Earth Science Serving Society

NASA Applied Sciences Program

Table of Contents

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The Applied Sciences Program is part of the Earth Science Division in the NASA Science Mission Directorate.

Applications Areas:

- **Disasters**
- **Ecological Forecasting**
- **Health & Air Quality**
- **Water Resources**

Capacity Building Activities:

- **DEVELOP**
- **SERVIR**
- **Gulf of Mexico Initiative**
- **Earth Observations Training**

Overview

Future Application Areas:

- **Agriculture**
- **Climate**
- **Energy**
- **Oceans**
- **Weather**

The NASA Applied Sciences Program promotes and funds activities that discover and demonstrate innovative uses and practical benefits of NASA's Earth science resources. By partnering with public and private organizations to apply NASA scientific findings and Earth observing data to decision-making activities, the Applied Sciences Program actively benefits society through Earth science.

All Program activities support three primary goals: to enhance application research; increase collaboration; and to accelerate applications. By working with partners – and continuing to build new relationships – the Applied Sciences Program is identifying priorities for new applications to develop and is also identifying possible applications in the early stages of satellite mission planning.

Through solicitations for competitively-selected, peer-reviewed projects, Applied Sciences supports both applied research and targeted decision-support projects in nine areas of national priority. The Program's Application Areas currently include four areas of focus: Disasters; Ecological Forecasting; Health & Air Quality; and Water Resources. The Program seeks opportunities to expand and develop robust efforts in five future areas: Agriculture; Climate; Energy; Oceans and Weather.

The diverse portfolio of projects in these Applications Areas deliver results and societal benefits through applying Earth observations and Earth science models to improve early warning systems, water management, natural hazard response, disease tracking, adaptation to climate change, and many other important topics.

In addition to the Applications Areas, the Applied Sciences Program supports four cross-cutting Capacity Building activities – DEVELOP, SERVIR, Gulf of Mexico Initiative and Earth Observation Training. These programs sponsor specific activities that improve the skill-sets and capabilities of decision makers, community leaders and resource managers in the US and abroad, especially in developing countries, on how to access and apply Earth observing satellite data and other NASA assets for beneficial purposes.

Photo credit: NASA

We invite you to become involved in the Applied Science Program and apply Earth observations into your activities.

A view of Hurricane Isabel's eye captured aboard the International Space Station by an Expedition 7 crewmember.

The Disasters Applications Area promotes the use of Earth observations and tools to forecast, mitigate, and respond to natural and technological disasters. By working seamlessly with other agencies, local government organizations and additional end-users, emergency managers and community decision-makers can use Earth observations to meet the challenges associated with disasters.

Disasters applications can contribute to a better understanding of the Earth processes that produce natural hazards, including earthquakes, hurricanes, floods, landslides, and wildland fires. This understanding can support emergency preparedness leaders in developing mitigation technologies, such as early warning systems, or providing information and maps to emergency responders and recovery teams.

Tracking Volcanic Ash

As Iceland's Eyjafjallajökull volcano erupted on April 14, 2010, plumes of ash capable of damaging aircraft engines spread across the skies over Europe. After years of working closely with partner agencies on volcanic and related hazards, Applied Sciences was able to quickly support the NOAA and Federal Aviation Administration (FAA) requests to provide customized-plume reports to the Volcanic Ash Advisory Center in London.

NASA built these reports by using data from the Ozone Monitoring Instrument (which detects aerosols and the presence of sulfur dioxide, a major component of volcanic ash) on the Aura satellite, Moderate Resolution Imaging Spectroradiometer (MODIS) on *Terra* and *Aqua* satellites, Multi-angle Imaging SpectroRadiometer (MISR) on the *Terra* satellite, and cloud height information from the lidar aboard the *CALIPSO* satellite. These data sets were used to validate the data gathered by the United Kingdom Meteorological Office to ensure safe airspace.

Today, NOAA continues to receive updates on volcanic ash and sulfur dioxide plumes. These reports, developed from Applied Sciences-funded projects at the University of Maryland-Baltimore County and the University of Wisconsin, give critical updates that affect the aviation and travel industries.

Disasters

Image credit: NASA

Aqua, an Earth observing satellite that collects data, mainly on water, via six instruments.
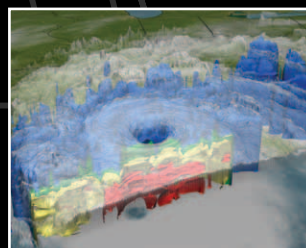

Image credit: NASA

The *TRMM* satellite collected the data that was used to depict the internal structure of Hurricane Katrina in the image above.

Image credit: NASA

Terra's ASTER instrument captured this false-color wildland fire image of smoke and scorched land in Northern California.

Ecological Forecasting

The Ecological Forecasting Applications Area promotes the use of Earth observations and Earth science models in applications that shed light on environmental changes that affect ecosystems and their living elements. The forecasts and forecasting tools developed with the Applied Sciences' support assist land-use managers, fisheries and other decision makers in the areas of conservation biology, natural resource management, and sustainable development.

River Temperatures and Endangered Species in California

To keep up with California's demand for water, rivers and streams are often exploited, thus altering their natural ecosystem. In the past, water managers depended on monthly river-temperature averages to decide how to best use the water for public use while simultaneously balancing the sensitivities of the river ecosystem. But, for several species, including an endangered salmonid species, water temperature is critical to their survival. There isn't enough data in a monthly-set for a water resource manager to predict water temperature fluctuations that are necessary to decide how much – or when – to divert water for public use.

An Applied Sciences-funded project, in cooperation with NOAA, is changing all of that. Now water temperature readings are available every 15 minutes to water managers in the Central Valley of the state. By combining the NASA Terrestrial Observation and Prediction System (TOPS) with satellite observations and NASA and NOAA models, river temperatures can be monitored and predicted with high accuracy.

The modeling framework that made this project possible was built using MODIS data gathered by the *Terra* and *Aqua* satellites. Water managers, tracking fine-scale temperature fluctuations, are able to forecast water temperature up to 72 hours in advance. This large prediction-window allows them to make educated decisions about how to best use the water for multiples uses, thus protecting temperature sensitive fish species.

Image credit: NASA

Landsat 7 continues the long-legacy of the Landsat program by providing valuable imagery of Earth's surface.

Image credit: NASA

Landsat captured this stunning image of a Mangrove forest – one of Earth's rapidly disappearing ecosystems – in Malayasia.

Image credit: NASA

ASTER captured this false-color image highlighting deforestation in Brazil. The dark red color indicates rainforests while brown areas indicate cleared land.

Health & Air Quality

NASA's Health & Air Quality Applications Area supports the use of Earth observations in air quality management and public health, particularly regarding infectious disease and environmental health issues. The Application Area addresses issues of toxic and pathogenic exposure and health-related hazards and their effects for risk characterization and mitigation. The area promotes uses of Earth observing data and models regarding implementation of air quality standards, policy, and regulations for economic and human welfare. The Health & Air Quality Applications Area also addresses effects of climate change on public health and air quality to support managers and policy makers in their planning and preparations.

The NASA-funded health and air quality applications developed from Earth observations are used in for climate and emissions regulations, planning, forecasting, and compliance – all for societal benefit.

NASA and CDC Partnership:

Since 2004, the Centers for Disease Control and Prevention (CDC) and NASA have partnered to create applications using remote sensing data for public health purposes. Using information gathered by Earth observing satellites, CDC, NASA researchers and applications specialists have developed a module for the Environmental Public Health Tracking Network to characterize extreme heat events.

Now, after identifying heat event trends and developing indicators for these occurrences, local public health officials can alert their communities about the elevated risk for heat-related illnesses and events. Officials can advise people with chronic illnesses, the elderly, and other vulnerable groups about extreme heat patterns that may affect them negatively with the goal of reducing temperature-induced illnesses and deaths.

The *Aura* satellite tracks the ozone layer and the dispersion of airborne pollution.
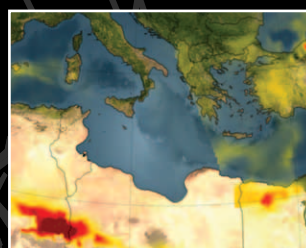
Image credit: NASA

The AIRS instrument on *Aqua* collected carbon monoxide data that was used in this image to track a plume of smoke caused by massive wildland fires in Greece.
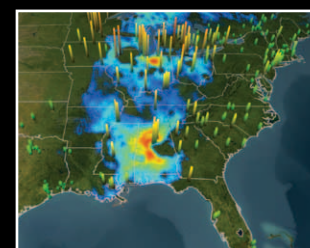
Image credit: NASA

MODIS data collected by *Terra* and *Aqua* when combined with EPA gathered data, as shown in this image, can aid the EPA in making air quality predictions.

Image credit: NASA

The Water Resources Applications Area promotes the use of Earth observing data related to water in all forms – from lakes, rivers, streams and seas, to snow and groundwater – to develop applications that promote responsible management for the sustainable use of water resources. Earth observations can be applied to water availability, water forecasts and water quality to create and improve the decision support tools that end-users rely on to manage water resources in their communities.

NASA's Earth observing data has been applied by the California Department of Water Resources to address issues related to snow melt, which provides potable water for the state's citizens, irrigation water for agriculture, and water for the state's hydroelectric power generation. In addition, US forces in Afghanistan have used NASA snow-melt data to better understand water supply and availability in that region of the world.

Monitoring Drought using Satellite Observations

Groundwater is necessary for many public and industrial uses that society depends upon. From irrigation, to drinking water, and even industrial cooling systems, all aspects of society can be affected by inadequate groundwater levels. Understanding the state of a groundwater system is vital to predicting water availability, flooding and especially drought.

An Applied Sciences project with the U.S. Drought Monitor at the University of Nebraska is using Earth observations to create drought indicators for soil moisture and groundwater. Data are being gathered by the US/German Gravity Recovery and Climate Experiment (GRACE) satellites and are then combined with rainfall and other meteorological-data. This combination has been integrated into a model that addresses the need for accurate information on deep water storage conditions. NASA researchers and applications specialists are using the soil moisture and groundwater indicators to produce maps of groundwater conditions that can be useful for not just drought monitoring but other water-use applications that can benefit society.
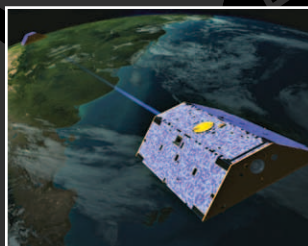
Water Resources

The *GRACE* satellites tracks changes in Earth's gravity field that can be used to better understand water systems on Earth.

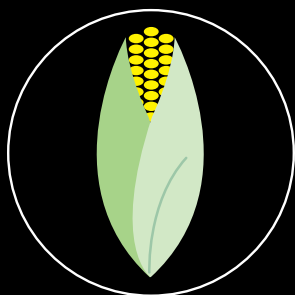Using MODIS data collected by *Terra*, this image depicts the changes the Aral Sea has gone through over the last decade.

Landsat imagery was used to create this mosaic of the Chesapeake Bay on the East Coast of the United States.

Agriculture

The Agriculture Applications Area will focus on using Earth observing data by public and private sector organizations to assess agricultural risk, forecasting, water management, and global food security. The use of this data can help planners adapt to extreme events such as drought, invasive species infestations and the impacts of a changing climate on agriculture both domestically and abroad. The Agriculture Applications Area will use observations and outputs of climate models to support agricultural productivity and yield forecasts, examine conservation effects, and assess management alternatives.

Applied Sciences has previously supported the Agriculture Applications Area and conducted numerous projects. Although no longer a focus area, this Applied Sciences plans to renew this Application Area in the future as opportunities allow.

Using Remote Sensing to Optimize Agricultural Irrigation

Irrigation is a necessary step to grow a healthy crop for harvest, especially in the more-dry western states. But knowing how much and when to irrigate can be a complicated and costly decision. Initially funded through the American Reinvestment and Recovery Act, an Applied Sciences' project used Earth observing data to optimize the irrigation process for the benefit of growers, and water use managers.

As part of this project, *Landsat*, *Terra*, and *Aqua* data-sets were used to observe crop-canopy conditions. When this Earth observing data was combined with local weather conditions, the project estimated a crop's water needs and then planned irrigation rates to accurately meet those needs.

To validate this Earth observing process, sensors that measure soil moisture and evapotranspiration have been installed at pilot sites in California. Initial comparisons between the sensor network and using the satellite data have been very promising. This new way to estimate irrigation needs is accurate on a spatial scale up to a quarter mile, ensuring a healthy crop yield and proper management of water resources.

Image credit: NASA

The *Terra* satellite gathers data through 5 sensors that study the interactions among the Earth's atmosphere, lands, oceans, and radiant energy.

Image credit: NASA

ASTER captured this image above Lake Naivasha, Kenya which highlights the scope of the agriculture industry, specifically growing flowers for export, in that region.
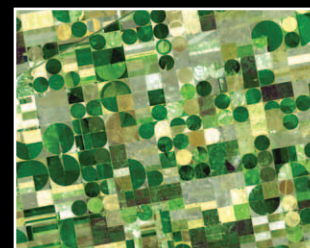

Image credit: NASA

ASTER produced this imagery of green crops, irrigated by water from the Ogallala Aquifer, in South-western Kansas.

The Climate Application Area will promote uses of Earth observations and Earth science models to support assessments, policy analyses, and implementation approaches that organizations will consider in their planning and response to climate change. The Climate Applications area will address adaptation and mitigation issues and the specific topic of carbon management. This area will focus on applications of Earth observations to assess climate policy alternatives and to track progress toward climate policy objectives.

Applied Sciences has previously supported the Climate Applications Area and conducted numerous projects. Although no longer a focus, this Applied Sciences plans to renew this Application Area in the future as opportunities allow.

Mapping Carbon in Forests

Forests may play an important role in offsetting carbon emissions as they absorb carbon dioxide from the atmosphere. Yet, forests do not solely remove carbon. They can later release stored carbon through events like wildland fires, insect infestations, and timber harvests. To know exactly how much carbon a forest can offset – and therefore ways to best manage a forest – it's important to understand the dynamic forests over time.

An Applied Sciences project focused on forest carbon management practices used images from *Landsat* to examine changes in forest cover during a year-long feasibility study in Oregon forests. The project integrated landscape modeling, satellite observations, vegetation mapping, and computer simulation for an innovative approach to carbon assessment.

The study helped the Oregon Roundtable on Sustainable Forests to assess the feasibility of their forest management plans. In addition, the Oregon Department of Forestry gained insight into the annual flux of carbon through their forests.

With applications like this one, Earth observations can be used by managers and policy makers to integrate environmental, economical and social considerations into land-management decisions. Earth observations also provide strong visuals of changes in forest coverage. These visuals help forest managers and the general public to understand the various changes occurring in their communities.
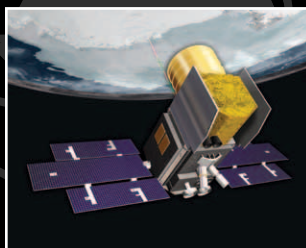
Climate

ICESat collected ice sheet, cloud and aerosol heights, and topography and vegetation data.
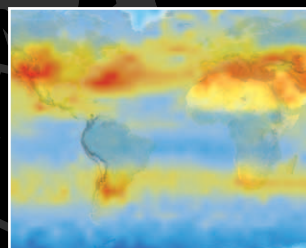
Image credit: NASA

This satellite image shows carbon dioxide emissions in red and areas of carbon dioxide absorption in blue.
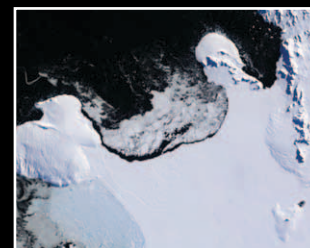
Image credit: NASA

The Wilkins Ice Shelf has been disintegrating into small pieces, as opposed to calving into large icebergs, raising concerns about warming waters.

Image credit: NASA

Energy

The Energy Applications Area will enable the use of Earth observations and Earth science models to improve the locating, planning, and harvesting of renewable energy sources, such as wind, geothermal, and solar. The area will focus on topics of energy efficiency, load forecasting, energy source distribution, building design, and energy assessments. Public and private organizations can use Earth observations and models in ways to improve the use of renewable sources in meeting energy needs and policy objectives.

Although Energy has not yet been a focused Application Area, Applied Sciences has sponsored various energy applications projects to assess and prepare for a future Energy Applications Area.

Harnessing Wind Power

Selecting optimal sites to construct a wind farm is key to determining the long-term efficiency and profitability of a wind energy venture. The process of site location can take significant analysis and a large financial investment. Applied Sciences sponsored a project with the National Center for Atmospheric Research (NCAR) to assess the use of Earth observations in reducing the time and expenses to assess and map optimal areas for harnessing wind power.

The project is designing an accurate and economical wind assessment model using NASA Earth science capabilities. The model incorporates the NASA Mirador data access tool, innovative statistical techniques, and data from MERRA, NASA's three-dimensional global record of weather since 1979. Using these and a NCAR analysis system, this project enables wind farm developers to incorporate NASA-NCAR analysis into their own decision making.

With this information, a development team can create a 20-year set of analyses of their region's wind variability. The project's sampling techniques can provide an accurate, reliable, and faster estimate of wind power production at a location with significantly reduced simulations and analysis expenses, supporting lower development costs and the nation's use of renewable energy sources.
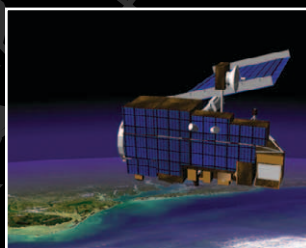
The *Terra* satellite gathers data through 5 sensors that study the interactions among the Earth's atmosphere, lands, oceans, and radiant energy.
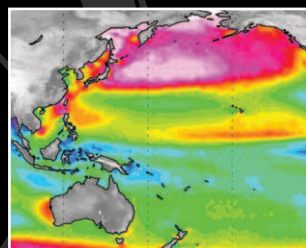
Image credit: NASA

QuikSCAT data that shows wind power density over global oceans. Data like this could be used to harness wind power.

Image credit: NASA

At the correct angle, solar power stations in the Mohave Desert can reflect solar energy from their large, mirror-like surfaces toward one of the MISR cameras.

Image credit: NASA

Oceans

The Applied Sciences' Oceans Applications Area will promote the use of Earth science models and Earth observing data in topics affecting ocean and coastal regions. The area will develop Earth science applications to support resource management, trade and navigation, assessment of options to sea level change, and emergency management and response. The Oceans Applications Area will focus on enhancing policy, business, and management decisions related to coastal zones, near-shore environments, marine and open-ocean activities, oceanic islands, and reefs and estuaries.

Applied Sciences has funded projects related to ocean and coastal applications, which will help the Program prepare for a future Oceans Applications Area.

Navigating Icy Paths

As Arctic sea ice melts, new shipping routes once inaccessible are becoming navigable. Yet ice flows still exist in the Arctic, leading to dangerous situations for ship, crew, and cargo. Currently, the U.S. Navy uses the Polar Ice Prediction System (PIPS) to provide short-term sea ice forecasts. But this system only has a grid resolution of approximately 27 kilometers. The Arctic Cap Nowcast/Forecast System (ACNFS) has improved upon PIPS' resolution, but still more detailed sea ice information from Earth observations is needed to create even higher resolution data sets.

NASA Applied Sciences supported a project to do just that. By using Earth observing data from the Aqua satellite, the highest resolution and most accurate data set to-date was developed and implemented into the ACNFS sea ice forecasts for testing. Initial results show that the ACNFS, using the merged NASA data, improved forecasts as much as 54% with an average regional improvement of 36%. Significant improvements in accurately forecasting sea ice can save valuable time, money, and most importantly, safety in navigating the waters of the Arctic.

Image credit: NASA

The Aquarius/SAC-D satellite observatory in orbit off the coast of South America. Measuring sea surface salinity, key tracer for understanding ocean circulation and global freshwater balance.
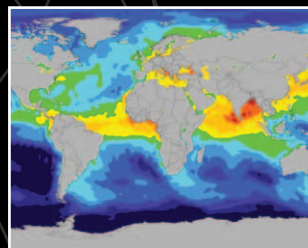

Image credit: NASA

This data-based map indicates areas of iron dust deposition on the oceans. The low-dust deposition areas have a high fluorescence.
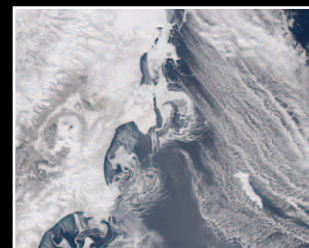

Image credit: NASA

Sea ice can form a filigree pattern when exposed to wind and ocean currents. This image was taken above Kamchatka's volcano dominated coastline.

The Weather Applications Area will focus on increasing the use of Earth observing data and tools in real-world applications that support specific weather-effected economic interests to enhance the global mobility of people and goods. The area will focus particularly on developing aviation weather applications to support the Next Generation Air Transportation System (NextGen). The Weather Applications Area will address issues related to convective weather which produces thunderstorms, high winds, heavy precipitation, hail and lightning, all of which can lead to weather related travel and supply chain delays, economic impacts, and can harm human welfare.

Applied Sciences previously supported the Weather Applications Area and sponsored numerous projects. The Program looks to resume this area as opportunities allow.

Predicting Turbulence

Turbulence is the primary cause of serious injury to passengers and flight crews aboard commercial passenger transport aircraft. In addition to improving air travel safety and comfort, accurately predicting where and when turbulent skies are likely to occur increases the efficiency of the National Airspace System. To address this, Applied Sciences has sponsored a project with NCAR and the University of Wisconsin-Madison Cooperative Institute for Meteorological Satellite Studies (CIMSS) to apply NASA Earth observing data to develop and enhance a new Global Graphical Turbulence forecast tool.

The project applies data from Earth observing satellites to increase the accuracy of predicting turbulent air space to aid the World Area Forecast System (WAFS), which issues alerts and weather charts to the worldwide aviation industry. By supporting WAFS forecasters, the use and application of NASA's Earth observing data can improve the safety and efficiency of air travel.

Weather

Image credit: NASA

TRMM, a joint mission between NASA and the Japanese Aerospace Exploration Agency, monitors tropical rainfall.
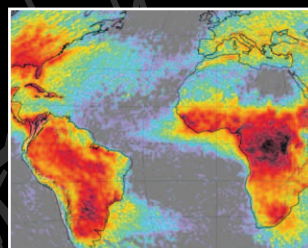

Image credit: NASA

This image displays the average yearly lightning flashes per square kilometer. Areas with the least lightning strikes are gray or light purple, while the most lightning strikes are deep red.

Image credit: NASA

TRMM flew over and captured data from tornadic thunderstorms over the eastern United States in early spring of 2011.

Capacity Building Activity

DEVELOP is a national training and development program for students and young professionals that provides experience in utilizing and integrating satellite remote sensing data into real-world application projects. DEVELOP extends NASA Earth science outcomes to the public by conducting projects that innovatively use NASA Earth observations and models to address environmental issues.

The program fosters a high-quality corps of early-career professionals to cultivate advanced skills in NASA Earth science applications and understanding partner agencies' decision support tools. The participants gain valuable experience delivering results to leaders in local, state, and federal government, academia, and industry. DEVELOP's projects and participants greatly expand the network of organizations and individuals contributing to, and benefiting from, the Applied Sciences Program by forming strong partnerships and demonstrating quality project results.

For example, DEVELOP teams are working with the international Group on Earth Observations (GEO) to conduct applied research projects that will enhance decision making related to health threats in Mexico, such as vector-borne disease risk mapping and degraded water and air quality monitoring. The projects have partnered with various Mexican government agencies including the Secretaria de Salud (Secretariat of Health) and the Comision Nacional del Agua (National Water Commission). The students' research will help their partners in Mexico improve their decision making process concerning public health threats through the use of Earth observations.

Challenged to think outside the box, take initiative, and employ innovative ideas using NASA data, students who participate in the DEVELOP Program are better prepared to handle the challenges that face our society and future generations.

http://develop.larc.nasa.gov/

DEVELOP

Image credit: NASA

DEVELOP leads from around the nation participate in a hands-on strategic planning and leadership workshop.
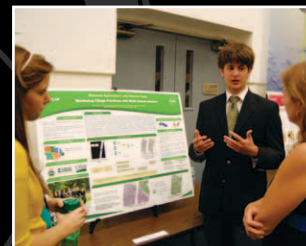

Image credit: NASA

DEVELOP students on Langley's Midwest Agriculture project present their research at a student poster session during the Summer 2011 term.

Image credit: NASA

DEVELOP participants with NASA Administrator Charles Bolden at the Robert H. Goddard Memorial Symposium.

SERVIR is a NASA and USAID-sponsored initiative that integrates satellite observations, ground-based data and forecast models to help developing nations monitor, forecast, and respond to environmental changes. SERVIR has regional hubs in Central America, East Africa, and the Hindu Kush-Himalaya. Additional hubs are expected. Endorsed by governments in these regions, SERVIR places a strong emphasis on partnerships to provide searchable and viewable Earth observations, measurements, animations, and analysis.

Using Earth observing satellite data, SERVIR enables managers, educators, scientists, media outlets, and policy implementers in the regions to better respond to a range of issues including disaster response, air quality, biodiversity conservation, climate change, water resources, health, and agricultural development.

SERVIR in Central America

In recent years wild fires have increased in frequency and intensity in Guatemala. With support from USAID, NASA, and CATHALAC (Water Center for the Humid Tropics of Latin America and the Caribbean), a SERVIR-Mesoamerica project generated products that support systematic and informed planning for the prevention and control of wild fires. The data and information generated by this project, called Geospatial Information System for Fire Management (SIGMA-I), increases awareness of the wild fire issues the country faces and facilitates the use of resources for fire management, thus reinforcing permanent monitoring mechanisms at the national level.

The data products developed by SIGMA-I track where fires have been, identify patterns of ignition, evaluate where fires are more likely to occur in the future, and support an overall report that helps the government of Guatemala better respond to fires in the future.

While originally developed for Guatemala, SIGMA-I is expected to expand throughout other countries in the area, including the Dominican Republic, El Salvador, Nicaragua and Costa Rica.
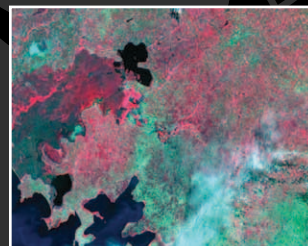
http://www.servirglobal.net/

SERVIR

Image credit: NASA

The SERVIR-Africa team captured this image of the Nzoia River basin from the NASA's EO-1 satellite to provide baseline imagery of this frequently flooded area for future analysis.

Image credit: NASA

Captured by the Sea-viewing Wide Field-of-View Sensor, this image shows the large amounts of smoke produced by fires in southern Mexico.
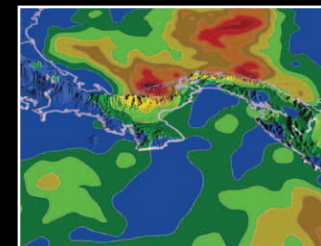

Image credit: NASA

Image of Accumulated rainfall during Panama floods. SERVIR uses this information to help Panama's government predict landslides.

Gulf of Mexico Initiative

NASA's Applied Sciences Program formed the Gulf of Mexico Initiative (GOMI) to help the Gulf region apply Earth observations in the recovery from the devastating hurricanes – Katrina and Rita – of 2005 and to address the coastal management issues of the future. Today, the Gulf of Mexico Initiative focuses on the regional priorities defined by the Gulf of Mexico Alliance, a collaboration of Alabama, Florida, Louisiana, Mississippi, and Texas and 13 federal agencies, to enhance the ecological and economic health of the Gulf region.

The Gulf of Mexico Initiative promotes the use of NASA's Earth science assets to provide information that helps local, state and federal leaders of the Gulf make informed decisions, establish policies, and respond to crises in their region.

Detecting Oceanic Oil Spills

Six months before an explosion on the Deepwater Horizon triggered the largest oil spill in US history, an Applied Sciences GOMI project began developing techniques to use Earth observing satellite data to improve detection of oil spills in the Gulf. The project combined researchers and applications specialists from the Naval Research Laboratory (NRL) at Stennis Space Center, NOAA, and NASA. This team created automated and interactive techniques to generate oil slick maps using data from Earth observing satellites, including *Terra*, *Aqua*, *CALIPSO*, *Envisat*, *ERS-2*, *RADARSAT*, and *ALOS*.

Working with Alabama A&M University, the team also demonstrated that oil spill aging and breakup can be monitored in real time, and that methods of oil spill detection and characterization can be automated. Utilizing NASA Earth science resources led to a clearer picture of what was happening in the Gulf of Mexico during the spill and can be used in the event of future oil-spill incidents. The team's techniques are expected to transition to NOAA to enhance the activities of NOAA's Emergency Response Division, which provides maps for emergency response activities.

http://www.coastal.ssc.nasa.gov/

Image credit: NASA

This true-color image of sediments in the Mississippi delta was taken using the ETM+ instrument on *Landsat-7*.
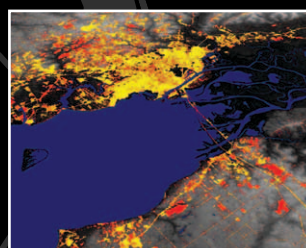
Image credit: NASA

The image above depicts approximately 35 years of urbanization in the Mobile Bay area based on *Landsat* data. Yellow areas depict urbanization in 1974 while the red areas show expansion since that time.
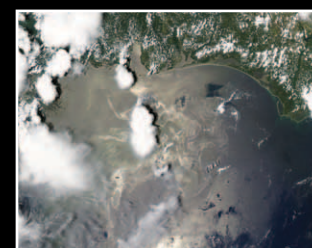
Image credit: NASA

This image, created on June 19, 2010 using MODIS data gathered by Aqua, shows oil spreading northeast from the Deepwater Horizon Well.

Earth
Observations
Training

The Applied Sciences Program conducts professional-level training focused on building skills and familiarity in accessing and using Earth observation data. By providing hands-on, computer-based training, NASA is raising awareness of remote sensing data

The Training Program hosts in-person and online workshops and sessions throughout the year. Project participants learn how to access, interpret, and apply NASA remote sensing data at regional and worldwide scales, using interactive case-studies to build familiarity and skills.

Growing the seeds of experience

Applied Sciences plays an active role in capacity building activities including Earth Observation training to enable people to actively use, teach and expand the applications of NASA Earth observing resources. Atmospheric modeler Scott Beaver is a true example of the far reaching effects of capacity building investments.

In 2009, Beaver attended the Applied Sciences training "Remote Sensing Data Usage in Air Quality Assessments." Within a year he was teaching that same class. From his experience, Beaver is able to actively incorporate NASA data including MODIS true color imagery, *CALIPSO* aerosol data, and *Aura* OMI trace gas measurements into applications that the Bay Area Air Quality Management District can use when developing emissions reduction programs. His students have learned how to apply similar data sets and models to air quality concerns in their communities.

http://airquality.gsfc.nasa.gov/
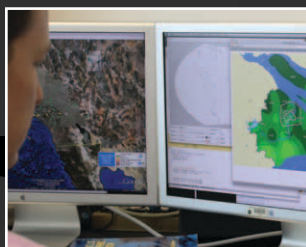
http://water.gsfc.nasa.gov/

Image credit: NASA

A student views NASA Earth observing data in Google Earth.
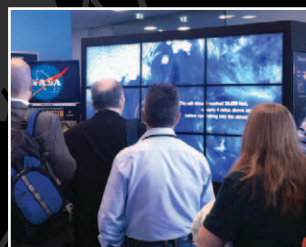
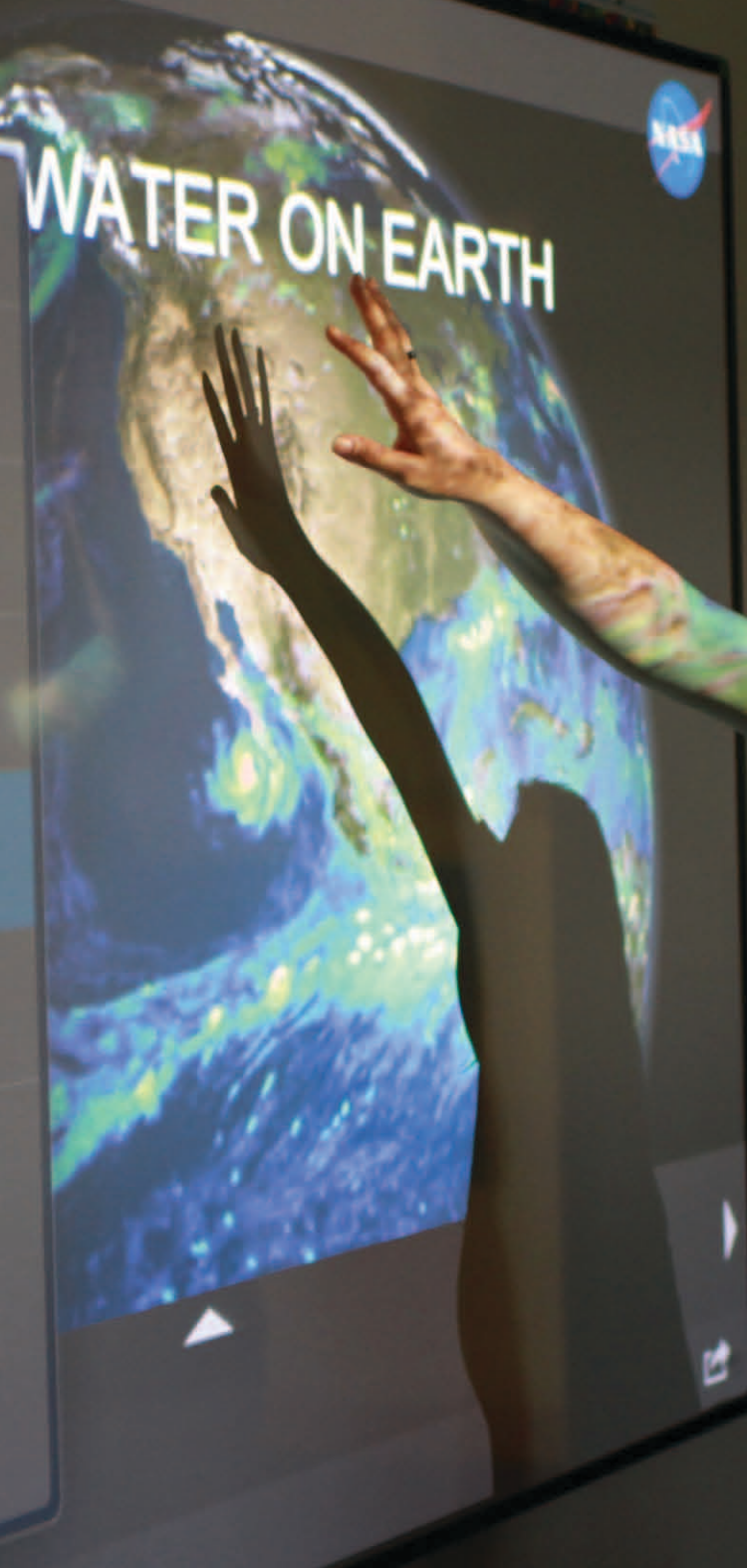Image credit: NASA

International Symposium for Remote Sensing of the Environment attendees view Earth observing imagery on a hyperwall display.
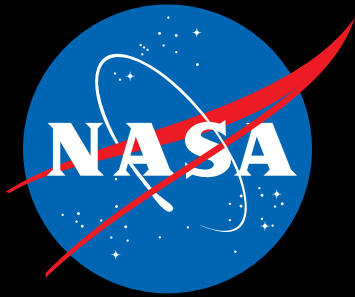

Image credit: NASA

The NASA Visualization Explorer iPad App delivers Earth observing information to your fingertips.

Get Involved

How can you apply Earth observations to benefit your organization? Want to know more about how Earth observations can support decision-making? Do you have an idea for a workshop to examine multiple uses of Earth observations in your field?

The Applied Sciences Program can help answer these questions and more. The Program funds feasibility studies, applications projects, and workshops to assist organizations apply Earth observations in their management, business, and policy decisions. The Applied Sciences seeks to increase the benefits NASA's Earth science investment for society.

NASA Earth observations including data, imagery, and tools are free and available to the public and private organizations. Visit *http://earthdata.nasa.gov* to access data gathered by satellites, aircraft, and field measurements to incorporate into your application-based project. All people and organizations across all levels of and Earth observing data experience are welcome.

Check out the Solicitations section of the Applied Sciences' website for information on funding opportunities, and the News section for workshops, trainings, and project results. Here are just a few ways you can become involved:

- *Propose and lead a feasibility study or application project*
- *Attend or host a training event*
- *Learn about projects your organization might adopt or adapt for your needs*
- *Request funds for a workshop or symposium*
- *Serve as a DEVELOP advisor or sponsor a DEVELOP intern*
- *Give feedback on NASA Earth science data products*
- *Participate on a project review panel*
- *Attend Earth science team meetings to learn about research-applications connections*
- *Meet and talk with the Applications Areas Program Managers*

Learn more:

NASA Applied Sciences Program: *http://appliedsciences.nasa.gov/*
Applied Sciences Solicitations: *http://appliedsciences.nasa.gov/solicitations.php*
EOSDIS: *http://earthdata.nasa.gov/*

For more information, contact the NASA Earth Science Applied Sciences Program:

Applied Sciences Program
HQ-AppliedSciences@mail.nasa.gov

www.hq.nasa.gov
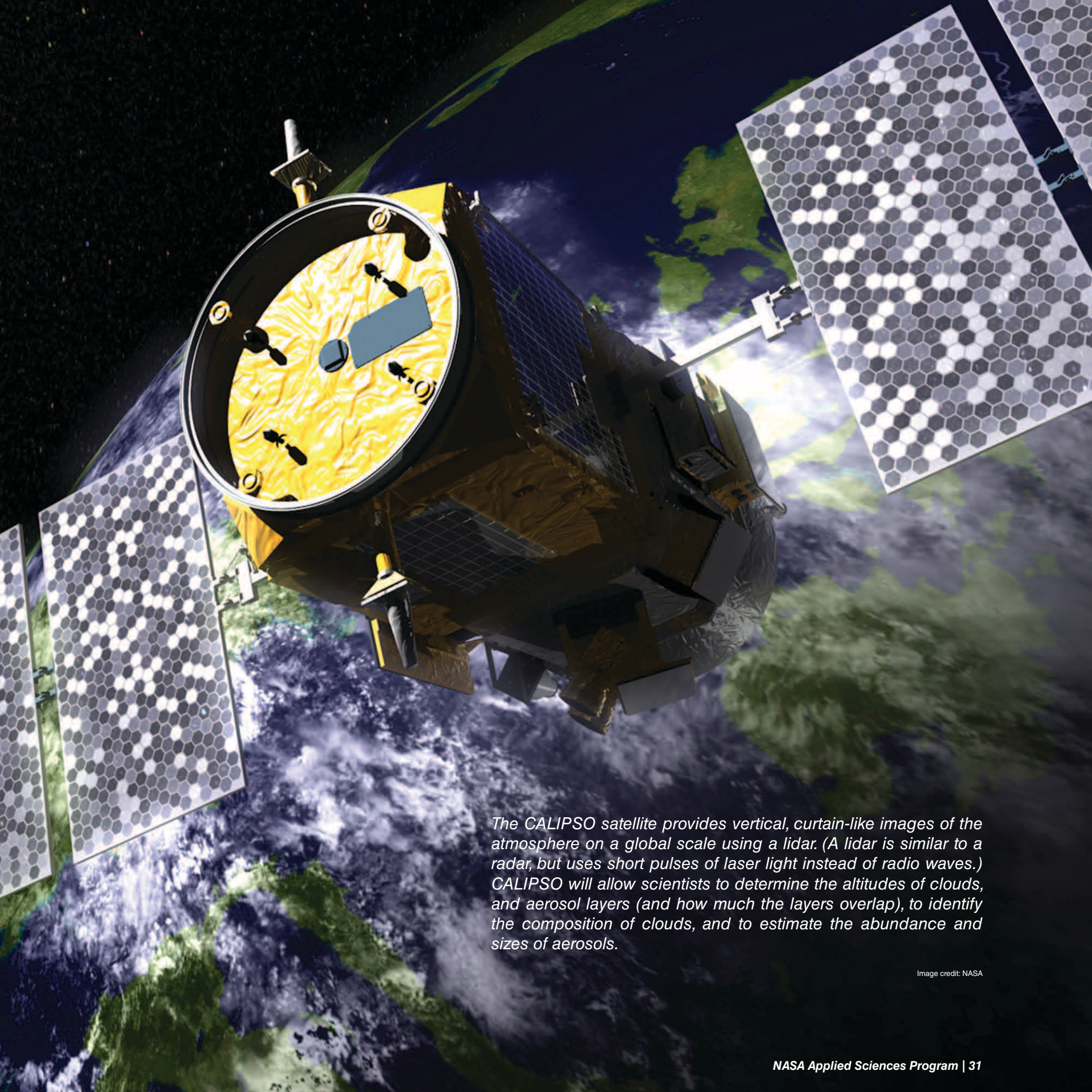
The CALIPSO satellite provides vertical, curtain-like images of the atmosphere on a global scale using a lidar. (A lidar is similar to a radar, but uses short pulses of laser light instead of radio waves.) CALIPSO will allow scientists to determine the altitudes of clouds, and aerosol layers (and how much the layers overlap), to identify the composition of clouds, and to estimate the abundance and sizes of aerosols.

Image credit: NASA