacting in complex ways. Understanding Earth requires understanding its air, land, water, ice sheets and life as an interconnected system—a system that is constantly changing on all scales of space and time. Recently, human activities have increasingly contributed to changes in the Earth system.

NASA's space-based perspective allows scientists to observe changes and interactions within the Earth system on a global scale. These observations help scientists advance their understanding of the Earth system and its response to natural and human-caused changes. They also help improve predictions of climate, weather and natural hazards. Such predictions can save lives, protect homes and businesses, and grow economies.

Learn more about how NASA is studying our changing planet at • science.nasa.gov/earth-science

Banner satellite image: NASA/Goddard Space Flight Center Scientific Visualization Studio • svs.gsfc.nasa.gov/goto?3829 • shows the ocean surface flows colored by the sea surface temperature data from the ECCO 2 computer simulation.

GET INVOLVED!

The Home Frontier: Earth Day Video Contest ■ On Earth Day in 2011, NASA asked the public to create their own short video that encapsulated both NASA's Earth science mission and what makes it inspiring. Look for a second contest during April 2012; details will be posted at • www.nasa.gov/earth



Credit: One Earth, 2011 winning video.

One Earth by Fiona Conn was the 2011 winning entry in NASA's inaugural Earth Day Video contest. Her moving video captures what makes Earth stand apart from the infinite cosmos that is NASA's mission to explore—what makes Earth our “Home Frontier.” • www.nasa.gov/topics/earth/features/earth-videos266349.html

2011 Earth Science Week Our Ever-Changing Earth

Get the latest on NASA plans for Oct. 9–15 Earth Science Week! climate.nasa.gov/esw2011

Upcoming Events, Programs and Learning Resources

Go to • www.smdeponews.org • for an ongoing blog about upcoming educational programs and workshops, events, opportunities and learning resources related to NASA Earth and space science education. You can also subscribe to an RSS feed of content on this site. To subscribe to a monthly email broadcast, email • ese_ed_newslist-subscribe@lists.hq.nasa.gov • with “Subscribe” as the subject.

Following are a few of the many NASA Earth science educational programs, resources and opportunities for learning about our changing planet:

GLOBE Student Climate Research Campaign (SCRC) • globe.gov/scrc • is a worldwide effort to engage youth in understanding climate through research of locally-relevant climate issues. The SCRC will include foundational activities, intensive observing periods and research investigations. Through international collaboration and discussions as well as interactions with scientists, students will examine climate issues in their communities and around the world. The campaign launches fall 2011 and concludes summer 2013. Register to join the campaign at • globe.gov/scrc

S'COOL (Students' Cloud Observations On-Line) • scool.larc.nasa.gov • S'COOL is a real-time, collaborative science experiment that elementary through secondary students conduct with NASA scientists. Participants make ground truth observations of clouds for comparison with satellite data. These observations help NASA scientists validate the measurements from NASA's CERES satellite instrument (Clouds and Earth's Radiant Energy System). The S'COOL website includes several educational resources, including tutorials, cloud ID charts and ideas for projects. The site also includes information on *Roving Cloud Observations for S'COOL*, a program for citizen scientists.

Landsat Education Activity Matrix • landsat.gsfc.nasa.gov/education/activity_matrix.html • has classroom activities for analyzing land cover changes, including: *Annotating Change in Satellite Images* and *Quantifying Changes in Land over Time*.

Exploring Air Quality in Aura NO₂ Data and *Exploring Regional Differences in Climate Change* are chapters from the **Earth Exploration Toolbook** • serc.carleton.edu/eet • a collection of computer-based Earth science activities for middle school to college level instruction.

Find hundreds more learning resources for all ages in the **NASA-Reviewed Collection** within **DLESE** (Digital Library for Earth System Education) • bit.ly/NASA_Collection

Data and Tools

The Scientific Visualization Studio • svs.gsfc.nasa.gov • works closely with scientists to create data visualization products that promote a greater understanding of NASA Earth and Space Science research activities. Visualizations are searchable by keyword, mission, instrument, scientist, etc. They can be downloaded as movies of various file types and resolutions or as stills.

NASA Earth Observations (NEO) • neo.sci.gsfc.nasa.gov • was developed to help museums, science centers and other informal education institutions access imagery of NASA's global datasets. Images are available in several formats, including those supported by Science On a Sphere and other global kiosk displays. Includes access by Web Mapping Service so that kiosks and other applications can update automatically.

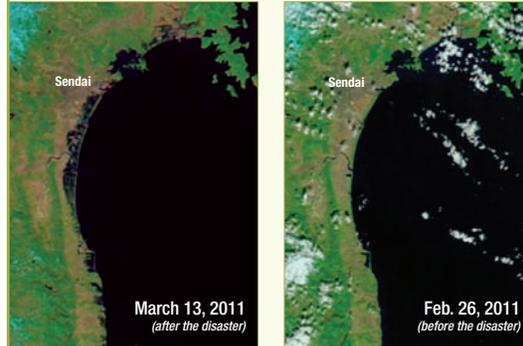
MY NASA DATA • mydasdata.larc.nasa.gov • Students of all ages can investigate microsets of NASA Earth science satellite data, including atmosphere, biosphere, cryosphere, ocean and land surface. Data are available along with lesson plans, computer tools and an Earth science glossary. Citizen science project ideas are also available.

Giovanni • daac.gsfc.nasa.gov/giovanni • provides a simple and intuitive way to visualize, analyze and access vast amounts of Earth science remote-sensing data without having to download the data.

USGS Earth Resources Observation and Science (EROS) Center • eros.usgs.gov/#/Find_Data • maintains a long-term, comprehensive archive of satellite imagery of our planet's changing land surface, including USGS/NASA Landsat, and NASA MODIS and ASTER. Image data can be accessed by using two tools: Earth Explorer and Global Visualization.

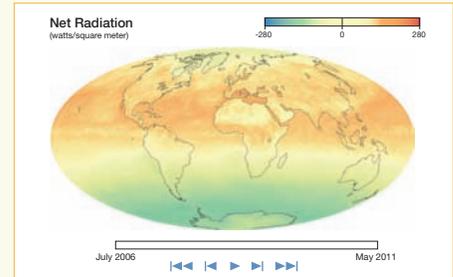
NASA'S EARTH OBSERVATORY

NASA's Earth Observatory • earthobservatory.nasa.gov • shares the images, stories and discoveries that emerge from NASA Earth science research, including its satellite missions, in-the-field research and climate models. View global maps of NASA data, check out the *Image of the Day* and images of current events, and read feature articles and blogs. Also includes special collections of NASA images, including the *World of Change* series, which documents how our planet's land, oceans, atmosphere and Sun are changing over time.



Japan Earthquake & Tsunami • Skies over northeastern Japan were entirely cloud-free on March 13, 2011, providing a clear view of tsunami flooding along the coastline. Water, black and dark blue in these false-color images, still covers the ground as much as five kilometers (three miles) from the coast. The right image, taken on Feb. 26, 2011, shows the coastline under normal conditions. The images are from MODIS sensors on NASA's Aqua and Terra satellites. Both images were made with infrared and visible light to highlight the presence of water on the ground. Plant-covered land is bright green, bare earth is tan-pink, and snow is blue. The city of Sendai is brown.

Credit: MODIS Rapid Response Team at NASA GSFC.



Global Maps • NASA satellites give us a global view of what's happening on our planet. Download animations of these images to explore how key parts of Earth's climate system change from month to month. Global maps include: snow cover, total rainfall, cloud fraction, vegetation, water vapor, net radiation, land and sea surface temperature, and more.

Latest Features

The Carbon Cycle
June 16, 2011
Carbon flows between the atmosphere, land, and ocean in a cycle that encompasses nearly all life and sets the thermostat for Earth's climate. By burning fossil fuels, people are changing the carbon cycle with far-reaching consequences.
[Read More](#)

Feature Articles • provide science stories and in-depth information about Earth science.
Photo: © 2007 MorBCN.



NASA GLOBAL CLIMATE CHANGE

Explore Earth and its changing climate at • climate.nasa.gov • to find breaking climate news, FAQs, amazing visualizations, and fun and educational interactives and resources for all ages.

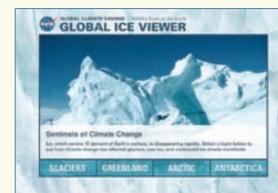
Climate Kids for ages 10–12 answers the big questions about climate change using simple illustrations, humor and interactivity. Includes Earth science games and a *Green Careers* section.



Climate Time Machine • Track changes in global conditions over time: average temperature, carbon emissions, sea ice and sea level.



Sea Level Viewer • Explore the latest global sea level from space, as well as sea level changes during El Niño and La Niña years, Hurricane Katrina, and the 2004 Indian Ocean tsunami.



Global Ice Viewer • Explore how climate change has affected glaciers, sea ice, and continental ice sheets worldwide.



Eyes on the Earth 3D • Fly in real time alongside current Earth-observing missions, which constantly monitor our planet's vital signs—such as sea level height, carbon dioxide concentrations in our atmosphere, global temperatures, and extent of sea ice in the Arctic.



Water Cycle • Follow the path of water in our climate system.