

Earth System Science Data Resources

tapping into a wealth of data, information, and services

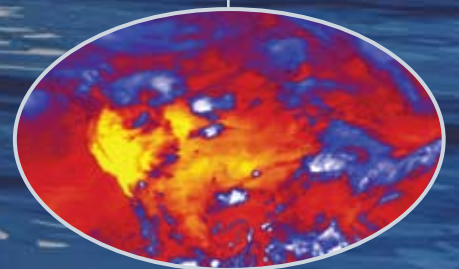
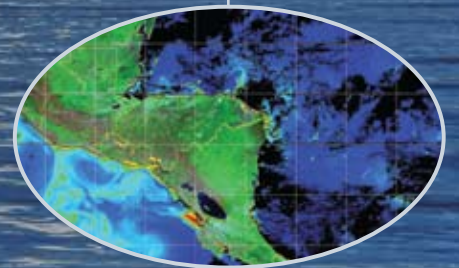


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Introduction

Introduction

One of the primary purposes of NASA's Earth science program is to develop a scientific understanding of Earth's system and its response to natural and anthropogenic changes. NASA recently completed deployment of the Earth Observing System, the world's most advanced and comprehensive capability to measure global climate change. This unique view of Earth from space enables us to begin to understand Earth's atmosphere, lithosphere, hydrosphere, cryosphere and biosphere as a single connected system. Over the coming decade, NASA and the Agency's research partners will be analyzing EOS and other Earth science data to characterize, understand, and predict variability and trends in Earth's system for both research and applications

NASA's Earth Observing System (EOS) comprises a series of satellites, a science component and a data system which is called The Earth Observing System Data and Information System (EOSDIS). Eleven data centers distribute more than 2,400 Earth system science data products and associated services for interdisciplinary studies. These data centers process, archive, document, and distribute data from NASA's past and current Earth system science research satellites and field programs. Each center serves one or more specific Earth science disciplines and provides its user community with data products, data information, services, and tools unique to its particular science discipline.

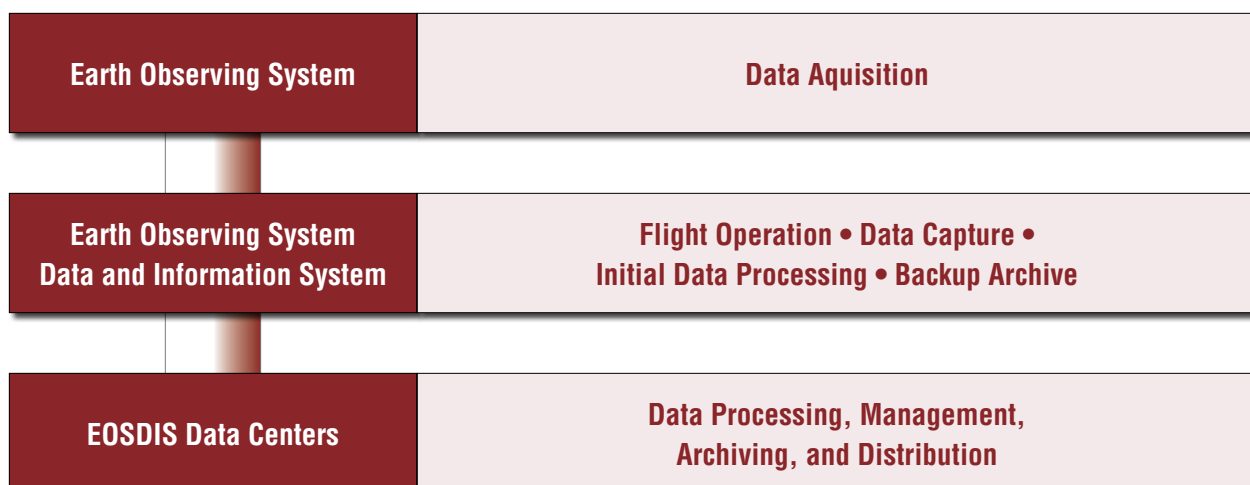
Presently, EOSDIS supports the daily production of over 3 terabytes (TB) of interdisciplinary Earth system science data. These data are either from EOS missions (e.g. Aqua, Aura, ICE-Sat, Jason, QuikSCAT, SORCE, Terra), pre-EOS missions (e.g.,

SeaWiFS, TOMS-EP, TOPEX/POSEIDON, TRMM, UARS), other Earth system science data (e.g., Pathfinder data sets), NASA funded field campaigns (e.g., BOREAS, FIFE, SAFARI), or human dimensions derived data (e.g., Gridded Population Data, GRUMP). An excess of 4 petabytes (PB) of data products that cover a wide range of physical, geophysical, biochemical, and other parameters are archived at the eleven data centers.

In 2006 alone, over 65 million or 1086 TB of Earth system science data products and information about NASA missions, instruments, and other data resources were disseminated. Over 3 million distinct users included people from the science, government, industry, education, and policy maker communities. These data are collected by approximately 70 instruments onboard more than 43 satellite and aircraft platforms.

The data centers provide an assortment of services to users via their User Services Offices (USOs). The USO is each data center's interface to the public. Data support includes end-to-end product support, expert assistance in selecting and obtaining data, online data order and access, data set information and documentation, current data-related news and community discussion lists, referrals to other data resources, hands-on training and assistance, and support for data-handling and visualization tools.

The hierarchical relationship and responsibilities of EOS, EOSDIS, and the data centers as one component of NASA's Earth System Science Division are depicted in the figure below.





Remote Sensing: An Overview

Remote Sensors: An Overview

Types of Remote Sensors

Remote sensing instruments are of two primary types—passive and active. Passive sensors detect natural energy (radiation) that is emitted or reflected by the object or scene being observed. Reflected sunlight is the most common source of radiation measured by passive sensors.

Active sensors, on the other hand, provide their own source of energy to illuminate the objects they observe. An active sensor emits radiation in the direction of the target to be investigated. The sensor then detects and measures the radiation that is reflected or backscattered from the target.

Types of passive and active remote sensors are described in the following paragraphs.

Passive Sensors

Passive sensors include different types of radiometers and spectrometers. Most passive systems used in remote sensing applications operate in the visible, infrared, thermal infrared, and microwave portions of the electromagnetic spectrum. Passive remote sensors include the following:

Accelerometer—An instrument that measures acceleration (change in velocity per unit time). There are two general types of accelerometers. One measures translational accelerations (changes in linear motions in one or more dimensions), and the other measures angular accelerations (changes in rotation rate per unit time). Translational accelerations are proportional to the sum of the forces acting through the center of mass of the instrument, and rotational accelerations are proportional to the total torque acting to change the rotation of the instrument around its center of mass.

Radiometer—An instrument that quantitatively measures the intensity of electromagnetic radiation in some bands within the spectrum. Usually, a radiometer is further identified by the portion of the spectrum it covers; for example, visible, infrared, or microwave. Microwave sensors are able to penetrate clouds and most rain, making them all-weather sensors.

Imaging radiometer—A radiometer that has a scanning capability to provide a two-dimensional array of pixels from which an image may be produced. Scanning can be performed mechanically or electronically by using an array of detectors.

Spectrometer—A device that is designed to detect, measure, and analyze the spectral content of incident electromagnetic radiation. Conventional imaging spectrometers use gratings or prisms to disperse the radiation for spectral discrimination.

Spectroradiometer—A radiometer that measures the intensity of radiation in multiple wavelength bands (i.e., multispectral). Many times the bands are of high-spectral resolution, designed for remotely sensing specific parameters such as sea surface temperature, cloud characteristics, ocean color, vegetation, and trace chemical species in the atmosphere and in snow and sea ice data.

Hyperspectral radiometer—An advanced multispectral sensor that detects hundreds of very narrow spectral bands throughout the visible, near-infrared, and mid-infrared portions of the electromagnetic spectrum. This sensor's very high-spectral resolution facilitates fine discrimination between different targets based on their spectral response in each of the narrow bands.

Sounder—An instrument that measures vertical distributions of atmospheric parameters such as temperature, pressure, and composition from multispectral information.

Active Sensors

The majority of active systems operate in the microwave portion of the electromagnetic spectrum, which makes them able to penetrate the atmosphere under most conditions. Active remote sensors include the following:

Ranging Instrument—A device that measures the distance between the instrument and a target object. Radars and altimeters work by determining the time a transmitted pulse (microwaves or light) takes to reflect from a target and return to the instrument. Another technique employs identical microwave instruments on a pair of platforms. Signals are transmitted from each instrument to the other, with the

distance between the two determined from the difference between the received signal phase and transmitted (reference) phase. These are examples of active techniques. A passive technique views the target from either end of a baseline of known length. The change in apparent view direction (parallax) is related to the absolute distance between the instrument and target.

Radar—An active radio detection and ranging sensor that provides its own source of electromagnetic energy. An active radar sensor, whether airborne or spaceborne, emits microwave radiation in a series of pulses from an antenna. When the energy reaches the target, some of the energy is reflected back toward the sensor. This backscattered microwave radiation is detected, measured, and timed. The time required for the energy to travel to the target and return back to the sensor determines the distance or range to the target. By recording the range and magnitude of the energy reflected from all targets as the system passes by, a two-dimensional image of the surface can be produced. Because radar provides its own energy source, images can be acquired day or night. Also, microwave energy is able to penetrate clouds and most rain, making it an all-weather sensor.

Scatterometer—A high-frequency microwave radar designed specifically to measure backscattered radiation. Over ocean surfaces, measurements of backscattered radiation in the microwave spectral region can be used to derive maps of surface wind speed and direction.

Lidar—A light detection and ranging sensor that uses a laser (light amplification by stimulated emission of radiation) to transmit a light pulse and a receiver with sensitive detectors to measure the backscattered or reflected light. Distance to the object is determined by recording the time between transmitted and backscattered pulses and by using the speed of light to calculate the distance traveled. Lidars can determine atmospheric profiles of aerosols, clouds, and other constituents of the atmosphere.

Laser altimeter—An instrument that uses a lidar to measure the height of the platform (spacecraft or aircraft) above the surface. The height of the platform with respect to the mean Earth's surface is used to determine the topography of the underlying surface.

Sounder—An instrument that measures vertical distribution of precipitation and other atmospheric characteristics such as temperature, humidity, and cloud composition.

NASA Earth System Science Remote Sensors

The following tables list and describe many of the passive and active remote sensors whose data are supported by EOSDIS. Some of these sensors may overlap categories. The Earth system science data centers archive and distribute these data. Data from some instruments are incorporated in data sets from field campaigns (e.g., BOREAS, FIFE, CAMEX-3 and -4). Section 4 provides information about available data holdings within Earth science disciplines. (See Section 8 for the definitions of the acronyms and abbreviations used in these tables.)

Passive Sensors				
Instrument	Type	Platform	Data Center	Comments
Single Channel/Total Power Radiometers and Imagers				
ACRIM II	Total power radiometer	UARS	LaRC ASDC	Measures total solar irradiance.
ACRIM III	Total power radiometer	ACRIMSAT	LaRC ASDC	Measures total solar irradiance.
TIM	Total power radiometer	SORCE	GES DISC	Measures total solar irradiance.
LIS	Imager	TRMM	GHRC	Detects intra cloud and cloud-to-ground lightning, day and night.
WFC	Wide Field Camera	CALIPSO	LaRC ASDC	Fixed, nadir-viewing imager with a single spectral channel covering the 620-270 nm region.
Multispectral Instruments				
AMSR-E	Multichannel microwave radiometer	Aqua	NSIDC DAAC	Measures precipitation, oceanic water vapor, cloud water, near-surface wind speed, sea and land surface temperature, soil moisture, snow cover, and sea ice. Provides spatial resolutions of 5.4 km, 12 km, 21 km, 38 km, and 56 km.
ASTER	Multispectral radiometer	Terra	LP DAAC ORNL DAAC	Measures surface radiance, reflectivity, emissivity, and temperature. Provides high spatial resolutions of 15 m, 30 m, and 90 m.
AVHRR	Multispectral radiometer	NOAA POES	GES DISC NSIDC DAAC ORNL DAAC	Has four or five bands, depending on platform. Telemetered resolutions are 1.1 km (HRPT data) and 4 km (GAC data).
CERES	Broadband scanning radiometer	Aqua Terra TRMM	LaRC ASDC	Has four to six channels (shortwave, longwave, total). Measures atmospheric and surface energy fluxes. Provides 20 km resolution at nadir.
IIR	Imaging Infrared Radiometer	CALIPSO	LaRC ASDC	Nadir-viewing, non-scanning imager having a 64 km swath with a pixel size of 1 km. Provides measurements at three channels in the thermal infrared window region at 8.7 mm, 10.5 mm, and 12.0 mm.
MAS	Imaging spectrometer	NASA ER-2 aircraft	GES DISC GHRC LaRC ASDC ORNL DAAC	Has 50 spectral bands. Provides spatial resolution of 50 m at typical flight altitudes.
MISR	Imaging spectrometer	Terra	LaRC ASDC ORNL DAAC	Obtains precisely calibrated images in four spectral bands, at nine different angles, to provide aerosol, cloud, and land surface data. Provides spatial resolution of 250 m to 1.1 km.
MODIS	Imaging spectrometer	Aqua Terra	GES DISC LP DAAC MODAPS NSIDC DAAC OBPG* ORNL DAAC PO.DAAC	Measures many environmental parameters (ocean and land surface temperatures, fire products, snow and ice cover, vegetation properties and dynamics, surface reflectance and emissivity, cloud and aerosol properties, atmospheric temperature and water vapor, ocean color and pigments, and ocean biological properties). Provides moderate spatial resolutions of 250 m (bands 1 and 2), 500 m (bands 3–7), and 1,000 m (bands 8–36).
SSM/I	Multispectral microwave radiometer	DMSP	GHRC LaRC ASDC NSIDC DAAC PO.DAAC ORNL DAAC	Has seven channels and four frequencies. Measures atmospheric, ocean, and terrain microwave brightness temperatures at 19.35 GHz, 22.235 GHz, 37.0 GHz, and 85.5 GHz.

* OBPG=Ocean Biology Processing Group

Passive Sensors				
Instrument	Type	Platform	Data Center	Comments
SMMR	Multispectral microwave radiometer	Nimbus-7	GES DISC LaRC ASDC NSIDC DAAC PO.DAAC	Has 10 channels. Measures sea surface temperatures, ocean near-surface winds, water vapor and cloud liquid water content, sea ice extent, sea ice concentration, snow cover, snow moisture, rainfall rates, and differentiation of ice types.
Hyperspectral Instruments				
AVIRIS	Imaging spectrometer	Aircraft	ORNL DAAC	Has 224 contiguous channels, approximately 10 nm wide. Measurements are used to derive water vapor, ocean color, vegetation classification, mineral mapping, and snow and ice cover (BOREAS Project).
SOLSTICE	Spectrometer	SORCE	GES DISC	Measures the solar spectral irradiance of the total solar disk in the ultraviolet wavelengths from 115 to 430 nm.
Polarimetric Instruments				
POLDER	Polarimeter	Aircraft	ORNL DAAC	Measures the polarization and the directional and spectral characteristics of the solar light reflected by aerosols, clouds, and the Earth's surface (BOREAS Project).
PSR	Microwave polarimeter	Aircraft	GHRC	Measures wind speed and direction (CAMEX-3 Project).
Sounding Instruments				
AIRS	Sounder	Aqua	GES DISC	Measures air temperature, humidity, clouds, and surface temperature. Provides spatial resolution of ~13.5 km in the IR channels and ~2.3 km in the visible. Swath retrieval products are at 50 km resolution.
AMSU	Sounder	Aqua	GES DISC	Has 15 channels. Measures temperature profiles in the upper atmosphere. Has a cloud filtering capability for tropospheric temperature observations. Provides spatial resolution of 40 km at nadir.
HIRDLS	Sounder	Aura	GES DISC	Measures infrared emissions at the Earth's limb in 21 channels to obtain profiles of temperature, ozone, CFCs, various other gases affecting ozone chemistry, and aerosols at 1 km vertical resolution. In addition, HIRDLS measures the location of polar stratospheric clouds.
MLS	Sounder	Aura	GES DISC	Five broad band radiometers and 28 spectrometers measure microwave thermal emission from the limb of Earth's atmosphere to derive profiles of ozone, SO ₂ , N ₂ O, OH and other atmospheric gases, temperature, pressure, and cloud ice.
MOPITT	Sounder	Terra	LaRC ASDC ORNL DAAC	Measures carbon monoxide and methane in the troposphere. Is able to collect data under cloud-free conditions. Provides horizontal resolution of ~22 km and vertical resolution of ~4 km.
OMI	Multispectral radiometer	Aura	GES DISC	Has 740 wavelength bands in visible and ultraviolet. Measures total ozone and profiles of ozone, N ₂ O, SO ₂ , and several other chemical species.
TES	Imaging Spectrometer	Aura	LaRC ASDC	High-resolution imaging infrared Fourier-transform spectrometer that operates in both nadir and limb-sounding modes. Provides profile measurements of ozone, water vapor, carbon monoxide, methane, nitric oxide, nitrogen dioxide, and nitric acid.

Active Sensors				
Instrument	Type	Platform	Data Center	Comments
Altimeters - Radar and Laser (Lidar)				
ALT	Radar altimeter	TOPEX/POSEIDON	PO.DAAC	Measures altimeter height of the satellite above the sea (satellite range), wind speed, wave height, and ionospheric correction.
CALIOP	Cloud and Aerosol Lidar	CALIPSO	LaRC ASDC	Two-wavelength polarization-sensitive lidar that provides high-resolution vertical profiles of aerosols and clouds.
GLAS	Laser altimeter	ICESat	NSIDC DAAC ORNL DAAC	Measures ice sheet and other surface topography, cloud height, and aerosol layer height. Provides vertical resolution of 75 to 200 m and horizontal resolution of 150 m to 50 km.
Poseidon-2	Radar altimeter	Jason-1	PO.DAAC	Measures sea level, wave height, and wind speed.
Scatterometers				
NSCAT	Radar scatterometer	ADEOS-I	PO.DAAC	Measured ocean vector wind data. Provided spatial resolutions of 25 km and 50 km (9 months of data received before satellite failure).
Seacat (instrument and platform)	Radar scatterometer	Seasat	PO.DAAC	Measured ocean vector winds (3 months of data received before satellite failure).
SeaWinds	Radar scatterometer	QuikSCAT ADEOS-II	PO.DAAC	Provides spatial resolution of ~6 by 25 km and 25 km resolution for ocean vector winds.
Imaging Radar/SAR				
SAR	Synthetic aperture radar	ERS-1 ERS-2 JERS-1 RADARSAT-1 PALSAR	ASF DAAC NSIDC DAAC ORNL DAAC	Provides high-resolution surface imagery at 7 to 240m.
Sounding Instruments				
CLS	Lidar	ER-2	LaRC ASDC	Determines vertical cloud structure. (FIRE Project).
PR	Phased-array radar	TRMM	GES DAAC ORNL DAAC	Measures 3-D distribution of rain and ice. Provide horizontal resolution of 250 m and vertical resolution of 5 km.
VIL	Lidar	Ground	LaRC ASDC ORNL DAAC	Determines vertical cloud structure. (FIFE, FIRE and BOREAS Projects).



Data Terminology and Formats

Data Terminology and Formats

Data Products and Types

The data centers process, archive, and distribute EOSDIS data products. The products are data sets, or groups of data sets, derived from EOS instruments and other Earth system science measurement systems. They can be either standard data products (SDPs) or special data products.

Standard Data Products

Data products are considered to be standard data products if they are:

- Generated as part of a research investigation using EOS data.
- Recognized to have wide research utility.
- Generated routinely.
- Produced for spatially and/or temporally extensive sets of data.

SDPs are produced at the data centers or by Science Investigator-led Processing Systems (SIPSs). These products are formally defined in EOSDIS requirements documentation.

Special Data Products

Data products are considered to be special data products if they are:

- Generated as part of a research investigation using EOS data.
- Produced for a limited region or time period.
- Not accepted as standard by the EOS Investigators Working Group (IWG) and NASA Headquarters.
- Referred to as “special data products” to distinguish them from other nonstandard products such as ancillary data sets.

Special data products are normally generated at the investigators’ Scientific Computing Facilities (SCFs).

Data Level	Description
Level 0	Reconstructed, unprocessed instrument and payload data at full resolution, with any and all communications artifacts (e.g., synchronization frames, communications headers, duplicate data) removed. (In most cases, the EOS Data and Operations System (EDOS) provides these data to the data centers as production data sets for processing by the Science Data Processing Segment (SDPS) or by a SIPS to produce higher level products.)
Level 1A	Reconstructed, unprocessed instrument data at full resolution, time-referenced, and annotated with ancillary information, including radiometric and geometric calibration coefficients and georeferencing parameters (e.g., platform ephemeris) computed and appended but not applied to Level 0 data.
Level 1B	Level 1A data that have been processed to sensor units (not all instruments have Level 1B source data).
Level 2	Derived geophysical variables at the same resolution and location as Level 1 source data.
Level 3	Variables mapped on uniform space-time grid scales, usually with some completeness and consistency.
Level 4	Model output or results from analyses of lower level data (e.g., variables derived from multiple measurements).

Data Processing Levels for Standard Data Products

EOSDIS SDPs are processed at various levels ranging from Level 0 to Level 4. Level 0 products are raw data at full instrument resolution. At higher levels, the data are converted into more useful parameters and formats. All EOS instruments must have Level 1 SDPs. Most have products at Levels 2 and 3, and some have products at Level 4.

The data processing levels described in the table on page 10 and referenced in the following sections are identical to the EOSDIS Data Panel's definitions and are consistent with the Committee on Data Management, Archiving, and Computing (CODMAC) definitions.

Data Formats

HDF

The Hierarchical Data Format (HDF) is designed to facilitate managing and sharing scientific data. HDF includes two formats (HDF4 and HDF5), software for accessing data in HDF formats, and applications for working with HDF data. HDF is designed for efficient storage and access of high volume, complex data, and for mixing varieties of data types in a single container. HDF libraries are used to read and write data, to define data types and structures for applications, and to control how data is stored. HDF applications include commercial and free software for viewing, creating, comparing, searching, analyzing and visualizing HDF data, and for converting between HDF and other formats. There are specialized libraries for HDF in application domains. These libraries promote the standard use of HDF, enabling data consumers more easily to share their data and applications. Some such libraries, such HDF-EOS, are broad in scope, and support a very wide range of applications. For more information about HDF as a scientific data format, see <http://hdfgroup.org>.

HDF-EOS

Hierarchical Data Format for the Earth Observing System (HDF-EOS) is NASA's primary format for standard data products derived from EOS instruments. Because many Earth science data structures need to be geolocated, NASA developed the HDF-EOS format with additional conventions and data types for HDF files. There are two versions of HDF-EOS: HDF-EOS2 and HDF-EOS5. HDF-EOS2 uses HDF4 and HDF-EOS5 uses HDF5.

HDF-EOS2 and HDF-EOS5 support three geospatial data types (grid, point, swath) and HDF-EOS5 also supports a "Zonal Average" datatype. HDF-EOS provides uniform access to diverse data types in a geospatial context. The HDF-EOS software libraries allow a user to query or subset the contents of a file by earth coordinates and time if there is a spatial dimension in the data. HDF-EOS also provides a container for EOS inventory, archive and product specific metadata. HDF-EOS2 is used operationally by MODIS, MISR, ASTER, Landsat, AIRS and other EOS instruments. HDF-EOS5 is used by EOS Aura instruments.

Tools that process standard HDF files will also read HDF-EOS files; however, standard HDF library calls cannot access geolocation data, time data, and product metadata as easily as with HDF-EOS library calls. For an overview of data tools, see Section 6. For more information on HDF-EOS, see <http://www.hdfeos.org>.

netCDF

The network Common Data Form (netCDF) is an interface for array-oriented data access and a freely distributed collection of software libraries for C, FORTRAN, C++, Java, and Perl that provide implementations of the interface. The netCDF software was developed at the Unidata Program Center in Boulder, Colorado, and augmented by contributions from other netCDF users. The netCDF libraries define a machine-independent format for representing scientific data. Together, the interface, libraries, and format support the creation, access, and sharing of scientific data.

netCDF data have the following features: (1) self-describing—a netCDF file includes information about the data it contains; (2) architecture-independent—a netCDF file is represented in a form that can be accessed by computers with different ways of storing integers, characters, and floating-point numbers; (3) directly accessible—a small subset of a large data set may be accessed without the need to first read through the preceding data; (4) appendable—data can be appended to a netCDF data set along one dimension without copying the data set or redefining its structure; and (5) sharable—one writer and multiple readers can simultaneously access the same file.

For more information or to obtain netCDF software, see <http://www.unidata.ucar.edu/packages/netcdf>. (The above information on netCDF was taken from the Unidata Web site.)

ASCII

An American Standard Code for Information Interchange (ASCII) text file is one in which each byte represents one character according to the ASCII code. ASCII files are human readable and are sometimes called plain text files. Files that have been formatted with a word processor should be transmitted as binary files to preserve the formatting.

Binary

A binary file is computer readable but not human readable. Binary formats are used for executable programs and numeric data, whereas text formats are used for textual data. Many files contain a combination of binary and text formats. Such files are usually considered to be binary.

Shapefile

A shapefile is a digital vector (non-topological) storage format for storing geometric location and associated attribute information. The shapefile format is created by ArcGIS and can be used by ArcView, ArcInfo, ArcGIS and other widely used GIS software. A shapefile stores map (geographic) features and attribute data as a collection of files having the same prefix and several file extensions. Geographic features in a shapefile can be represented by points, lines, or polygons (areas). NOTE: An individual shapefile is actually a collection of files as described above that must be moved or distributed as a group otherwise the shapefile can be rendered unusable.

TIFF

A TIFF is a raster data format for storage, transfer, display, and printing of raster images, such as clipart, logotypes, and scanned documents. The TIFF imagery file format can be used to store and transfer digital satellite imagery, scanned aerial photos, elevation models, scanned maps or the results of many types of geographic analysis. TIFF is a full-features format in the public domain, capable of supporting compression, tiling, and extension to include geographic metadata.

GeoTIFF

GeoTIFF implements the geographic metadata formally, using compliant TIFF tags and structures. GeoTIFF refers to TIFF files which have geographic (or cartographic) data embedded as tags within the TIFF file. The geographic data can then be used to position the image in the correct location and geometry on the screen of a geographic information display. GeoTIFF is a metadata format, which provides geographic information to associate with the image data. But the TIFF file structure allows both the metadata and the image data to be encoded into the same file.

GeoTIFF makes use of a public tag structure which is platform interoperable between any and all GeoTIFF-savvy readers. GIS, CAD, Image Processing, Desktop Mapping and any other types of systems using geographic images can read any GeoTIFF files created on any system to the GeoTIFF specification.



Earth System Science Data Centers

Earth System Science Data Centers

This section provides information on each of the EOSDIS data centers. Each of these is responsible for archiving and distributing data products related to its areas of Earth science expertise. The data centers also provide assistance to users in finding and ordering data products, and many provide tools (see Chapter 6) for reading, manipulating, and/or displaying the data. User services contact information for each data center is given below.

Alaska Satellite Facility DAAC (ASF DAAC)

The ASF DAAC is located in the Geophysical Institute at the University of Alaska Fairbanks. The ASF DAAC is supported by NASA to acquire, process, archive, and distribute Synthetic Aperture Radar (SAR) data from polar orbiting satellites to advance polar research (sea ice, polar processes) and geophysics. ASF is actively archiving data from the Canadian RADARSAT-1, European Remote Sensing Satellite-2 (ERS-2) and the Japanese ALOS PALSAR. In addition, ASF archives heritage data from the ERS-1 and Japanese Earth Resource Satellite-1 (JERS-1). The majority of available data is considered restricted and available only to NASA-approved researchers. ASF also provides unrestricted data products to users. For information see, <http://www.asf.alaska.edu/dataproducts>

The ASF DAAC archive contains data from around the world. All the satellites are owned by foreign flight agencies, therefore

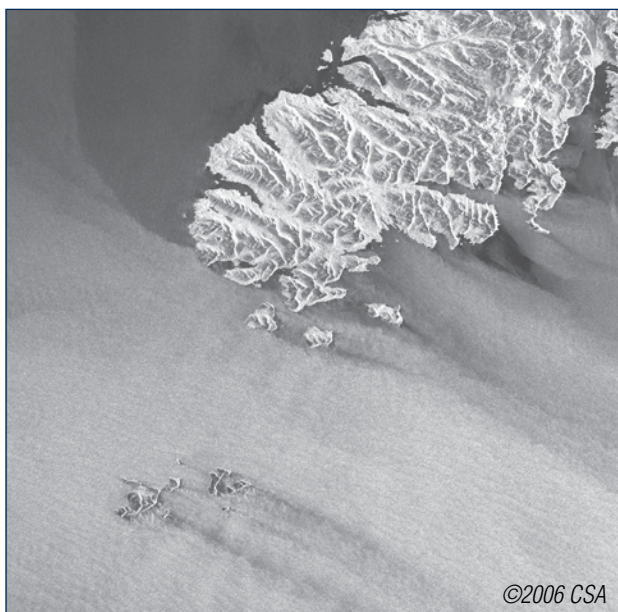
access to the data is restricted. Interested users gain access to the data by submitting a proposal to asf@eos.nasa.gov. Guidelines on the structure of the proposal can be found at: <http://www.asf.alaska.edu/getdata/guidelines/proposal.html>

Data Access

Online access to ASF DAAC data is available through the EDG data search and order system and through the URSA interface at ASF DAAC <https://ursa.asf.alaska.edu/cgi-bin/login> (see section 5). For information on becoming an approved researcher, see the ASF web site: <http://www.asf.alaska.edu/getdata/guidelines/proposal.html>.

Contact Information

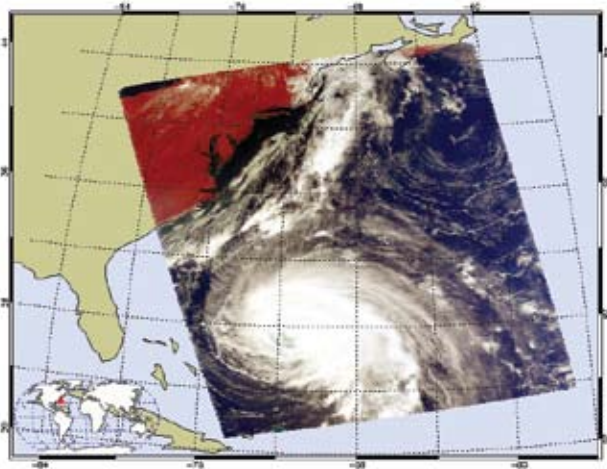
ASF DAAC User Services
Alaska Satellite Facility
University of Alaska Fairbanks
Phone: +1 907-474-6166
FAX: +1 907-474-2665
E-mail: asf@eos.nasa.gov or uso@asf.alaska.edu
URL: <http://www.asf.alaska.edu>



The RADARSAT-1 standard beam image from 2006 shows a portion of the Cook Inlet, Alaska. The image illustrates the changes in the water surface due to the winds. The dark streaks that start at the islands in the image are the result of the wind shadow created by the islands.
Courtesy: ASF DAAC and the Canadian Space Agency.

GSFC Earth Sciences Data and Information Services Center (GES DISC)

The NASA GES DISC is located within the Goddard Space Flight Center (GSFC) in Greenbelt, Maryland. It provides access to a wide range of global climate data, concentrated primarily in the areas of atmospheric composition, atmospheric dynamics, global precipitation, and solar irradiance. The DISC supports data from many heritage and EOS missions including Aqua, Aura, SORCE, TRMM, UARS, and Earth Probe (TOMS). The GES DISC also provides data subsetting, exploration, visualization, and access services.



The Atmospheric Infrared Sounder (AIRS) is an ultra-high spectral resolution infrared grating spectrometer aboard the EOS Aqua satellite. AIRS and its partner sounder, the Advanced Microwave Sounding Unit-A (AMSU-A), measure humidity, temperature, cloud properties, and amounts of greenhouse gases. AIRS calibrated Vis/NIR radiances.
 Courtesy: GES DISC at GSFC.

Data Access

Data can be downloaded through the online data access page that provides several search and order methods http://disc.gsfc.nasa.gov/get_data.shtml. Access to GES DISC data is also available through the EDG (see section 5).

Contact Information

GES DISC User Services
 Goddard Space Flight Center
 Phone: +1 301-614-5224
 U.S. Toll Free: +1-877-422-1222
 FAX: +1 301-614-5268
 E-mail: gsfc@eos.nasa.gov or help@daac.gsfc.nasa.gov
 URL: <http://disc.gsfc.nasa.gov>

Global Hydrology and Resource Center (GHRC)

The GHRC provides both historical and current Earth Science data, information, and products from satellite, airborne, and surface-based instruments. The GHRC acquires basic data streams and produces derived products from many of those instruments. The data center specializes in data involving the hydrological cycle, severe weather interactions, lightning, and convective processes.

Data Access

Most data are publicly available, although some restrictions apply for the distribution of commercially obtained data. Access to data, data search and order, and information about

GHRC's data sets can be found at the Web site given below. Online data access is also available through the EDG (see section 5).

Contact Information

GHRC User Services
 Global Hydrology and Climate Center
 Phone: +1 256-961-7932
 Fax: +1 256-961-7723
 E-mail: ghrc@eos.nasa.gov
 URL: <http://ghrc.msfc.nasa.gov>



NASA DC-8 flying over the marine cloud layer during the NASA African Monsoon Multidisciplinary Activities (NAMMA) experiment. The NAMMA experiment (Aug-Sept 2006) investigated the birth of tropical storms (e.g., hurricanes) in the vicinity of Cape Verde Islands off the coast of West Africa. NAMMA studied the deleterious effect of the Saharan dust blown off the continent (see the red haze in the clouds and along the horizon) on the genesis and growth of tropical storms. Courtesy: GHRC.

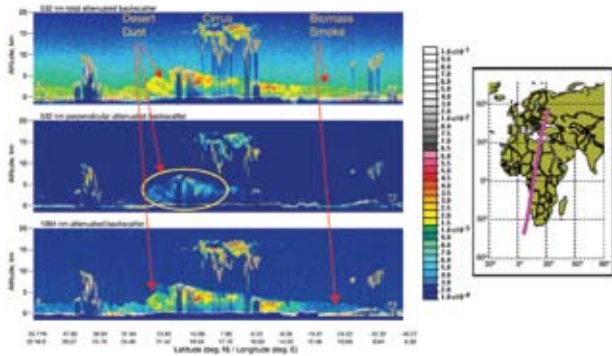
Langley Research Center (LaRC) Atmospheric Science Data Center (ASDC)

The ASDC at NASA LaRC supports more than 40 projects and has more than 1800 archived data sets. These data sets were obtained from satellite measurements, field experiments, and modeled data products. ASDC projects are focused on the Earth science disciplines Radiation Budget, Clouds, Aerosols, and Tropospheric Chemistry. A complete list of data sets is available at <http://eosweb.larc.nasa.gov>.

Data Access

There are multiple methods of obtaining data and information from the NASA Langley ASDC including ASDC ordering tools, Data Pool, Web download of renewable energy data (SSE), pre-packaged CDs, and the EDG (see section 5).

CALIPSO First-Light Observations - All 3 Lidar Channels 9 June 2006



Nighttime lidar observations on June 7, 2006 from Cloud-Aerosol Lidar Infrared Pathfinder Satellite Observations (CALIPSO) for 532 nm total and perpendicular attenuated backscatter, and 1064 nm total attenuated backscatter (color bar units /km/sr). The orbit transect is shown on map. Backscatter signals from cirrus, dust, and smoke are identified. Large particles in cirrus and dust produce strong 532 nm total and 1064 nm signals. Particle shape irregularities are strongly depolarizing and produce a significant perpendicular signal. The smoke layer is composed of relatively small, spherical particles as indicated by weak scattering at 1064 nm and absence of a perpendicular signal. Courtesy of: NASA LaRC CALIPSO team.

Contact Information

User and Data Services

NASA Langley Research Center

Phone: +1 757-864-8656

Fax: +1 757-864-8807

E-mail: larc@eos.nasa.gov

URL: <http://eosweb.larc.nasa.gov>

Land Processes DAAC (LP DAAC)

The LP DAAC at the USGS Center for Earth Resources Observation and Science (EROS) ingests, processes, archives, and distributes data products related to land processes derived from two EOS sensors, ASTER and MODIS. The LP DAAC provides data crucial to the investigation, characterization, and monitoring of biologic, geologic, hydrologic, ecologic, and related conditions and processes. In doing so, it promotes interdisciplinary study and understanding of Earth's integrated systems.

Data Access

Access to data, data search, order, and browse, and order information including information on Land Processes DAAC is available at <http://LPDAAC.usgs.gov>. An online search-and-order service is also available through the EDG (see section 5). Before ordering, users are encouraged to use the tutorial at <http://LPDAAC.usgs.gov/tutorial>. Data are available by FTP or on a variety of media, including CD-ROM and DVD.

Contact Information

LP DAAC User Services

U.S. Geological Survey

National Center for Earth Resources Observation and Science (EROS)

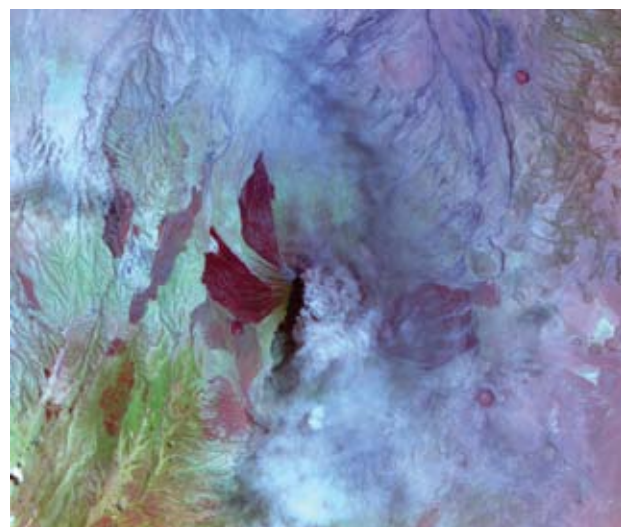
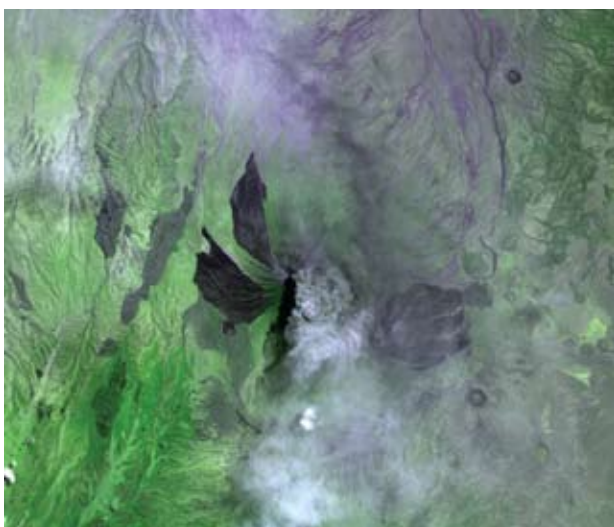
Phone: +1 605-594-6116

U.S. Toll Free: 1-866-573-3222

Fax: +1 605-594-6963

E-mail: LPDAAC@eos.nasa.gov

URL: <http://LPDAAC.usgs.gov>



The Ol Doi Lengai Volcano in Tanzania erupted in early September 2007. On September 4, 2007, the Advanced Spaceborne Thermal Emission and Reflection Radiometer (ASTER) on NASA's Terra satellite captured this image of the volcano sending a cloud of ash into the atmosphere. Image on the left is a pseudo true color composite image (VNIR -15 meter pixel size). The other image is a color composite using ASTER SWIR band 6, VNIR band 3N, and band 2 in red, green, and blue, respectively. The hot spots shown in this image are in red. The band 6 of the SWIR telescope was resampled to 15 meter pixel size in order to be overlaid with VNIR band 3N and 2. Courtesy: LP DAAC at USGS EROS.

Level 1 Atmosphere Archive and Distribution System (MODAPS)

MODAPS, located within GSFC, provides access to MODIS Radiance (Level 1) and Atmosphere (Level 2 and Level 3) data products. These products have been transitioned from the GES DISC, which no longer archives and distributes them. MODAPS supports MODIS data from both the Terra and Aqua platforms. Products may be subset by parameter, area, or band; and mosaicked, reprojected, or masked. Users may also visually browse MODIS level 1 and atmosphere data products.

Data Access

MODAPS provides access to its data holdings through its Level 1 and Atmosphere Archive and Distribution System (LAADS), whose "ladsweb" URL is given below. Data may be searched by product name, temporal window, collection, and spatial coordinates, or may be found and downloaded using the Level 2 and Level 3 Browsers. Data also may be downloaded directly using FTP.

Contact Information

MODAPS User Support
Phone: +1 301-352-2106
Toll Free Phone (U.S. Only): +1 866-506-6347
Email: modapsuso@saicmodis.com
URL: <http://ladsweb.nascom.nasa.gov>



A true-color MODIS/Aqua image from August 26, 2007 shows smoke plumes emanating from devastating wildfires in Greece. Prevailing winds carried the smoke across the Mediterranean Sea and spread into North Africa over the next several days. This particular image shows MODIS fire locations superimposed on the Level 1B imagery. Courtesy: MODIS Rapid Response Project and NASA GSFC.

National Snow and Ice Data Center DAAC (NSIDC DAAC)

The NSIDC DAAC provides data and information for snow and ice processes, particularly interactions among snow, ice, atmosphere, and ocean, in support of research in global change detection and model validation. It archives and distributes cryosphere and climate related products from several EOS sensors including MODIS, AMSR-E, and GLAS. NSIDC also provides general data and information services to the cryospheric and polar processes research community.

Data Access

Data orders may be placed at the NSIDC DAAC through the EDG, SNOWI, or Data Pool (see sections 5 and 6). Users may also access information about NSIDC data holdings through the online data catalog on NSIDC's Web site. Depending on the data set, NSIDC data products are available on a variety of media, including FTP, CD-ROM, 8-mm tape, DVD, and DLT.

Contact Information

NSIDC DAAC User Services
National Snow and Ice Data Center - University of Colorado
Phone: +1 303-492-6199
Fax: +1 303-492-2468
E-mail: nsidc@eos.nasa.gov or nsidc@nsidc.org
URL: <http://nsidc.org>



The National Snow and Ice Data Center (NSIDC) tracks Arctic sea ice extent closely, especially during the summer melt season. This image shows the sea ice on September 17, 2007, at its lowest point. Satellite data from the Sea Ice Index is shown in Google Earth to provide viewers with better orientation on the globe; the magenta line indicates where the ice edge would be in a normal year, based on September average extent from 1979 to 2000. Sea ice on September 16 was down 38% compared to the long-term average, and down 22% compared to the previous record, set in 2005. Courtesy: NSIDC

Oak Ridge National Laboratory DAAC (ORNL DAAC)

The ORNL DAAC provides data and information relevant to biogeochemical dynamics, ecological data, and environmental processes, critical for understanding the dynamics relating the biological, geological, and chemical components of Earth's environment. These dynamics are influenced by interactions between organisms and their physical surroundings, including soils, sediments, water, and air. ORNL archives contain data from a large number of field campaigns, climate, vegetation, and soil collections, and satellite validation campaigns. MODIS land product subsets are also provided.

Data Access

ORNL DAAC data are available through an online search-and-order system at <http://daac.ornl.gov> and through the EDG (see section 5).

Contact Information

ORNL DAAC User Services
Oak Ridge National Laboratory
Phone: +1 865-241-3952
Fax: +1 865-574-4665
E-mail: ornl@eos.nasa.gov or
ornldaac@ornl.gov
URL: <http://daac.ornl.gov>



This AirMISR image, covering a 9 x 9 km portion of northeastern South Africa, was acquired on September 7, 2000 from aboard the NASA ER-2 as part of the SAFARI 2000 field campaign. The project was conducted during 1999-2001 to develop a better understanding of the Earth-atmosphere-human system in southern Africa. This image was taken to characterize a prescribed fire in the Timbavati Private Game Reserve, near Kruger National Park. (Image from King et al. 2003. Remote sensing of smoke, land, and clouds from the NASA ER-2 during SAFARI 2000, *Journal of Geophysical Research*, Vol. 108.) Earth System Science Data Centers [4-15]

Ocean Biology Processing Group

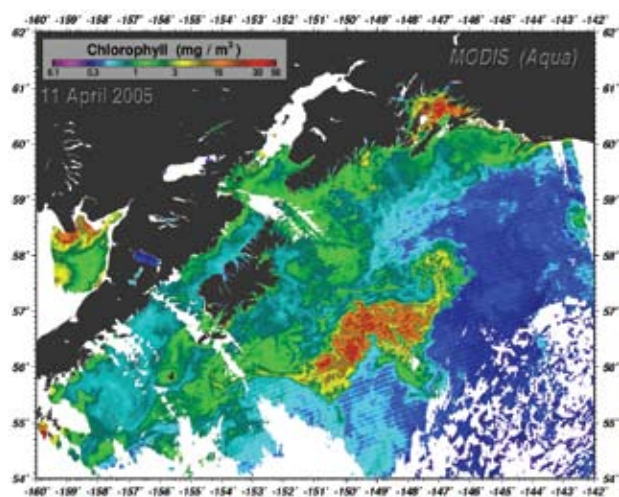
The OceanColor data facility at GSFC archives and distributes ocean color data from several sensors, including MODIS Aqua, SeaWiFS, OCTS, and CZCS, as well as sea surface temperature data from Terra and Aqua MODIS. MODIS ocean products, originally available from the GES DISC, have been transitioned to the OceanColor facility. SeaWiFS data access is restricted to authorized users; new users can request authorization using an online application form (see the Support Services link below).

Data Access

OceanColor provides access to data and information through the OceanColor Web. Users can visually search the ocean color data archive and directly download and/or order data from single files to the entire mission using the Level 1 and 2 Browser. Using the Level 3 Browser, users may also browse the entire Level 3 global ocean color data set for many parameters and time periods and download either PNG images or digital data in HDF format. In addition, the OceanColor Project maintains several FTP sites containing the most popular data products including the complete Level 3 data archive.

Contact Information

OceanColor Web: <http://oceancolor.gsfc.nasa.gov>
Support Services (and SeaWiFS authorization):
<http://oceancolor.gsfc.nasa.gov/SUPPORT/register.html>



This Aqua MODIS image shows a phytoplankton bloom along a weak temperature front in the Gulf of Alaska on April 11, 2005. Blooms of phytoplankton often occur in these latitudes at this time of year when the day length is increasing and the solar zenith angle is decreasing resulting in more light for photosynthesis and for the heating of surface waters. Courtesy: The Ocean Biology Processing Group at GSFC.

Physical Oceanography DAAC (PO.DAAC)

The NASA JPL PO.DAAC provides global oceanographic data from spaceborne instruments and produces higher level data products. Core holdings include ocean surface topography, ocean winds, and sea surface temperatures. Other holdings include data on significant wave height, ionospheric electron content, atmospheric moisture, and heat flux, as well as in-situ data related to the satellite data. PO.DAAC data strongly support research in oceanic processes and air-sea interactions.

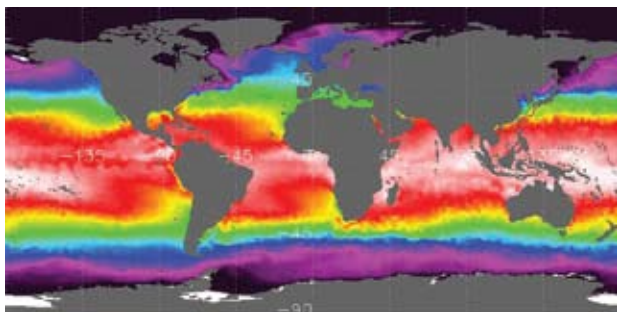


Image shows a global daily SST analysis for March 11, 2007 from the Operational Sea Surface Temperature and Sea Ice Analysis (OSTIA) product. The SST analysis is a blended product derived from infrared instruments such as AATSR and AVHRR, and microwave instruments such as AMSRE and TMI. The temperature ranges in the image from -3 to 30° Celsius. Data is distributed through the GHRSSST-PP Global Data Assembly Center (GDAC) in conjunction with the National Centre for Ocean Forecasting (NCOF) and the United Kingdom Meteorological Office (UK Met Office). Courtesy: PO.DAAC

Data Access

The PO.DAAC offers a catalog of products through its Web site (see below). Investigators may subscribe to the PO.DAAC data-news bulletins. An online search-and-order service is also available through the EDG (see section 5).

Contact Information

PO.DAAC User Services
Jet Propulsion Laboratory
E-mail: jpl@eos.nasa.gov or
podaac@podaac.jpl.nasa.gov
URL: <http://podaac.jpl.nasa.gov>
FTP: podaac.jpl.nasa.gov

Socioeconomic Data and Applications Center (SEDAC)

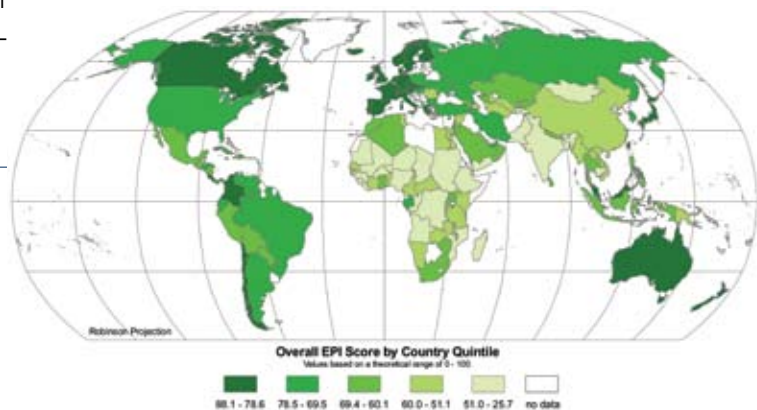
SEDAC is operated by the Center for International Earth Science Information Network (CIESIN), a unit of the Earth Institute at Columbia University based at Lamont-Doherty Earth Observatory in Palisades, New York. SEDAC's missions are to synthesize Earth science and socioeconomic data and information in ways useful to a wide range of decision makers and other applied users, and to provide an "Information Gateway" between the socioeconomic and Earth science data and information domains. The data center has extensive holdings related to population, sustainability, and geospatial data, and provides access to a large number of multilateral environmental agreements.

Data Access

SEDAC datasets can be accessed via the SEDAC web site, by searching an Information Gateway of metadata, or by browsing the SEDAC Dataset Catalog. The gateway is available at <http://sedac.ciesin.columbia.edu/gateway>

Contact Information

SEDAC User Services
CIESIN at Columbia University
Phone: +1 845-365-8920
Fax: +1 845-365-8922
E-mail: sedac@eos.nasa.gov or
ciesin.info@ciesin.columbia.edu
URL: <http://sedac.ciesin.columbia.edu>



This Pilot 2006 Environmental Performance Index (EPI) measures how close each country comes to a set of specific targets of environmental performance. The index ranks 133 countries on 16 indicators. Top-ranked countries (darker green) all commit significant resources and effort to environmental protection, while lower-ranked countries (lighter green) are underdeveloped nations with little capacity to invest in environmental infrastructure and weak regulatory systems. The EPI provides a quantitative gauge of pollution control and natural resource management results. Courtesy: SEDAC.

Earth Science Data Disciplines

NASA's Earth Observing System (EOS) comprises a series of satellites, a science component and a data system which is called The Earth Observing System Data and Information System (EOSDIS). The data centers distribute more than 2,400 Earth system science data products and associated services for interdisciplinary studies. These data centers process, archive, document, and distribute data from NASA's past and current Earth system science research satellites and field programs. Each center serves one or more specific Earth science discipline and provides its user community with data products, data information, services, and tools unique to its particular science.

Atmosphere

Aura High Resolution Dynamics Limb Sounder (HIRDLS)

Resolution: 1 km vertical x 10 km across x 300 km along line of sight

Availability: August 22, 2004 to present

Coverage: Global

HIRDLS is an infrared limb-scanning radiometer designed to sound the upper troposphere, stratosphere, and mesosphere to determine temperature; the concentrations of O₃, H₂O, CH₄, N₂O, NO₂, HNO₃, N₂O₅, CFC11, CFC12, and aerosols; and the locations of polar stratospheric clouds and cloud tops.

<http://disc.gsfc.nasa.gov/Aura/HIRDLS>

<http://acdisc.gsfc.nasa.gov>

Aura Microwave Limb Sounder (MLS)

Resolution: 3 km vertical x 165 km along the orbital track.

Availability: August 8, 2004 to present

Coverage: Near-global (82° N to 82° S)

The MLS on Aura measures microwave emissions from the Earth's limb at 118, 190, 240 and 640 GHz, and 2.5 THz. These measurements allow MLS to derive vertical profiles of ozone, water vapor, OH, HO₂, CO, HCN, N₂O, HNO₃, HCl, HOCl, ClO, BrO, and SO₂, as well as temperature, cirrus

ice, relative humidity with respect to ice, and geopotential height.

<http://disc.gsfc.nasa.gov/Aura/MLS>

<http://acdisc.gsfc.nasa.gov>

Aura Ozone Mapping Instrument (OMI)

Resolution: 13 x 24 km at nadir (nominal) and 13 x 12 km (zoomed)

Availability: August 9, 2004 to present

Coverage: Global, with a 2600 km orbital swath width (nominal)

The OMI aboard Aura employs hyperspectral imaging to observe solar backscatter radiation in the ultraviolet (264–383 nm) and visible (349–504 nm). OMI measures column amounts of ozone, NO₂, SO₂, BrO, HCHO, OClO, and ozone profiles, as well as UV-B radiation at the surface, aerosol and cloud properties.

<http://disc.gsfc.nasa.gov/Aura/OMI>

<http://acdisc.gsfc.nasa.gov>

Moderate Resolution Imaging Spectroradiometer (MODIS) Atmosphere Products

Resolution: 1 km over a 2330 km orbital swath

Availability: February 2000 to present for MODIS on Terra; June 2002 to present for MODIS on Aqua

Coverage: Global (every 1 to 2 days depending on latitude)

MODAPS produces several atmosphere products from the MODIS instruments on the Terra and Aqua platforms and distributes these products through the MODAPS Level 1 and Atmosphere Archive and Distribution System (LAADS). Level 2 products include data for aerosols, cloud properties (e.g., cloud fraction, cloud reflectance, cloud top temperature and pressure, cloud optical thickness), atmospheric temperature and moisture profiles, total water vapor, total ozone, and a cloud mask. Level 3 daily, 8-day, and monthly products for aerosols, cloud properties, and water vapor are also available.

<http://ladsweb.nascom.nasa.gov>

Solar Radiation and Climate Experiment (SORCE)

Resolution: Full solar disk data at different spectral resolutions

Availability: January 2003 to present

Coverage: Full solar disk

SORCE carries four instruments: the Total Irradiance Monitor (TIM), the Solar Stellar Irradiance Comparison Experiment (SOLSTICE), the Spectral Irradiance Monitor (SIM), and the Extreme Ultraviolet Photometer System (XPS). SORCE data contain measurements of the incoming x-ray, UV, visible, near-infrared, and total solar radiation

<http://disc.gsfc.nasa.gov/SORCE>

Upper Atmosphere Research Satellite (UARS)

Resolution: Most atmospheric products at a 4° interval along track; solar spectral data at 1 nm

Availability: September 1991 to present

Coverage: Near global (80° N to 80° S)

The GES DAAC archives upper atmospheric data from nine UARS instruments (CLAES, HALOE, HRDI, ISAMS, MLS, PEM, SOLSTICE, SUSIM, and WINDII) and UARS correlative data. Data contain profiles of upper atmospheric chemical constituents, winds, solar irradiance, and energetic particle input. Products are available as time- and latitude-ordered data sets.

<http://daac.gsfc.nasa.gov/data/dataset/UARS>

Tropical Rainfall Measuring Mission (TRMM) Global Precipitation Climatology Project (GPCP) Merged Products

Resolution: 0.25°

Availability: 1998 to present

Coverage: 50°N to 50°S

Provides two final products, the combined satellite-gauge precipitation estimate and the combined satellite-gauge precipitation error estimate. The complete data set, which includes the input and intermediate data files, contains a suite of 27 products providing monthly, global gridded values of precipitation totals and supporting information for the period January 1979–January 2004.

<http://disc.sci.gsfc.nasa.gov/precipitation>

AIRS/AMSU-A/HSB on Aqua

Resolution: AIRS IR at 13.5 km at nadir, 41 by 21.4 km at the scan extremes, and 1 km vertical; AIRS VIS/NIR at 2.3 km at nadir; AMSU-A at 40.5 km at nadir; HSB at 13.5 km at nadir.

Availability: AIRS and AMSU-A, September 1, 2002, to present; HSB, September 1, 2002, to January 31, 2003

Coverage: Global, twice daily swath (daytime and nighttime)

The Atmospheric Infrared Sounder (AIRS) is a high-spectral-resolution spectrometer with 2,378 bands in the thermal infrared (IR) and 4 bands in the visible and near infrared (VIS/NIR). AIRS and its two sounder partners—the Advanced Microwave Sounding Unit A (AMSU-A) and the Humidity Sounder for Brazil (HSB)—form the AIRS Sounding System. Since reaching polar orbit in May 2002, this system has been providing accurate measurements of air temperature, humidity, clouds, and surface temperature.

<http://disc.gsfc.nasa.gov/AIRS/>

Polar Ozone and Aerosol Measurements (POAM) II and III

Resolution: 0.1° latitude x 25.4° longitude

Availability: POAM II: October 15, 1993 to November 13, 1996; POAM III: April 22, 1998 to December 5, 2005

Coverage: Polar Regions

Measurements of the vertical distribution of atmospheric ozone, water vapor (POAM III only), nitrogen dioxide, and aerosol extinction over the Polar Regions.

http://eosweb.larc.nasa.gov/PRODOCS/poam2/table_poam2.html

http://eosweb.larc.nasa.gov/PRODOCS/poam3/table_poam3.html

Tropical Cloud Systems and Processes (TCSP) Research Experiment

Resolution: dataset dependent

Availability: June–August 2005

Coverage: Gulf of Mexico, Caribbean, Western Atlantic, Eastern Pacific

This mission is a field research investigation focused on the study of the dynamics and thermodynamics of precipitating cloud systems, including tropical cyclones using NASA-funded aircraft and surface remote sensing instrumentation. TCSP research specifically addresses the following topical areas: 1) tropical cyclone structure, genesis, intensity change, moisture fields and rainfall; 2) satellite and aircraft remote sensor data assimilation and validation studies pertaining to development of tropical cyclones; and 3) the role of upper tropospheric/lower stratospheric processes governing tropical cyclone outflow, the response of wave disturbances to deep convection and the evolution of the upper level warm core.

<http://tcsp.nsstc.nasa.gov>

NASA African Monsoon Multidisciplinary Analyses (NAMMA) Campaign

Resolution: dataset dependent

Availability: August–September 2006

Coverage: Cape Verde, Africa; North Atlantic Ocean

This mission was based in the Cape Verde Islands, 350 miles off the coast of Senegal in west Africa. Commencing in August 2006, NASA scientists employed surface observation networks and aircraft to characterize the evolution and structure of African Easterly Waves (AEWs) and Mesoscale Convective Systems over continental western Africa, and their associated impacts on regional water and energy budgets. NASA will also made extensive use of its orbiting satellites (including Aqua, TRMM, and the recently-launched Cloudsat/CALIPSO) and modeling capabilities to improve its forecasts and flight plans.

<http://namma.nsstc.nasa.gov>

Lightning Imaging Sensor/Optical Transient Detector (LIS/OTD) 11 Year (1995-2005) v2.2. Climatology Datasets

Resolution: dataset dependent

Availability: 1995–2005

Coverage: Global

These new data provide a global lightning and thunderstorm climatology from which changes (even subtle temperature variations) might be easily detected.

Release includes updates to the existing low and high resolution LIS/OTD full climatology gridded composite lightning build, Annual Climatology, diurnal climatology and low resolution time series datasets.

http://thunder.msfc.nasa.gov/data/#GRIDDED_DATA

Cloud-Aerosol Lidar and Infrared Pathfinder Satellite Observations (CALIPSO)

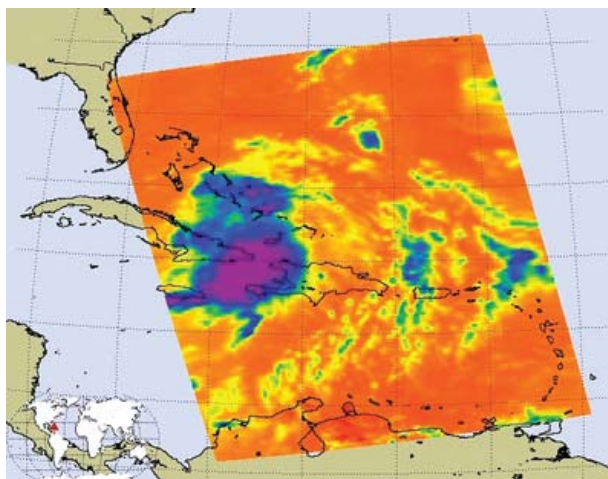
Resolution: depending on data product, the resolution is 125 m, 333 m, 1 km, 5 km

Availability: May 1, 2006 to present

Coverage: Global

Lidar measurements of attenuated backscatter, lidar cloud and aerosol layer products and vertical feature mask, imaging infrared radiometer (IIR) radiance and wide field camera (WFC) radiance data are available.

http://eosweb.larc.nasa.gov/PRODOCS/calipso/table_calipso.html



Hurricane Isabel as seen on September 13, 2003 by AIRS calibrated IR radiances (brightness temperatures). The warmest to coldest observed temperatures are represented by the color sequence reddish-orange, orange, yellow, green, blue, and purple. The coldest temperatures are from the tops of the towering clouds in the central part of the storm. Courtesy: GES DISC.

Total Ozone Mapping Spectrometer (TOMS)

Resolution: 1 by 1.25 deg

Availability: Nimbus-7, November 1978 to May 1993; Meteor-3, August 1991 to December 1994; ADEOS, September 1996 to June 1997; EP, July 1999 to December 2005

Coverage: Global

Data contain global column ozone amounts and UV reflectivity, and are available from the Nimbus-7 and Meteor-3 satellites, and the Advanced Earth Observing System (ADEOS) and Earth Probe (EP) missions

<http://daac.gsfc.nasa.gov/data/dataset/TOMS>

Tropospheric Emission Spectrometer (TES)

Resolution: Nadir: 0.5 x 5 km; Limb: 2.3 x 23 km

Availability: August 22, 2004 to present

Coverage: Global Survey: Global; Special Observation: Varies

Global Survey and Special Observation Nadir and Limb measurements of water vapor, ozone, carbon monoxide, atmospheric temperature, and heavy water; and Special Observation Spectra Low Resolution and Spectra High Resolution data. (Note: Global Survey limb observations were suspended after April 10, 2005.) Special observations are research measurements of localized or regional phenomena such as volcanoes, biomass burning, or air pollution events, or observations made to support field campaigns and other validation efforts.

http://eosweb.larc.nasa.gov/PRODOCS/tes/table_tes.html

Clouds and the Earth's Radiant Energy System (CERES)

Resolution: 1° Swath; 2.5° Zonal, Gridded Swath, and Equal Angle Grid

Availability: TRMM: December 27, 1997 to August 31, 1998 and March 2000; Terra: June 25, 2000 to present; Aqua: June 18, 2002 to present

Coverage: TRMM: 55° x -55° and 180° x -180°; Terra and Aqua: Global

Solar-reflected and Earth-emitted radiation from the top of the atmosphere to the Earth's surface, aerosols, UVA/UVB, and photosynthetically active radiation; cloud properties determined using simultaneous measurements from other EOS instruments. CERES data products are available from TRMM, Terra and Aqua.

http://eosweb.larc.nasa.gov/PRODOCS/ceres/table_ceres.html

Multi-angle Imaging SpectroRadiometer (MISR)

Resolution: The swath products have varying resolutions depending on the parameter with resolutions ranging from 250 m to 70.4 km. The resolution of the gridded products is .5° x .5° or 1° x 1°.

Availability: February 2000 to present

Coverage: Global

Geolocated, co-registered, map-projected radiance, browse imagery, geometric parameters, cloud, aerosol, and land surface products on an orbit basis. Globally gridded statistical summaries of radiance, aerosol, land, albedo, surface, and cloud products on a daily, monthly, seasonal, and yearly basis in HDF-EOS and netCDF formats. (See also Land and Calibrated Radiance.)

http://eosweb.larc.nasa.gov/PRODOCS/misr/table_misr.html

Surface Radiation Budget (SRB)

Resolution: Nested grid, with a spatial resolution of 1° in latitude (global) and longitude resolution ranging from 1° (tropics and subtropics) to 120° (poles).

Availability: July 1, 1983 to December 31, 2005

Coverage: Global

Global 3-hourly, daily and monthly averages of surface longwave and shortwave radiative properties, cloud amount, and meteorology computed using models. The main input data for these models include cloud information, top-of-atmosphere radiances and profiles of atmospheric water vapor and temperature. Some of the input data include Earth Radiation Budget Energy (ERBE) top-of-atmosphere clear-sky albedo and International Satellite Cloud Climatology Project (ISCCP) radiances and cloud amount.

http://eosweb.larc.nasa.gov/PRODOCS/srb/table_srb.html

Surface Meteorology and Solar Energy (SSE)

Resolution: 1° x 1° grid

Availability: July 1, 1983 to June 30, 1993

Coverage: Global

Contains parameters formulated for assessing and designing renewable energy systems. On-line plotting capabilities allow quick evaluation of potential renewable energy projects for any region of the world. The SSE data set is formulated from NASA satellite- and reanalysis-derived insolation and meteorological data for the 10-year period July 1983 through June 1993. Average daily and monthly measurements for 1195 World Radiation Data Centre ground sites are also available.

http://eosweb.larc.nasa.gov/PRODOCS/sse/table_sse.html

Fast Longwave And Shortwave Radiative Fluxes (FLASHFlux)

Resolution: Varies across satellite swath (~20 km at nadir)

Availability: March 1, 2006 to current production

Coverage: Global

Produces near real-time surface and Top of Atmosphere (TOA) radiative fluxes which are important for understanding the impact of changes to the Earth's surface and the state of the atmosphere. FLASHFlux can be processed either with the CERES Terra instruments FM1 or FM2 typically in the cross-track scan mode. Thus, the user should allow for the possibility that a combination of CERES FM1 and CERES FM2 data may be required to obtain all the Terra CERES data for a given time period. For Aqua, FLASHFlux processes only the CERES FM3 data.

http://eosweb.larc.nasa.gov/PRODOCS/flashflux/table_flashflux.html

Measurements of Pollution In The Troposphere (MOPITT)

Resolution: 22 km horizontally, 4 km vertically

Availability: March 3, 2000 to present

Coverage: Global

Generates atmospheric profiles of carbon monoxide (CO) using thermal radiation at 4.7 μm . Column CO using channels at 2.4 μm to sense solar radiation from the surface. Gridded CO daily averages and monthly means are available.

http://eosweb.larc.nasa.gov/PRODOCS/mopitt/table_mopitt.html

International Satellite Cloud Climatology Project (ISCCP)

Resolution: equal area grid

Availability: July 1, 1983 to June 30, 2006

Coverage: Global

Measurements include radiances, sea ice, snow cover, ice cover, cloud amount, cloud top pressure, ozone, perceptible water profiles, surface pressure, surface temperature, temperature profiles, tropopause pressure, tropopause temperature, cloud type, cloud top temperature, cloud optical thickness, and cloud water path.

http://eosweb.larc.nasa.gov/PRODOCS/isccp/table_isccp.html

Global Cloud Imagery (GCI)

Availability: August 14, 1993 to current production

Coverage: Global

Images produced from the ISCCP B3 radiances. Each composited image represents a nearly-instantaneous snapshot of global cloud field. With horizontal resolution of 0.5° and temporal resolution at 3 hours, the GCI resolves the spectrum of convective phenomena, including mesoscale features and the global diurnal cycle.

http://eosweb.larc.nasa.gov/PRODOCS/gci/table_gci.html

Stratospheric Aerosol and Gas Experiment (SAGE) I, II, and III

Availability: SAGE I: February 18, 1979 to November 18, 1981; SAGE II: October 24, 1984 to August 31, 2005; SAGE III: February 27, 2002 to December 21, 2005

SAGE I, II, and III obtain profile measurements of aerosol extinction. SAGE II and III obtain ozone, water vapor, and nitrogen dioxide. SAGE III also obtains nitrogen trioxide, chlorine dioxide, clouds, temperature and pressure. All measurements are obtained in the mesosphere, stratosphere, and upper troposphere with a vertical resolution of 0.5 - 1 km resolution.

http://eosweb.larc.nasa.gov/PRODOCS/sage1/table_sage1.html
http://eosweb.larc.nasa.gov/PRODOCS/sage2/table_sage2.html
http://eosweb.larc.nasa.gov/PRODOCS/sage3/table_sage3.html

LIS and OTD Science Data

Resolution: LIS, 4 km; OTD, 70 km

Availability: LIS, 1998 to present; OTD, 1995 to 2000

Coverage: LIS, 35° N to 35° S; OTD, 70° N to 70° S

The world's first space-based lightning sensors are capable of detecting and locating lightning events during day-and-night conditions with high detection efficiency. The LIS sensor contains a staring imager which is optimized to locate and detect lightning with storm-scale resolution of 3-6 km (3 at nadir, 6 at limb) over a large region (550-550 km) of Earth's surface. The field of view (FOV) is sufficient to observe a point on Earth or a cloud for 80 seconds, adequate to estimate the flashing rate of many storms. The instrument records the time of occurrence of a lightning event, measures the radiant energy, and estimates the location.

<http://thunder.nsstc.nasa.gov/data>

SSM/I

Resolution: 12.5 km @ 85 GHz; 25 km all others

Availability:

F13: 1995-05-03 to present

F14: 1997-05-10 to present

F15: 2000-02-23 to present

Coverage: Global

Brightness temperatures (7 channels), water vapor, cloud liquid water, and ocean wind speed data products are available. (Also see Ocean.)

<http://datapool.nsstc.nasa.gov>

Advanced Microwave Scanning Radiometer-Earth Observing System (AMSR-E) on Aqua

Resolution: 5 to 56 km

Availability: May 2002 to present

Coverage: Global

AMSR-E data include brightness temperatures, ocean products (water vapor, cloud liquid water, sea surface temperature), and rain, in both swath and gridded formats.

http://nsidc.org/data/amsre/data_summaries.html

First ISLSCP Field Experiment (FIFE) and FIFE Follow-On

Resolution: varied

Availability: Campaign data, 1987 to 1989 and 1987 to 1993; historical background data as early as 1858

Coverage: A 15 km x 15 km study area in Kansas, U.S.A.

As part of the International Satellite Land Surface Climatology Project (ISLSCP), FIFE characterized exchanges of radiation, moisture, and carbon dioxide between a prairie site and the atmosphere. Ninety-eight FIFE data sets (9 boundary layer fluxes, 11 vertical atmosphere profiles, 14 vegetation, 3 hydrology, 5 optical properties, 5 satellite and aircraft observations, 6 soil moisture, 6 soil properties, 12 surface fluxes, 8 surface meteorological measurements, and 19 surface radiation measurements) and sixteen FIFE Follow-On data sets are available.

http://daac.ornl.gov/FIFE/FIFE_Home.html

Global Flux Tower Network (FLUXNET)

Resolution: varied

Availability: Campaign data, 1990 to present

Coverage: Global

FLUXNET is compiling measurements of radiation, water vapor, carbon dioxide, and trace gas fluxes provided by regional networks and independent sites. Flux data are used to understand the mechanisms controlling the exchanges of carbon dioxide, water vapor, and energy across a spectrum of temporal and spatial scales to compare to EOS satellite products. Site data can be downloaded for more than 400 sites or viewed through a web map server. Three Fluxnet data sets are also available.

<http://daac.ornl.gov/FLUXNET/fluxnet.html>



Lightning illuminates a funnel cloud forming during a storm near Huntsville, Alabama, in April 2006. Alabama's turbulent weather gives scientists frequent opportunities to study lightning and storm development. (copyright Wes Thomas Photography).

Hydroclimatology Collections

Resolution: varied

Availability: 1951–1990

Coverage: U.S.A. and U.S. territories

Hydroclimatic characteristics (e.g., stream flow, wetlands, precipitation, temperature) were measured at various sampling sites.

<http://daac.ornl.gov/HYDROCLIMATOLOGY/hydroclimatology.html>

Prototype Validation Exercise (PROVE)

Availability: 1997

Coverage: Jornada Experimental Range near Las Cruces, New Mexico, U.S.A.

PROVE collected land and atmospheric measurements to develop methods for validating satellite data. Measurements include surface reflectance, surface temperature, albedo, and leaf area index.

<http://daac.ornl.gov/PROVE/prove.html>

TOGA COARE (Tropical Ocean Global Atmospheres/Coupled Ocean Atmosphere Response Experiment)

An international research program investigating the scientific phenomena associated with the interaction between the atmosphere and the ocean in the warm pool region of the western Pacific. The field experiment phase of the program took place from November, 1992 through February, 1993 and involved the deployment of oceanographic ships and buoys, several ship and land based Doppler radars, multiple low and high level aircraft equipped with Doppler radar and other airborne sensors, as well as a variety of surface based instruments for in situ observations.

<http://www.ncdc.noaa.gov/oa/coare/>
<http://daac.gsfc.nasa.gov/fieldexp/TOGA/>

The Kwajalein Experiment (KWAJEX)

This experiment was centered at the permanent Ground Validation site on Kwajalein Island in the Republic of the Marshall Islands from July 23 through September 15, 1999 and was designed to address scientific issues related to the generation of TRMM satellite products over the tropical open ocean.

<http://camex.nsstc.nasa.gov>

The Southern Great Plains (SGP) experiments

These experiments, in 1997 and 1999, were designed to examine the feasibility of estimating vertical profiles of soil moisture and temperature by combining in situ data, remote sensing measurements at the surface, and modeling techniques and to evaluate the influence of soil moisture on the local surface energy budget and the influence of mesoscale variability in the surface energy budget on the development of convective boundary layer.

<http://daac.gsfc.nasa.gov/fieldexp/sgp.shtml>

Texas Florida Underflights (TEFLUN)

The Texas Florida Underflights (TEFLUN) field experiments were designed to provide validation measurements for TRMM (Tropical Rainfall Measuring Mission) and for the enhancement of precipitation algorithms. TEFLUN A took place from April 1–May 15, 1998 and focused on eastern Texas.

TEFLUN-B was conducted between August 1 and September 30, 1998 in close coordination with the 3rd Convection And Moisture Experiment (CAMEX-3), and focused principally on eastern Florida to utilize the existing dense network of ground-based facilities.

<http://camex.nsstc.nasa.gov>

The Convection And Moisture Experiment (CAMEX)

A series of field research investigations sponsored by the Earth Science Directorate of the National Aeronautics and Space Administration (NASA). The third field campaign in the CAMEX series (CAMEX-3) was based at Patrick Air Force Base, Florida from 6 August to 23 September, 1998. CAMEX-3 successfully studied Hurricanes Bonnie, Danielle, Earl and Georges. The fourth field campaign in this series (CAMEX-4) ran from 16 August to 25 September, 2001 and was based out of Jacksonville Naval Air Station, Florida. Both CAMEX-3 and CAMEX-4 collected data for research in tropical cyclone development, tracking, intensification, and landfalling impacts using NASA-funded aircraft and surface remote sensing instrumentation.

<http://ghrc.msfc.nasa.gov/camex>
<http://camex.nsstc.nasa.gov>

Calibrated Radiance

Active Cavity Radiometer Irradiance Monitor (ACRIM) II and III

Availability: ACRIM II: October 4, 1991 to November 1, 2001; ACRIM III: April 5, 2000 to present

These instruments monitor the total variability of solar irradiance with active cavity radiometer solar monitoring sensors.

http://eosweb.larc.nasa.gov/PRODOCS/acrimII/table_acrimII.html

Multi-angle Imaging SpectroRadiometer (MISR)

Resolution: The resolution of the swath products is 250 m or 275 m. The resolution of the gridded products is $.5^\circ \times .5^\circ$ or $1^\circ \times 1^\circ$.

Availability: February 2000 to present

Coverage: Global

Geolocated, co-registered, map-projected radiance on an orbit basis. Globally gridded statistical summaries of radiance on a daily, monthly, seasonal and yearly basis in HDF-EOS and netCDF formats.

http://eosweb.larc.nasa.gov/PRODOCS/misr/table_misr.html

Moderate Resolution Imaging Spectroradiometer (MODIS) Atmosphere Products

Resolution: 1 km, 500 m, and 250 m over a 2330 km orbital swath

Availability: Terra: February 2000 to present; Aqua: June 2002 to present

Coverage: Global (every 1 to 2 days depending on latitude)

MODIS instruments operate on both the Terra and Aqua spacecraft. MODIS detectors measure 36 spectral bands between 0.405 and 14.385 μm , and it acquires data at three spatial resolutions – 250 m, 500 m, and 1,000 m. MODAPS produces distinct Level 1B calibrated radiance products for each of those resolutions, with a 5-km subset for each instrument also available. The 1 km products contain data from all 36 MODIS spectral bands, the 500 m products contain MODIS bands 1-7, and the 250 m product contains data from bands 1 and 2. MODAPS distributes these products through the MODAPS Level 1 and Atmosphere Archive and Distribution System (LAADS).

<http://ladsweb.nascom.nasa.gov>

Cryosphere

RADARSAT-1 SAR Mosaics of Antarctica

Resolution: 25 m or 125 m

Availability: October 1997

Coverage: Antarctica

The first, most complete and detailed views of the Antarctic continent were obtained by RADARSAT-1 during October 1997. The RADARSAT-1 SAR Mosaic of Antarctica was produced by the RADARSAT-1 Antarctic Mapping Project (RAMP). The mosaic is available by FTP at a resolution of 125 m from http://www.asf.alaska.edu/dataproducts/ramp_antarctic_mosaic.html. The mosaic is included on the Ends of the Earth CD. The CD displays mosaics of Alaska and Antarctica along with detailed images of selected areas through an interactive viewer. The 25-m resolution product of the RAMP is considered restricted and available as a 15-DVD set to NASA approved investigators. Interested users gain access to the data by submitting a proposal to asf@eos.nasa.gov. Guidelines on the structure of the proposal can be found at: <http://www.asf.alaska.edu/getdata/guidelines/proposal.html>



The image is a portion of a RADARSAT-1 ScanSAR Wide B image of the collision between the Drygalski Ice Tongue and the B-15 iceberg in the Ross Sea, Antarctica during the spring of 2005. Courtesy: ASF DAAC and the Canadian Space Agency.

RADARSAT-1 C-Band SAR System

Resolution: 10 to 600 m

Availability: February 1996 to present

Coverage: Global

The side-looking radar has a range of incidence angles from approximately 20 to 60°. Swath widths range from approximately 50 to 500 km. New acquisitions are available. RADARSAT-1 data are the property of the Canadian Space Agency (CSA).

<https://ursa.asf.alaska.edu/cgi-bin/login/guest>

ERS-1 and ERS-2 C-Band SAR Systems

Resolution: 30 to 240 m

Availability: ERS-1, August 1991 to June 1996; ERS-2, October 1995 to present

Coverage: Within a circle of 3,000-km radius centered on ASF and another centered on McMurdo Station, Antarctica

The side-looking radar has an incidence angle of 23° and a 100-km swath width. ERS-2 is a current mission and new acquisitions are available within the stated coverage. ERS-1 and ERS-2 data are the property of the European Space Agency (ESA).

<https://ursa.asf.alaska.edu/cgi-bin/login/guest>

ALOS PALSAR L-Band SAR System

Resolution: 10 to 100 m

Availability: October 2006 to present

Coverage: Global

PALSAR is an L-band SAR capable of detailed, all-weather, day and night observations and repeat-pass interferometry. It has multiple observation modes with variable polarizations, resolutions, swath widths, and off-nadir angles. PALSAR data are the property of the Japan Aerospace Exploration Agency (JAXA).

<https://ursa.asf.alaska.edu/cgi-bin/login/guest>

Advanced Microwave Scanning Radiometer-Earth Observing System (AMSR-E) on Aqua

Resolution: 5 to 56 km

Availability: May 2002 to present

Coverage: Northern and Southern Hemispheres

AMSR-E data include brightness temperatures, snow, and sea ice in polar stereographic and EASE-Grid formats.

JERS-1 L-Band SAR System

Resolution: 30 to 240 m

Availability: May 1992 to October 1998

Coverage: Global

The side-looking radar has an incidence angle of 35° and a 75-km swath width. Coverage outside the ASF mask is more limited but includes extensive rain forest and boreal forest data. JERS-1 data are the property of the Japan Aerospace Exploration Agency (JAXA).

<https://ursa.asf.alaska.edu/cgi-bin/login/guest>

AMSR-E Validation Data

Resolution: Variable

Availability: 2000 to 2005

Coverage: Arctic Ocean, Baffin Bay, Colorado, Wyoming, Iowa, Oklahoma, Georgia, Alabama, Arizona, Mexico, Brazil, Japan, Baltic Sea

The AMSR-E validation effort addresses data quality through comprehensive calibration and validation programs. These programs characterize the accuracy and precision of AMSR-E observations and their derived products, and provide for the assessment and refinement of algorithm performance for the standard AMSR-E products. A number of different campaigns addressed cryospheric, soil moisture, and precipitation data validations. Much of the data acquired is available to the general public. Data from Antarctic missions and recent Arctic missions are restricted to approved users.

http://nsidc.org/data/amsr_validation

AMSR-E/Aqua Daily Ease-Grid Brightness Temperatures

Resolution: 25 km and quarter-degree

Availability: May 2002 to present

Coverage: Northern and Southern Hemispheres, Global

Three EASE-Grid (Equal-Area Scalable Earth Grid) projections: North or South (Lambert Azimuthal) or Global (Cylindrical), and in a global, quarter-degree grid. AMSR-E data are interpolated to the output grids from swath space using an inverse-distance squared method.

Data sets complement and extend NSIDC's SMMR and SSM/I 25 km EASE-Grid brightness temperature data sets..

<http://nsidc.org/data/nsidc-0301.html>

<http://nsidc.org/data/nsidc-0302.html>

AVHRR Polar 1 Km Level 1B Data Set

Resolution: 1.1 km at nadir

Availability: 1992 to 2000

Coverage: Polar regions

This Advanced Very High Resolution Radiometer (AVHRR) data set provides nearly complete coverage of sea ice, land ice, and land in polar regions at 1.1-km resolution for all five bands of the AVHRR sensor.

http://nsidc.org/data/avhrr_level1b

AVHRR Polar Pathfinder Twice-Daily EASE-Grid Composites

Resolution: 1.25, 5, and 25 km

Availability: 1992–1998 (1.25 km), 1981–1998 (5 km), 1981–2000 (25 km); NOTE: NSIDC will be updating the 5km data through 2005 in the Fall of 2007

Coverage: Polar regions

These data sets are a collection of products for both poles, consisting of twice-daily gridded and calibrated satellite channel data and derived parameters. The parameters include average albedo and skin temperature, solar zenith angle, surface type mask, cloud mask, cloud fraction files, and others. Data are in 1-byte and 2-byte integer gridded format.

<http://nsidc.org/data/avhrr>

Cold Land Processes Experiment

Resolution: Variable

Availability: 2002 and 2003

Coverage: Northern Colorado and southern Wyoming

The Cold Land Processes Experiment (CLPX) is a multi-sensor, multi-scale field program designed to extend the current local-scale understanding of water fluxes, storage, and transformations to regional and global scales. Using ground, airborne, and spaceborne observations, the experiment emphasizes the development of a strong synergism between process-oriented understanding, land surface models, and microwave remote sensing.

<http://nsidc.org/data/clpx>

RAMP Digital Elevation Model (DEM) Version 2

Resolution: 200 m, 400 m, and 1 km

Availability: Collected between 1940s and 2000

Coverage: Antarctica, from 60° S to 90° S latitude

This high-resolution RADARSAT Antarctic Mapping Project (RAMP) DEM combines topographic data from a variety of sources to provide consistent coverage of all of Antarctica.

<http://nsidc.org/data/dems>

Ice, Cloud, and Land Elevation Satellite (ICESat) Geoscience Laser Altimeter System (GLAS)

Resolution: 60-m spot size at nadir

Availability: Begins Feb. 2003; see schedule for availability

Coverage: Global, from 86° N to 86° S latitude

The ICESat mission measures ice sheet elevations and changes in elevation through time. Secondary measurements include cloud and aerosol height profiles, land elevation, vegetation cover, and sea ice thickness. Level 2 elevation products include Antarctic and Greenland Ice Sheet Altimetry, Sea Ice Altimetry, Global Land Surface Altimetry, and Ocean Altimetry datasets. Level 2 atmosphere products include Global Cloud Heights for Multi-layer Clouds, Thin Cloud/Aerosol Optical Depths, Global Aerosol Vertical Structure Data, Global Cloud Heights for Multi-layer Clouds, and Global Planetary Boundary Layer and Elevated Aerosol Layer Heights. There are two Level 3 DEM products, one for Greenland having a horizontal spatial resolution of 1 km and the other for Antarctica at 500-m resolution.

<http://nsidc.org/data/icesat/data.html>

Moderate Resolution Imaging Spectroradiometer (MODIS) Snow and Sea Ice Products

Resolution: Snow cover at 500 m and 0.5 deg; sea ice extent at 1 km and 4 km

Availability: Terra, February 2000 to present; Aqua, July 2002 to present

Coverage: Global

NSIDC's MODIS holdings include several snow and sea ice extent products. These products consist of Level 2 swath data and Level 3 gridded composites.

<http://nsidc.org/data/modis>

Greenland 5 km DEM, Ice Thickness, and Bedrock Elevation Grids

Resolution: 5 km interpolated, but true horizontal resolution varies according to slope and surface characteristics

Availability: Collected between 1970s and 1990s

Coverage: Greenland

A Digital Elevation Model (DEM), ice thickness grid, and bedrock elevation grid of Greenland are available in ASCII text format at a 5 km grid spacing in a polar stereographic projection.

<http://nsidc.org/data/dems>

Near Real-Time SSM/I EASE-Grid Daily Global Ice Concentration and Snow Extent

Resolution: 25 km

Availability: January 2000 to present

Coverage: Polar regions

This Near real-time Ice and Snow Extent (NISE) product provides daily, global near real-time maps of sea ice concentrations and snow extent. NSIDC uses SSM/I data to generate the NISE product, which is meant to provide a best estimate of current ice and snow conditions. Several EOS instruments use NISE data as inputs to their own data processing.

<http://nsidc.org/data/nise1.html>

Northern Hemisphere EASE-Grid Weekly Snow Cover and Sea Ice Extent, Version 2

Resolution: 25 km

Availability: 1966 to 2001 and 1978 to 2001

Coverage: Northern Hemisphere

This data set combines snow cover and sea ice extent at weekly intervals for 1978 to June 2001, and snow cover alone for 1966 to June 2001.

<http://nsidc.org/data/nsidc-0046.html>

Scanning Multichannel Microwave Radiometer (SMMR) and Special Sensor Microwave/Imager (SSM/I) data

Resolution: 25 km

Availability: SMMR, 1978 to 1987; SSM/I, 1987 to present

Coverage: Northern and Southern Hemispheres

SMMR and SSM/I data include gridded brightness temperatures and sea ice extent and concentration in polar stereographic and EASE-Grid projections. The Bootstrap and NASA Team algorithms are used in the production of the sea ice data sets. NSIDC distributes a host of ancillary sea ice products, including ice extent, melt onset data, climatologies, ice persistence, total ice-covered area, and ocean masks.

SMMR and SSM/I brightness temperature and sea ice data sets are available from

<http://nsidc.org/data/nsidc-0001.html>

<http://nsidc.org/data/nsidc-0007.html>

<http://nsidc.org/data/nsidc-0051.html>

<http://nsidc.org/data/nsidc-0079.html>

http://nsidc.org/data/smmr_ssmi_ancillary

Human Dimensions

United States Census Grids

Resolution: 30-arc-seconds (~1 km) for country; 7.5-arc-seconds (~250 m) for 50 metropolitan statistical areas

Availability: 2000 (1990 and 2005 estimates forthcoming)

Coverage: United States

The U.S. Census Grids provide raster data sets that include not only population and housing counts, but a wide variety of socioeconomic characteristics. These gridded data sets transform irregularly shaped census block and block group boundaries into a regular surface – a raster grid – for faster and easier analysis. The raster format allows analysis at a higher resolution for a larger area than is feasible using Census statistical units. The gridding and reformatting also makes it easier to combine data to support vulnerability analysis; for example, studying how particular social groups were affected by Hurricane Katrina.

<http://sedac.ciesin.columbia.edu/usgrid>

Human Appropriation of Net Primary Productivity

Resolution: ¼° latitude/longitude

Availability: Circa 1990s

Coverage: Global

How does the spatial distribution of human consumption of carbon (as embodied in food, fiber, and wood products) compare to the ability of land-based ecosystems to produce it? Research led by NASA scientists attempted to address this question by comparing satellite-derived maps of net primary productivity (NPP) with human appropriation of carbon, which is partly derived from SEDAC's Gridded Population of the World dataset. The resulting global spatial distribution of NPP, Human Appropriation of NPP (HANPP) and HANPP as a percentage of local NPP data are available for downloading in raster GRID and GeoTIFF formats. In addition, tabular data by country on total estimated consumption of NPP in the form of food, paper, wood, and fiber can be accessed.

<http://sedac.ciesin.columbia.edu/es/hanpp.html>

Global Distribution of Poverty

Resolution: Ranges from national-level to 2.5 arc-minute, depending on data set

Coverage: Global

The Global Poverty Mapping Project seeks to enhance current understanding of the global distribution of poverty and the geographic and biophysical conditions of where the poor live. Additionally, the project aims to assist policy makers, development agencies, and the poor themselves in designing interventions to reduce poverty.

<http://sedac.ciesin.columbia.edu/povmap/>

Low Elevation Coastal Zone Urban-Rural Estimates (LECZ)

Resolution: National

Coverage: Global

Country-level estimates of urban, rural and total population and land area in a low elevation coastal zone (LECZ) were generated globally using Global Rural-Urban Mapping Project (GRUMP) alpha population and land area data products and a Digital Elevation Model (DEM) derived from Shuttle Radar Topographic Mission (SRTM) remote sensing data. The zone was derived from the DEM by selecting all land contiguous with the coast that was 10 m or less in elevation. Zonal statistics were generated for urban, rural and total population and land area for the country as a whole and within the LECZ. These LECZ data form the basis for the first global study to identify populations, particularly urban populations, at risk from rising sea levels and more intense cyclones linked to changing climate.

<http://sedac.ciesin.columbia.edu/gpw/lec.z.jsp>

Environmental Performance Index (EPI)

Resolution: National

Availability: 2006

Coverage: Global

The EPI utilizes six policy categories—Environmental Health, Air Quality, Water Resources, Productive Natural Resources, Biodiversity and Habitat, and Sustainable Energy—to track national-level progress towards internationally recognized environmental policy objectives. The pilot 2006 version includes 133 countries.

<http://sedac.ciesin.columbia.edu/es/epi>

Socio-Economic Data and Scenarios

Resolution: National

Availability: Circa 1990s

Coverage: Global

The Data Distribution Centre (DDC) of the Intergovernmental Panel on Climate Change (IPCC) is a shared activity between the British Atmospheric Data Centre (BADC), the Deutsches Klimarechenzentrum GmbH in Germany and SEDAC. SEDAC distributes baseline (from the IPCC Report on the Regional Impacts of Climate Change) and scenario data (from the IPCC reports Climate Change 1992: The Supplementary Report to the IPCC Scientific Assessment (IS92); and Special Report on Emissions Scenarios (SRES)) related to population, economic development, technology and natural resources for use in climate impact assessments. This information, along with environmental data and scenarios also held by the DDC, is important for characterizing the vulnerability and adaptive capacity of social and economic systems in relation to climate change in different regions.

<http://sedac.ciesin.columbia.edu/ddc/index.html>

China Dimensions Data Collection

Resolution: Includes administrative regions of China at 1:1,000,000

Availability: Varies by data set, from 1949 to 1991

Coverage: National, provincial, and county levels

China Dimensions is a rich collection of data resources for the People's Republic of China. Highlights include digital administrative boundaries, fundamental GIS layers, and county-level data on population, agriculture, economics, and hospitals.

<http://sedac.ciesin.columbia.edu/china>

Gridded Population of the World (GPW)

Resolution: 2.5-arc-minute grid

Availability: 1990-2015 (in five year increments)

Coverage: Global, continental, and national

In the GPW data set, the distribution of human population is converted from national or subnational units to georeferenced quadrilateral grids. Land area, population counts, and densities for each 2.5-arc-minute grid cell are available for the world, six continental regions, and individual countries. In addition, estimates of population to 2015 are available for continents and the globe. GPW raster (grid) data are available in three formats: ASCII text, ArcInfo interchange files (.e00), and binary band interleaved by line (.bil). Maps of administrative boundaries and population density are in portable document format (.pdf).

<http://sedac.ciesin.columbia.edu/gpw>

Global Rural Urban Mapping Project (GRUMP)

Resolution: 30 arc-second grid

Availability: 1990, 1995, and 2000

Coverage: Global, continental, and national

The Global Rural Urban Mapping Project (GRUMP) data collection consists of three databases that build upon population datasets mostly from national statistical offices, satellite data and other representations of settlements. GRUMP Human Settlements is a global database of cities and towns of 1,000 persons or more, each represented as a point, and includes information on population and latitude and longitude coordinates. Populations were estimated for 1990, 1995, and 2000. The GRUMP Urban Extent Mask is the first systematic global-scale attempt to portray the boundaries of urban areas with defined populations of 5,000 and larger. The GRUMP Population Grid represents the distribution of human population across the globe, accounting for urban population concentration more precisely than previous efforts. In addition to the data, maps of human settlements (continents only) and urban extents are available.

<http://sedac.ciesin.columbia.edu/gpw>

Population, Landscape, and Climate Estimates (PLACE)

Resolution: National

Availability: 1990 and 2000

Coverage: Global

In the PLACE data set, population and territorial extent are overlaid with biophysical parameters such as biome, climate, coastal proximity, elevation, population density, and slope. The resulting data set consists of an estimate of population and area (expressed as counts and percentages) for each of these parameters and is suitable for researchers who require tabular data aggregated to the national level

<http://sedac.ciesin.columbia.edu/place>

Environmental Sustainability Index (ESI)

Resolution: National

Availability: Reports issued in 2000, 2001, 2002, and 2005

Coverage: Global

The ESI provides a benchmark for the ability of nations to protect the environment over the next several decades. It does so by integrating data sets related to tracking natural resource endowments, past and present pollution levels, environmental management efforts, and a society's capacity to improve its environmental performance —into a set of indicators of environmental sustainability. The indicators permit comparison across the following fundamental components of sustainability: Environmental Systems, Environmental Stresses, Human Vulnerability to Environmental Stresses, Societal Capacity to Respond to Environmental Challenges, and Global Stewardship. Variable, indicator, component and index data are available:

<http://sedac.ciesin.columbia.edu/es/esi>

Human Footprint and Last of the Wild

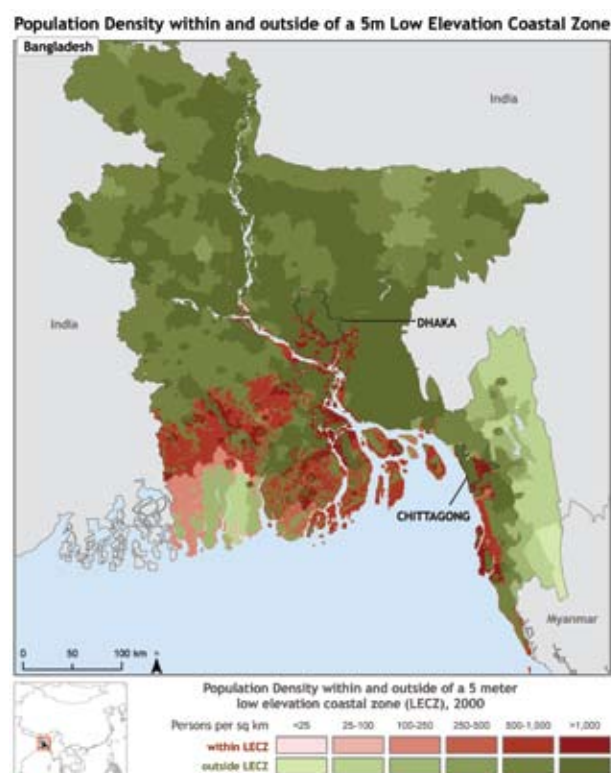
Resolution: Subnational

Availability: Circa 1990s

Coverage: Global

Human influence on Earth's land surface is a global driver of ecological processes. The Human Footprint and Last of the Wild data sets are the result of a mapping project showing how humans directly influence the land surface. The Human Footprint map is based on geographic proxies for drivers of human impact such as human population density, land cover and land use mapping, lights regularly visible from a satellite at night, locations of roads, rivers and coasts, and settlement patterns. Based on the Human Footprint data, the Last of the Wild maps are of areas representing the largest and relatively wildest places in each of their biomes

http://www.ciesin.columbia.edu/wild_areas



Population density distribution of Bangladesh within (red shading) and outside (green shading) a 5-meter Low Elevation Coastal Zone (LECZ). Population data are from SEDAC's Global Rural-Urban Mapping Project (GRUMP) dataset and elevation data is from the NASA Shuttle Radar Topographic Mission (SRTM). The LECZ helps identify populations at risk from flooding and tropical cyclones as well as sea level rise. Courtesy: SEDAC at CIESIN, Columbia University.

Environmental Treaties and Resource Indicators (ENTRI)

ENTRI is a searchable relational database that contains international environmental treaties, treaty summaries, treaty status information, and global natural resource indicator data. A Conference of Parties (COP) decision search tool allows users to search decisions produced by the Parties of a selected number of multilateral environmental agreements.

<http://sedac.ciesin.columbia.edu/entri>

Thematic Guides on the Human Dimensions of Global Environmental Change

Thematic Guides offer overviews of several issues that pertain to human interactions in the environment and global change. They give researchers, policy makers, educators, and the public quick access to background materials on global change issues, and to locate data sets and information resources. Guides are available for Social Science Applications of Remote Sensing; Land-Use and Land-Cover Change; and Global Population Projections

http://sedac.ciesin.columbia.edu/tg/guide_main.jsp

Urban Remote Sensing Studies

The following Web page groups together SEDAC-sponsored publications and reports that focus on remote sensing applications in urban areas, and provides links to other resources.

http://sedac.ciesin.columbia.edu/urban_rs

When the Weather is Uggianaqtuq: Inuit Observations of Environmental Change

Uggianaqtuq (pronounced OOG-gi-a-nak-took) is a North Baffin Inuktitut word that means to behave unexpectedly, or in an unfamiliar way. From the perspective of many hunters and elders in the Arctic, the weather has been uggianaqtuq in recent years. In this interactive, multi-media CD-ROM, Inuit from two communities, Baker Lake (Qamani'tuaq) and Clyde River (Kangiktugaapik) in Nunavut, Canada, share their observations and perspectives on recent environmental changes .

<http://nsidc.org/data/arcss122.html>

Land

Advanced Spaceborne Thermal Emission and Reflection Radiometer (ASTER) Products

Resolution: VNIR at 15 m; SWIR at 30 m; TIR at 90 m

Availability: March 2000 to present

Coverage: Global (on demand)

Of the instruments on board Terra, ASTER offers the highest resolution image data in visible and near-infrared (VNIR), shortwave infrared (SWIR), and thermal infrared (TIR) wavelengths. Routinely acquired data and data products generated include Level 1A reconstructed unprocessed instrument data. Higher level products, which can be requested on demand, include brightness temperature, surface reflectance, decorrelation stretch, surface radiance, surface emissivity, surface kinetic temperature, polar cloud classification, orthorectified and digital elevation models.

<http://lpdaac.usgs.gov/main.asp>

<http://lpdaac.usgs.gov/aster/asterdataproduct.asp>

Advanced Spaceborne Thermal Emission Radiometer (ASTER) Level-3 Orthorectified Imagery

Resolution: VNIR at 15 m; SWIR at 30 m; TIR at 90 m

Availability: March 2000 to present

Coverage: Global (on demand)

The LP DAAC offers a suite of ASTER Level-3 on-demand Orthorectified Image products. An orthorectified image is similar to a map with near-vertical views for every location. These products are generated using ASTER Level-1A data and a DEM derived from the same data. Two product suites are planned for release: 1.) AST140TH is the short name of the ASTER on-demand Level-3 Orthorectified product, which includes fifteen orthorectified ASTER Level-1B calibrated radiance images, one per each band, including Band 3B. 2.) AST14DMO is the short name of the ASTER on-demand product comprised of both the Level-3 DEM and Orthorectified Image product. The distributed product is a zipped multi-file containing both a DEM, and fifteen orthorectified L1B calibrated radiance images, one per band.

<http://lpdaac.usgs.gov/aster/AST140TH.asp>

ASTER Shortwave Infrared (SWIR) Crosstalk-Corrected Products

Resolution: SWIR at 30 m

Availability: March 2000 to present when SWIR bands had been acquired

Coverage: Global (on demand)

A new suite of higher-level on-demand ASTER L2 Surface Reflectance SWIR, and L2 Surface Radiance SWIR crosstalk-corrected products have been released. The crosstalk problem involves incident light reflecting off the ASTER Band 4 detector and being projected onto other SWIR detectors (VNIR retrieved products are not affected). These products contain atmospherically corrected shortwave infra-red data and include both the VNIR reflectance and radiance products along with the SWIR crosstalk-corrected products. The LP DAAC continues to offer the original suite of SWIR crosstalk-uncorrected radiance and reflectance products.

http://lpdaac.usgs.gov/aster/ast_07xts.asp

http://lpdaac.usgs.gov/aster/ast_09xts.asp

MODIS Products from Terra and Aqua

Resolution: 250 m, 500 m, and 1 km

Availability: Terra, February 2000 to present; Aqua, August 2002 to present; combined Terra and Aqua products, July 2002 to present

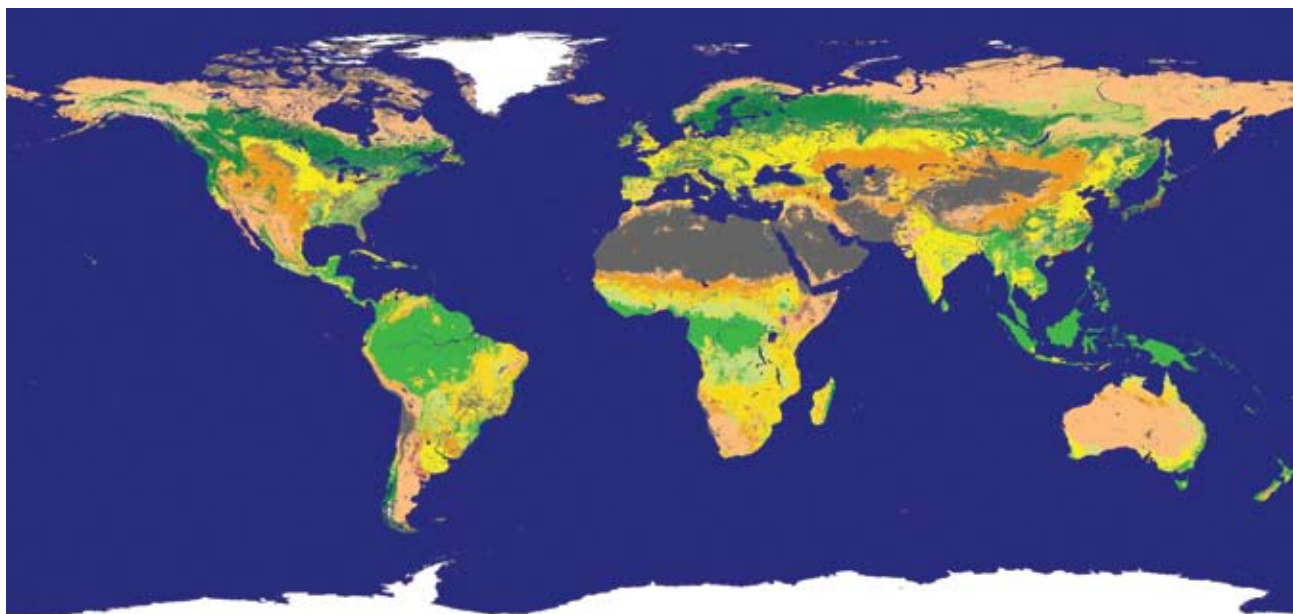
Coverage: Global

The Moderate Resolution Imaging Spectroradiometer (MODIS) provides an integrated tool for observing a variety of terrestrial, oceanic, and atmospheric features of Earth. Data sets are Level 2 and higher and include surface reflectance, land surface temperature, vegetation indices, fire anomalies, leaf area index, bidirectional reflectance distribution function and albedo, land cover change, vegetation cover conversion, and net primary production.

These higher data products have been designed to remove the burden of certain common types of data processing from the user community and meet the more general needs of global-to-regional monitoring, modeling, and assessment.

<http://lpdaac.usgs.gov/main.asp>

<http://lpdaac.usgs.gov/modis/dataproducts.asp>



This MODIS image represents the International Geosphere-Biosphere Programme (IGBP) global vegetation classification scheme for the year 2001. The IGBP scheme identifies 17 separate classes of land cover. Land cover data provides information in scientific studies including (but not limited to) resource management, forestry and land development. These data were acquired from the first MODIS sensor launched by NASA aboard the Earth Observing System (EOS) satellite Terra on December 18, 1999. A second MODIS instrument was launched May 4, 2002 on the EOS-Aqua platform. Courtesy: LP DAAC, at USGS EROS.

Boreal Ecosystem-Atmosphere Study (BOREAS) and BOREAS Follow-On

Resolution: Varied

Availability: Campaign data, 1993 to 1996 and 1993 to 1998; historical background data as early as 1937.

Coverage: A 1,000 km x 1,000 km study area with two sites in Manitoba and Saskatchewan, Canada.

Through remote sensing and field measurements, BOREAS investigated exchanges of energy, water, heat, carbon dioxide, and trace gases between a boreal forest and the atmosphere. Two-hundred and eighty-one Boreas data sets (24 airborne fluxes and meteorology, 33 hydrology, 40 remote sensing, 69 terrestrial ecology, 29 tower fluxes, 31 trace gas biogeochemistry, 42 staff science, and 13 miscellaneous science) and twenty-five Boreas Follow-On data sets are currently available.

http://daac.ornl.gov/BOREAS/boreas_home_page.html

The Large-Scale Biosphere-Atmosphere Experiment in Amazonia (LBA)

Resolution: Varied

Availability: 1995-2006

Coverage: Amazonia

The Large-Scale Biosphere-Atmosphere Experiment in Amazonia (LBA) was an international research initiative conducted from 1995-2006 and led by Brazil. The project focused on understanding how tropical forest conversion, regrowth, and selective logging influence carbon storage, nutrient dynamics, trace gas fluxes, and the prospect for sustainable land use in Amazonia. Twenty-six data sets (5 carbon dynamics, 1 human dimensions, 11 land use and land cover change, 5 physical climate, 3 surface hydrology and water chemistry, and 1 trace gases) are currently available.

<http://daac.ornl.gov/LBA/lba.html>

River Discharge (RivDIS)

Availability: Varies, between 1807 and 1991

Coverage: Global

Holdings contain long-term monthly averaged values for river discharge measured at various stations.

<http://daac.ornl.gov/RIVDIS/rivdis.html>

Southern African Regional Science Initiative (SAFARI) 2000

Resolution: Varied

Availability: 1992-2000

Coverage: Southern Africa, 5° W to 60° E; 5° N to 35° S

The SAFARI 2000 project was an international regional science initiative conducted from 1992-2000 to develop a better understanding of the Earth-atmosphere-human system in Southern Africa. One-hundred and eight data sets (19 atmospheric, 11 land cover, 7 soils, 14 climate and meteorology, 26 field based measurements, 2 hydrology, 4 regional, and 25 remote sensing) are available.

<http://daac.ornl.gov/S2K/safari.html>

Model Archive

Resolution: Varied

Availability: Benchmark, PNet, and published research results

Coverage: Global

The ORNL DAAC currently archives and distributes the following model products: 3 benchmark model versions: BIOME-BCG, Integrated Biosphere Simulator (IBIS), and Land Surface Model (LSM), CENTURY, Version 4 (VEMAP), 2 PNet model products, and 2 models used in published research results associated with specific model implementations: BIOME-BCG(Law et al.) and BIOME-BGC.

http://daac.ornl.gov/model_intro.shtml

Oregon Transect Ecosystem Research (OTTER)

Resolution: Varied

Availability: Campaign data, 1989 to 1991; background data, 1989 to 1991

Coverage: Six sites in Oregon, U.S.A.

The OTTER project estimated fluxes of carbon, nitrogen, and water in three Oregon forests, using an ecosystem-process model and remote sensing data. Fourteen OTTER data sets on canopy chemistry, meteorology, field sunphotometer, airborne sunphotometer, and timber measurements are available.

<http://daac.ornl.gov/OTTER/otter.html>

Superior National Forest (SNF)

Availability: Campaign data, 1983 to 1984; weather data, 1972 to 1990

Coverage: 50 km x 50 km study area in northern Minnesota, U.S.A.

SNF research investigated the usefulness of remote sensing data in estimating the biophysical properties (e.g., biomass) of a boreal forest. Fourteen data sets on canopy chemistry, leaf area index, leaf reflectance, meteorology, optical thickness, and reflectance are available.

<http://daac.ornl.gov/SNF/summary.html>

Accelerated Canopy Chemistry Program (ACCP)

Availability: Campaign data, 1992 to 1993

Coverage: Sites in the continental U.S.A.

ACCP used remote sensing to study the nitrogen and lignin content of the vegetation canopy in various ecosystems. Thirty-seven data sets are available on physical forest properties, climatology, phenology, and canopy reflectance.

<http://daac.ornl.gov/ACCP/accp.html>

EOS Land Validation

Availability: Campaign data, 1999 to present

Coverage: Global

The EOS Land Validation project is using the ORNL DAAC's Mercury system for registering data sets from ground-based and airborne measurements to compare with EOS satellite products.

http://daac.ornl.gov/LAND_VAL/valid.html

MODIS ASCII Subsets

Availability: February 2000 to present

Coverage: Global

Selected MODIS land products from the Terra and Aqua satellites are available for 1028 sites. The products are subset for 7- x 7-km around the field sites. MODIS data are in sinusoidal projection in ASCII format. Subset data can be viewed for individual composite periods or as a time series

<http://daac.ornl.gov/MODIS/modis.html>

Net Primary Productivity (NPP)

Availability: Varies, between 1930 and 2001

Coverage: Global

NPP holdings contain field measurements and NPP estimates for a variety of ecosystems. Eighty-two data sets are currently available (9 boreal forest, 1 us cropland, 37 grassland, 10 multi-biome, 4 temperate forest, 19 tropical forest and 2 Alaskan tundra).

http://daac.ornl.gov/NPP/npp_home.html

Soil Collections

Availability: Varies, between 1940 and 1996

Coverage: Global

Soil characteristics were measured at sampling sites or estimated for grids of various sizes in ten data sets.

http://daac.ornl.gov/SOILS/soils_collections.html

Vegetation Collections

Availability: Varies, between 1932 and 2000

Coverage: Global and regional

Holdings pertain to vegetation characteristics, including the distribution of vegetation types, as well as leaf area index calculated from field measurements in thirteen data sets.

http://daac.ornl.gov/VEGETATION/vegetation_collection.html

Vegetation/Ecosystem Modeling and Analysis Project (VEMAP)

Availability: Climate measurements, 1895 to 1993; climate scenarios, 1994 to 2100

Coverage: U.S.A.

VEMAP studied the global response of biogeography and biogeochemistry to variability in climate and other environmental factors (e.g., elevated atmospheric carbon dioxide concentrations). Fifteen VEMAP data sets are available.

<http://daac.ornl.gov/VEMAP/vemap.html>

Boreal Forest Mosaics

Resolution: 100 m to 2 km

Availability: 1997 and 1998

Coverage: North America boreal forest

JERS-1 SAR mosaics of boreal North America (Alaska and Canada) are now available on DVD. Winter and summer mosaics were assembled under the North American component of the Global Boreal Forest Mapping (GBFM) project. The DVD includes imagery extending from northern Alaska to the northeastern United States. Backscatter and texture products are provided as complete summer and winter mosaics at both 500-m and 2-km resolution. Backscatter data at 100-m resolution are also provided as tiles of about 50 JERS-1 scenes each.

http://www.asf.alaska.edu/dataproducts/unrestricted_order.html

Rain Forest Mosaics

Resolution: 100 m

Availability: Central America, 1996; South America, 1995 and 1996; Africa, 1996 and 1997; Northern Australia, 1996; South-East Asia, 1997 and 1998

Coverage: Major rain forests

The goal of the Global Rain Forest Mapping (GRFM) project is to acquire contiguous SAR data sets of Earth's major rain forests using the JERS-1 satellite. ASF has available complete GRFM-produced mosaics of the Amazon, Central America, Africa, Pantanal region, Africa, Northern Australia, and South-East Asia. The mosaics are available on CD-ROM.

http://www.asf.alaska.edu/dataproducts/unrestricted_order.html

Ice, Cloud, and Land Elevation Satellite (ICESat) Geoscience Laser Altimeter System (GLAS)

Resolution: 60-m spot size at nadir

Availability: Begins Feb. 2003; (see release schedule for availability)

Coverage: Global, from 86° N to 86° S latitude

Some of the secondary objectives of the ICESat mission include measurements of land parameters such as land elevations and vegetation cover. Using GLAS data to study vegetation has become a fruitful area of research. Data products useful to non-cryospheric land studies include the Land Surface Altimetry product and various Level 1 products, e.g., Level 1B Global Backscatter data. (See also Cryosphere)

<http://nsidc.org/data/icesat/data.html>

Advanced Microwave Scanning Radiometer-Earth Observing System (AMSR-E) on Aqua

Resolution: 5 to 56 km

Availability: May 2002 to present

Coverage: Global

The AMSR-E land products also contain interpretive information on vegetation roughness and water content. The Level 3 land product is produced daily on a 25-km EASE-Grid. Swath and gridded snow products are also available, with daily, 5-day, and monthly Level 3 snow products being produced.

http://nsidc.org/data/amsre/data_summaries.html

AIRSAR Data

Resolution: 12 to 100 m

Availability: 1990 to 2004

Coverage: Global

The AIRSAR dataset contains two modes, POLSAR and TOPSAR. The POLSAR mode acquires C-band, L-band and P-band polarimetric data. The TOPSAR mode acquires C-band DEM data, C-band VV, P-band polarimetric data. The P-band data will be a slant-range POLSAR, if the P-Band is a 20 MHz data and the DEM is a 40 MHz data. AIRSAR data can be downloaded from the web through the URSA interface at <https://ursa.asf.alaska.edu/cgi-bin/login>, under search and order select AIRSAR and chose the search type.

Multi-angle Imaging SpectroRadiometer (MISR)

Resolution: The swath products have varying resolutions depending on the parameter with resolutions ranging from 1.1 km to 70.4 km. The resolution of the gridded products is .5° x .5° or 1° x 1°.

Availability: February 1, 2000 to present

Coverage: Global

Surface Parameters contain bihemispherical and directional-hemispherical reflectance (albedo), hemispherical directional and bidirectional reflectance factor (BRF), BRF model parameters, leaf-area index (LAI), fraction of photosynthetically active radiation (FPAR), and normalized difference vegetation index on a 1.1 km grid. Component Global Land Surface Product contains average of directional hemispheric reflectance (DHR), DHR photosynthetically active radiation (PAR), fractional absorbed PAR, LAI, normalized difference vegetation index on a daily, monthly, seasonal and yearly basis in HDF-EOS and netCDF formats.

http://eosweb.larc.nasa.gov/PRODOCS/misr/table_misr.html

OCEANS

The GODAE High Resolution Sea Surface Temperature Pilot Project (GHRSSST-PP)

For L2P

Resolution: 1–25 km (depends on satellite)

Availability: Daily

Coverage: Global and regional (depends on satellite)

For L4

Resolution: 2–28 km

Availability: Daily

Coverage: Global and regional

An international collaboration to produce a new generation of global satellite-based SST measurements from infrared and microwave instruments. Near real-time Level-2 Preprocessed (L2P) and Level 4 merged SST products containing satellite-specific SST uncertainty statistics and other relevant ancillary information are available through a 30–45 day rolling store in netCDF format. L2P products are available within 6 hours of satellite overpass. The spatial resolution ranges from 1 km global coverage for MODIS and AATSR to 25 km global coverage for AMSR-E, and TMI. L4 blended products are available daily with both global and regional spatial coverages. All products are available through <ftp://podaac.jpl.nasa.gov/GHRSSST>. Historical data that are 30 days or older can be found at the GHRSSST Longterm Stewardship and Reanalysis Center (LTSRF) at:

<http://ghrsst.nodc.noaa.gov>

<http://ghrsst.jpl.nasa.gov>

<http://www.ghrsst-pp.org>

TOPEX/POSEIDON

Resolution: Along track

Availability: 1992 to 2005

Coverage: Global

Data include sea surface height (SSH), wind speed, significant wave height, tropospheric water vapor, ionospheric electron content, and ancillary information along the satellite's track, from both NASA and CNES (French space agency) altimeters and radiometer. Products include the complete Merged Geophysical Data Record-B (MGDR-B) as well as two reduced-volume sea surface height anomaly (SSHA) products.

http://podaac/DATA_PRODUCT/OST/Index.html#topex

Jason Data for Ocean Surface Topography Measurements

Resolution: Along track measurements are approximately 6 km apart and the ground tracks are 315 km apart at the equator.

Availability: January 15, 2002–present

Coverage: Global

Jason, a follow-on mission to the highly successful TOPEX/POSEIDON mission, provides an extended continuous time series of high-accuracy measurements of the ocean surface topography. New version “b” Jason science data products are available for the entire mission except for cycle 178. Improved algorithms include: orbits, wet path delay, re-tracking, tide models, sea state bias, mean sea surface, wind speed, non-tidal high frequency corrections and rain flagging.

http://podaac/DATA_PRODUCT/OST/index.html



A break in the clouds over the Barents Sea on August 1, 2007 revealed a large, dense phytoplankton bloom to the orbiting MODIS aboard the Terra satellite. The bright aquamarine hues suggest that this is likely a coccolithophore bloom. The visible portion of this bloom covers about 150,000 square kilometers (57,000 square miles) or roughly the area of Wisconsin. Courtesy: The Ocean Biology Processing Group at GSFC.

MODIS on Aqua and Terra

Resolution: L2 at 1 km, L3 at 4 km and 9 km

Availability: MODIS/Aqua: July 2002 to present, MODIS/Terra: February 2000 to present for sea surface temperature (SST) products and January 2007 to present for ocean color products

Coverage: Global oceans

MODIS ocean products are distributed by the Ocean Biology Processing Group via the OceanColor Web. SST products are available over the MODIS operational lifetimes for both the Aqua and Terra instruments. Ocean color products include chlorophyll concentration, diffuse attenuation coefficient, water leaving radiances at 6 wavelengths, and aerosol parameters used in atmospheric corrections. The quality of MODIS/Aqua ocean color products is much higher than those for MODIS/Terra, which is why the availability of the latter data is limited. The Level 2 swath products are given at full spatial resolution, with scene sizes approximately 2000 km by 2000 km. The mapped products are available at several temporal resolutions (daily, 8-day, monthly, seasonal, and yearly).

<http://oceancolor.gsfc.nasa.gov>

SeaWiFS on OrbView-2

Resolution: L2 at 1 km for local area coverage (LAC) and 4 km for global area coverage (GAC), L3 at 4 km and 9 km

Availability: September 1997 to present

Coverage: Global oceans

SeaWiFS ocean color products are similar to those produced from MODIS, but the instrument has no channels for retrieving SST. The products also are distributed by the Ocean Biology Processing Group via the OceanColor Web, and include chlorophyll concentration, diffuse attenuation coefficient, water leaving radiances at 6 wavelengths (slightly different from the MODIS wavelengths), and aerosol parameters used in atmospheric corrections. The Level 2 swath products are given at full spatial resolution. The swath widths depend on the coverage, approximately 2800 km for LAC and 1500 km for GAC. The mapped products are available at several temporal resolutions (daily, 8-day, monthly, seasonal, and yearly). Additional SeaWiFS products applicable to ocean biology include photosynthetically active radiation (PAR) reaching the ocean surface and a global biosphere browse product.

<http://oceancolor.gsfc.nasa.gov>

SeaWinds on QuikSCAT and SeaWinds on ADEOS-II

Resolution: Level 3 at 0.25 deg; Level 2B at 25 km

Availability: QuikSCAT, July 1999 to present; ADEOS-II, April 2003 to October 2003

Coverage: Global

Level 3 data sets from the SeaWinds instrument on both QuikSCAT and ADEOS-II provide daily gridded wind vectors, comprising zonal and meridional components. The Level 2B data sets provide per-orbit, swathed wind vectors, comprising speed and direction. SeaWinds orbits more than 14 times a day. Both products have ancillary data, e.g., rain flags and quality indicators.

http://podaac/DATA_PRODUCT/OVW/index.html

Advanced Microwave Scanning Radiometer-EOS (AMSR-E) on Aqua

Resolution: 5 to 56 km

Availability: May 2002 to present

Coverage: Global

AMSR-E data include brightness temperatures and ocean products (water vapor, cloud liquid water, sea surface wind speeds, sea surface temperature) in both swath and gridded formats.

http://nsidc.org/data/amsre/data_summaries.html



How to Find and Get Data

How to Find and Get Data

Data Center Data Search and Order

The data centers are responsible for data archival, product development and distribution, and user support. Each data center is distinguished from one another by their specific Earth system science discipline. In addition to the search-and-order capabilities provided by the EDG, the data centers have individual online systems that allow them to provide unique services for users of a particular type of data. The center-specific systems emphasize data products, services, and data-handling tools unique to the data center.

The data centers provide their users with the following services and information:

Data center services

- Center-unique search-and-order systems
- Specific Earth science discipline searches
- Specialized data set tools

User services

- Assistance in selecting and obtaining data
- Access to data-handling and visualization tools
- Notification of data-related news
- Technical support and referrals

For more information about the data centers and their data and services, see <http://nasadaacs.eos.nasa.gov>

EOS Data Gateway (EDG)

<http://eos.nasa.gov/imswelcome>

Currently the EDG is one of the primary access points to EOSDIS and other Earth science data holdings archived at the EOSDIS data centers and several international data centers. The goal of the EDG is to provide seamless, online access to these archives.

The EDG search-and-order tool provides access to more than 2,400 data sets held at 19 data centers. This system allows users, including those without specific knowledge of the data, to search science data holdings, retrieve high-level descriptions of data sets and detailed descriptions of the data inventory, view browse images, and place orders for data products.

The EDG search-and-order tool has the following features:

- Browse capability—Allows a user to explore the list of data sets or granules returned by a search by viewing their temporal coverage, spatial coverage, attributes (metadata), related documents (guide search), and browse images.
- Order function—Allows the user to select data for ordering, choose packaging information, enter ordering information (such as shipping address), and place an order.
- EOS and related search and access tools—Provides links to other search and access resources for EOS and related data.

ECHO/WIST

<http://eos.nasa.gov/echo>

The EOS ClearingHouse (ECHO) is a metadata catalog of NASA's EOS data and a registry for related data services (e.g. reformatting, pattern recognition). Users can access the data and services by using general or community-tailored clients that access ECHO using a series of Application Program Interfaces (APIs) defined using web services.

ECHO's catalog is populated by Data Partners (e.g. NASA EOSDIS data center), who provide metadata that represent their Earth science data holdings to ECHO to make it available for search. Data Partners allow users to access their data holdings either by order distribution or online access. ECHO's services registry is populated by Service Partners, who provide access to functions that operate on Earth science data or information. ECHO advertises these services as well as brokers these services, as the Service Partner requests. Client Partners develop software applications that communicate with ECHO via its APIs to allow end users to access its metadata catalog and functionality. Some Clients provide a web application or other graphical user interface (GUI) to assist users in navigating and exploring ECHO for data and services. Other Clients may use ECHO's machine-to-machine interfaces.

WIST, the Warehouse Inventory Search Tool, is a web-based client for searching and ordering all of ECHO's holdings. Users can submit cross-discipline queries using spatial and temporal criteria, examine search results for relevancy using built-in tools, and submit orders via ECHO to the appropriate data providers.

ECHO/WIST capabilities include:

- User Registration and Login
- Search for cartesian, geodetic and orbital data using:
 - Spatial Searches (e.g. line, polygon, multipolygon, circle)
 - Temporal Range Searches
 - Keyword Searches
 - Numeric Searches (e.g. cloud cover percentage)
 - Product Specific Attribute Searches
- Data Registry access (e.g. direct on-line access, orders brokering, subscriptions)
- Publish, discover, and access Extended Services (e.g. reformatting, pattern recognition)
- Subscribe to Event notification subscriptions notify users when an internal event occurs (e.g. catalog and extended services modifications)

NASA Earth Observations (NEO)

<http://neo.sci.gsfc.nasa.gov>

NEO is an on-line Web-based image access and analysis tool that is designed for designers in that it simplifies access to NASA remote-sensing data products in familiar file formats. NEO allows users to browse NASA satellite images with the ability to order matching data (for select products) via a single, integrated gateway. This resource is designed for educators, communicators, and citizen scientists who wish to export geo-referenced imagery into commonly used tools (i.e., GoogleEarth, MS Excel). Thus, all imagery are available at set temporal and spatial resolutions and the user can specify image size and file formats. NEO also allows the user to analyze the imagery quantitatively using standard techniques, such as value "probing," transect data plots, scatter plots, measurements of area and distance, histograms, and others.

Global Change Master Directory

<http://gcmd.nasa.gov/>

A directory to Earth science data and services, the GCMD database currently holds more than 19,000 Earth science data sets and services covering all aspects of Earth and environmental sciences. Features available on the GCMD website with the latest upgrade include:

- New GCMD homepage and website functionality
- New DIF & SERF metadata display
- Science keyword taxonomy extended to five levels
- Spatial search using Google Map
- Two-level Related_URL fields to capture additional data and service types, including web services
- Relative time capability to access real-time data pools
- Refinement by spatial and temporal resolution
- Support for international and mathematical characters in the metadata display
- Expanded biological classification taxonomies and geological time keywords
- New Platform & Instrument hierarchical keyword options in docBUILDER
- New features within docBUILDER authoring tool.



Data Tools

Data Tools

The data centers provide center-unique tools for functions such as searching and subsetting data. The table below lists and describes some of these available data-handling and service tools. The tools are grouped loosely into broad categories that indicate the primary function of each tool, for example, data handling, visualization and analysis, search and order, etc. Since many tools have multiple functions, a second summary table is included indicating the various uses of each tool.

Search and Order Tools		
Data Tool/Service	Data Center	Description
URSA	ASF DAAC	URSA (User Remote Sensing Access) is a search and order interface designed for the ASF SAR data archive. All SAR data products available through the ASF DAAC can be ordered through URSA. The interface provides the ability to search for data geographically and by date range. Express orders are also possible if orbit information is known. Search results can be exported as kml files for display in Google Earth. AirSAR data can be downloaded directly from search results. https://ursa.asf.alaska.edu/cgi-bin/login
ASDC Order Tools	LaRC ASDC	These tools allow users to search our data holdings without logging in to the system. The user, however, must log in before ordering the data. Searches can be done by project, parameter, and data set, and searches can be refined by selecting a geographic region or time range. The ordering tool is available in both Java and HTML versions. Select CERES and FLASHFlux data products can be subset by latitude and longitude, start and end time, parameter, and criterion via the Java version of the ASDC Ordering Tool. http://eosweb.larc.nasa.gov/HBDOCS/langley_web_tool.html
Multi-angle Imaging SpectroRadiometer (MISR) Order and Customization Tool	LaRC ASDC	<ul style="list-style-type: none"> • Allows users to order and customize data in a single interface. • Features include: non-consecutive path and orbit search, sorting search results by date, camera, path, orbit, and file version. • Customization options include: subsetting by parameter, block, and spatial coordinates, add latitude and longitude layers, unpacking and unscaling applicable fields. • Allows users to save searches and customizations. • Support EOS Validation site subsets. • Output data format in HDF-EOS stacked-block grid or conventional grid. • http://10dup05.larc.nasa.gov/MISR/cgi-bin/MISR/main.cgi
OPeNDAP	GES DISC	OPeNDAP (developed at the University of Rhode Island, P. Cornillion) provides software which makes local data accessible to remote locations regardless of local storage format. OPeNDAP also provides tools for transforming existing applications into OPeNDAP clients (i.e., enabling them to remotely access OPeNDAP served data).
Mirador	GES DISC	<ul style="list-style-type: none"> • Simplified web interface for searching, browsing, and ordering Earth science data at NASA Goddard Earth Sciences Data and Information Services Center (GES DISC). • Features include (quick response, data file hit estimator, Gazetteer, and interactive shopping cart. • Available data include AIRS, Aura (MLS, HIRDLS, OMI), SORCE, TOMS, TRMM, UARS, and MODIS subsets for A-Train. • http://mirador.gsfc.nasa.gov

Search and Order Tools		
Data Tool/Service	Data Center	Description
NOESIS	GHRC	Noesis is a meta search engine and a resource aggregator designed specifically for Atmospheric Science. Noesis uses ontologies to guide users to refine their search query producing better search results and thereby reduces the user's burden to experiment with different search strings. Noesis also serves as an educational tool as it allows users to browse and traverse the different concepts in the ontology. Noesis provides users a single site to find all the right resources in the Atmospheric Science domain and these resources cover web pages, publications, datasets, educational materials, books etc. <ul style="list-style-type: none"> • http://noesis.itsc.uah.edu
GHRC Data Pool	GHRC	The GHRC Data Pool provides on-line access to half a terabyte of passive microwave data (http://datapool.msfc.nasa.gov). <ul style="list-style-type: none"> • Multiple views of available data, e.g. search, ftp and calendars • Data search based on product, instrument, platform and date • SSM/I, TMI, and AMSU-A Coarse Grain Subsetting • Shopping cart style order creation • Automated order packaging for FTP delivery • Integration with GHRC Order Tracking System for metrics and user services support • Direct FTP access to online data sets • Web Mapping Services
Coincidence Search Engine	GHRC	The Coincidence Search Engine may be used to search for times when up to four satellites were over or within the same geographic area simultaneously. Searches may be constrained by time, geographic area, and/or distance between the satellites. The output consists of a sequence of text lines listing the date, time, satellite name, and latitude and longitude. <ul style="list-style-type: none"> • http://ghrc.msfc.nasa.gov/orbit-cgi-bin/execute?orbit+concur
HyDRO	GHRC	The Hydrologic Data Search, Retrieval, and Order (HyDRO) system allows the user to search data set holdings at GHRC. HyDRO provides a list of GHRC data sets specific to the user's requirements. Users are able to browse the online information and tools or services for each data set. They can download online data sets by FTP or place an order. <ul style="list-style-type: none"> • http://ghrc.nsstc.nasa.gov
MODIS L1 and Atmospheres Archive and Distribution System (LAADS)	MODAPS	Capabilities include parameter subsetting, geographic subsetting, day/night granule search, metadata search, masking, channel sub-setting, tile re-projection, order tracking, user push or pull, and a shopping cart. Granule reprojection, GeoTIFF re-formatting and mosaicking will be added to this list over the next few months. This is the sole source for MODIS L1 and atmospheric data products. <ul style="list-style-type: none"> • http://ladsweb.nascom.nasa.gov
"Which CERES Data Product Do I Want?" Interface	LaRC ASDC	User friendly interface helps users determine the specific CERES data product(s) that meet a desired search criteria based on product type, temporal and spatial resolution, and applicable studies. <ul style="list-style-type: none"> • http://eosweb.larc.nasa.gov/PRODOCS/ceres/search/ceres_form.php
"Which MISR Data Product Do I Want?" Interface	LaRC ASDC	User friendly interface helps users determine the specific MISR data product(s) that meet a desired search criteria based on product type, temporal and spatial resolution, and applicable studies <ul style="list-style-type: none"> • http://eosweb.larc.nasa.gov/PRODOCS/misr/search/misr_form.php
ASDC Data Pool	LaRC ASDC	An on-line, short-term data cache providing a Web interface and FTP access to select ASDC data products. Specially subsetted and/or reformatted data products supporting field campaigns are also available. <ul style="list-style-type: none"> • http://eosweb.larc.nasa.gov/HPDOCS/datapool

Search and Order Tools

Data Tool/Service	Data Center	Description
Data Pool	LP DAAC	The Data Pool at the LP DAAC is an online archive that provides FTP access to select ASTER and MODIS data products. ASTER Data Pool coverage includes the United States and U.S. Territories. These data are populated on a two-year rolling archive basis. MODIS coverage is global. The Data Pool HDF-EOS to GeoTiff (HEG) tool provides the ability to reformat, reproject, or spatially subset data. Several data types are available at no charge through the Data Pool. New features allow access to MODIS land products via product type, tile, and map selections. Separate methods are offered for tile grid products and climate modeling grid products. <ul style="list-style-type: none"> • http://LPDAAC.usgs.gov/datapool/datapool.asp
Data Pool	NSIDC DAAC	The Data Pool at NSIDC is an online archive providing easy access to AMSR-E, GLAS, MODIS, and near real-time SSM/I data. The HDF-EOS to GeoTIFF (HEG) tool allows users to reformat, reproject, or spatially subset many of the ASMR-E and MODIS data sets. <ul style="list-style-type: none"> • http://nsidc.org/data/data_pool
GloVis	LP DAAC	The USGS Global Visualization Viewer (GloVis) allows users to search, browse, and order ASTER and MODIS data. Users click on a global locator map to view ASTER or MODIS images for their selected geographic area. <ul style="list-style-type: none"> • http://glovis.usgs.gov
MODextract	LP DAAC	MODextract is a software tool available for retrieving MODIS gridded products from the LP DAAC Data Pool and is executed from the end-user's machine. The MODextract is supported on IRIX, Solaris and LINUX. <ul style="list-style-type: none"> • http://lpdaac.usgs.gov/landaac/tools/datapool
GISMO	NSIDC DAAC	The Graphical Interface for Subsetting, Mapping, and Ordering (GISMO) Web-based tool can be used to search, subset, and order gridded data from NSIDC. Data may be queried by spatial range, temporal range, and data-specific parameters. <ul style="list-style-type: none"> • http://nsidc.org/data/gismo
PSQ	NSIDC DAAC	The Polar Spatial Query (PSQ) tool allows users to search for orbit and scene data sets by collection, parameter (channel), date, and region of interest. <ul style="list-style-type: none"> • http://nsidc.org/data/psq
Mercury	ORNL DAAC	Mercury is a Web-based system for searching metadata and retrieving selected data. Data and documentation can reside anywhere on the Internet, including in a data center or, for a project, on the individual data providers' servers. Mercury keeps the central metadata current by updating its database every night. Mercury supports international metadata standards and is compatible with Internet search engines. <ul style="list-style-type: none"> • http://mercury.ornl.gov/ornldaac
GHRSSST Master Metadata Repository (MMR)	PO.DAAC	A Web-based interface tool for data discovery and download for all GHRSSST-PP products. MMR provides a simple searchable index to all GHRSSST-PP data products, irrespective of where they are physically located. The MMR is therefore the foundation of the GHRSSST-PP data management framework. It provides a searchable catalogue of the distributed GHRSSST-PP data holdings providing information on its physical location, contents and any constraints on its use. <ul style="list-style-type: none"> • http://ghrsst.jpl.nasa.gov • http://www.ghrsst-pp.org/Metadata-Records.html
ENTRI	SEDAC	The Environmental Treaties and Resource Indicators (ENTRI) is a comprehensive database for accessing multilateral environmental treaty data. Using ENTRI you can find treaty texts as well as country and treaty status data. <ul style="list-style-type: none"> • http://sedac.ciesin.org/entri/index.jsp

Data Handling Tools (Read/Ingest, Format Conversion, Data Manipulation)		
Data Tool/Service	Data Center	Description
ASF MapReady Tool	ASF DAAC	<ul style="list-style-type: none"> • Supports ASF SAR data and CEOS data from a variety of other SAR facilities. • Enables a user to geocode the data using a variety of projections and standard datums. • Enables user to terrain correct (orthorectify) the data. • Enables a user to export the images as geotiffs for use in GIS programs. • Enables a user to export the images as tiffs, jpegs, or pgm files for easy viewing. • Includes a CEOS metadata viewer. • Displays thumbnails of imagery as it is loaded. • Displays thumbnails of imagery that it has processed. • Includes a simple image viewer. • http://asf.alaska.edu/softwaretools
ASF SAR Training Processor	ASF DAAC	<ul style="list-style-type: none"> • Enables user to follow the steps as a SAR image is processed from Level 0 raw data to a Level 1 image via the range-Doppler technique. • Writes and displays images at each selected processing stage, giving user visibility into the intermediate steps of the process. • Enables user to modify various parameters as well as steps that are performed to visualize the impact of each on the final product. • http://www.asf.alaska.edu/softwaretools
READ_HDF	GES DISC	<p>This command-line program allows a user to view the contents of an HDF file, as well as subset the data therein. Data can be subset along any dimension, or the entire data can be dumped if no subset options are given. There is also a mode to print a hierarchical tree list of the objects in the file. Data can be sent to an ASCII text file, a set of flat binary files, or displayed on the screen (default).</p> <ul style="list-style-type: none"> • http://daac.gsfc.nasa.gov/tools/index.shtml#read_hdf
hdfscan	LaRC ASDC	<p>A data browser for files in Hierarchical Data Format (HDF), and HDF Earth Observing System (EOS) extension (HDF-EOS) formats. It is specifically written to facilitate access to Terra MISR data products. In particular, many MISR-unique functions are incorporated into the tool, such as data scaling, reformatting, unpacking, fill value recognition, and flag value interpretation. However, because of the standard formats provided by HDF and HDF-EOS, hdfscan can also serve as the general purpose tool for use with any other files making use of these formats.</p> <ul style="list-style-type: none"> • http://eosweb.larc.nasa.gov/PRODOCS/misr/tools/hdfscan.html
MISR ENVI Tool	LaRC ASDC	<p>Imports MISR Level 1B2 Ellipsoid and Terrain stacked block data into ENVI, allows automatic geolocation and correctly interprets band information. The tool consists of a set of routines written in IDL programming language which implement an ENVI User Function for working with MISR L1B2 data. MISR map projection definitions are provided for augmenting the ENVI defined map projections file, and a sample ENVI menu file which adds a menu item to invoke this tool is also included.</p> <ul style="list-style-type: none"> • http://eosweb.larc.nasa.gov/PRODOCS/misr/tools/envi_tool.html

Data Handling Tools (Read/Ingest, Format Conversion, Data Manipulation)

Data Tool/Service	Data Center	Description
MISR Toolkit	LaRC ASDC	<p>A simplified programming toolkit to access MISR Level 1B2, Level 2, and ancillary data products. The collection of routines that can be used as command line tools or in the development of larger software applications. The toolkit also handles the MISR conventional format.</p> <p>Features include:</p> <ul style="list-style-type: none"> • specifying regions to read based on geographic bounding box, geographic location and extent, or the MISR path and block range • mapping between path, orbit, block, time range and geographic location • automatically stitching, unpacking and unscaling MISR data • performing coordinate conversions between lat/lon, SOM x/y, block/line/sample and line/sample of a data plane, which means geo-location can be computed instantly without referring to an ancillary data set lookup • http://eosweb.larc.nasa.gov/PRODOCS/misr/tools/misr_toolkit.html
Tool for Working with MISR Data	LaRC ASDC	<p>Tools are available for Orbit/Date and Latitude/Longitude to Path/Block Conversion, extracting data and metadata and calculating block center times.</p> <ul style="list-style-type: none"> • http://eosweb.larc.nasa.gov/PRODOCS/misr/tools/misr_tools.html
TES Read Software	LaRC ASDC	<p>The TES L1B and L2 read software packages allow users to access the parameters in TES data files.</p> <ul style="list-style-type: none"> • http://eosweb.larc.nasa.gov/PRODOCS/tes/table_tes.html
NGAT MapReady tool	NSIDC DAAC	<p>The NSIDC GLAS Altimetry elevation extractor Tool (NGAT) extracts elevation and geoid data from GLAS altimetry products (GLA06 and GLA12-15) and outputs latitude, longitude, elevation, and geoid in ASCII columns.</p> <ul style="list-style-type: none"> • http://nsidc.org/data/icesat/tools.html

Subsetting and Filtering Tools (Temporal, Spatial, Parameter, Channel)		
Data Tool/Service	Data Center	Description
Coarse Grain Subsetter	GHRC	With the use of special internal coverage files, this tool provides a very quick retrieval of the passes in the user's area of interest. The subsetter can be used on SSM/I, AMSU-A, and TMI data. It is available on the GHRC Data Pool and through User Services for SSM/I data that is not available on the Data Pool. • http://datapool.msfc.nasa.gov
On-Demand Subsetting	GES DISC	On-demand subsetting services are available for many AIRS data products and other datasets provided by the GES DISC via our online search and order interface. The following URL is for the data product online access page. For the products listed under the AIRS, MLS, and OMI links, information is provided on the types of subsetting available for each product. • http://daac.gsfc.nasa.gov/data/dataset
HDF-EOS Subsetter	GHRC	The HDF-EOS Subsetting Engine (HSE), a dataset-independent subsetting service for HDF-EOS data, provides robust, operational subsetting software, available for use within EOSDIS and by the science community. HSE supports both HDF-EOS (based on HDF 4) and HDF-EOS 5 (based on HDF 5) data formats. HSE-based products include the HDF-EOS Subsetting Appliance (HSA) for integration with ECS data order Processing, a simplified stand-alone subsetting tool called "hewbe", and a subsetting web service (in work). • http://subset.org
SPOT	GHRC	A companion program to HSE, SPOT can be used to check HDF-EOS files for subsettability by HSE. SPOT is invoked using a simple command-line interface. It checks that: • The file exists and is readable • The file is in HDF format • The file is in HDF-EOS format • The file contains valid HDF-EOS structures • The file contains the metadata needed for subsetting http://subset.org
SAGE II Binary File Subset Tool	LaRC DAAC	This software subsets SAGE II binary format files. The tool is written in IDL programming language. It can be run either with a licensed version of the IDL package or by using the IDL Virtual Machine freeware at: • http://www.itvis.com/idlvm Subsets may be specified by latitude and longitude regions and/or by parameter. The selected subset is written to an ASCII output file along with header information for profiles that match the subset criteria. • http://eosweb.larc.nasa.gov/PRODOCS/sage2/tools/subset_sage2_tool.html
ICESat/GLAS Subsetter	NSIDC DAAC	Users of ICESat/GLAS data are now able to spatially subset certain GLAS products. The ordering interface allows you to choose GLAS product(s) you are interested in, a time period, and options to enter one or multiple sets of spatial bounding coordinates. • http://nsidc.org/data/icesat/order.html
MODIS ASCII Subsets	ORNL DAAC	Users can select subsets of selected land products from the MODIS (Moderate Resolution Imaging Spectroradiometer) sensor for 280 (Collection 4) or 1052 (Collection 5) field sites. These subsetted products, which are in ASCII format for a 7 x 7 km area centered on the field sites, are useful for tracking seasonal dynamics and for validating remote sensing products. Currently, 18 MODIS Land Products from MODIS sensors onboard the Terra and Aqua platforms are offered, along with a tool for creating graphs of single composite periods or time series of the entire period of record. • http://www.modis.ornl.gov/modis
MODIS Subsetting and Visualization Tool for North America	ORNL DAAC	Web-based tool to obtain MODIS data for North American Carbon Program (NACP) field sites or flux towers (140 sites in collection 4 and 492 sites in collection 5). Subsets are created by choosing coordinates or country, site, product, and subset size. Selected data are displayed for the composite period, as a time plot, and can be downloaded in ASCII. • http://www.modis.ornl.gov/modis/NorthAmerica_Tool/index.cfm

Geolocation, Reprojection, and Mapping Tools		
Data Tool/Service	Data Center	Description
MRT	LP DAAC	The MODIS Reprojection Tool (MRT) enables users to read MODIS Level 2G, Level 3, and Level 4 land products in HDF-EOS format. The software supports spatial subsetting and spectral subsetting, performs geographic transformation to a different coordinate system or cartographic projection, and writes the output to file formats other than HDF-EOS (GeoTIFF, raw, binary). The MRT is supported on several platforms including SGI and Sun UNIX, Windows and Linux. <ul style="list-style-type: none"> • http://LPDAAC.usgs.gov/landdaac/tools/modis
MRTSwath	LP DAAC	The MODIS Reprojection Tool Swath (MRTSwath) provides the capability to transform MODIS Level 1B and Level 2 land products from HDF-EOS swath format to a uniformly gridded image that is geographically referenced. The software supports spatial subsetting and spectral subsetting, performs geographic transformations, and writes the output to file formats other than HDF-EOS (GeoTIFF, raw, binary). The MRTSwath is supported on several platforms including SGI and Sun UNIX, Windows and Linux. <ul style="list-style-type: none"> • http://LPDAAC.usgs.gov/landdaac/tools/mrtswath
Atlas of the Cryosphere	NSIDC DAAC	This National Snow and Ice Data Center web site allows visitors to explore and dynamically map the Earth's frozen regions. Viewed from a polar perspective, the available scenes include snow cover, sea ice extent and concentration, glaciers, permafrost, and other critical components of the Earth's cryosphere. <ul style="list-style-type: none"> • http://nsidc.org/data/atlas
EASE-Grid Geolocation Tools	NSIDC DAAC	EASE-Grid tools include IDL routines and map projections for geolocation and conversion tools to use with EASE-Grid data sets. <ul style="list-style-type: none"> • http://nsidc.org/data/ease/tools.html
MS2GT	NSIDC DAAC	The MODIS Swath-to-Grid Toolbox (MS2GT) is a set of software tools that read HDF-EOS files containing MODIS swath data and produce flat binary files with gridded data in a variety of map projections. MS2GT consists of three Perl programs that make calls to several standalone IDL and C programs. Documentation for some products is in development. <ul style="list-style-type: none"> • http://nsidc.org/data/modis/ms2gt
PMSDT	NSIDC DAAC	These tools make it easy to process data into custom grids with any temporal or spatial resolution. When you download the software, you get AS2GT as part of the larger package that will also allow you to work with some forms of SSM/I and SMMR data. <ul style="list-style-type: none"> • http://nsidc.org/data/tools/pmsdt/as2gt.html
AS2GT	NSIDC DAAC	Use this suite of software tools to subset and grid Level-1B and Level-2A AMSR-E swath data. These tools make it easy to process data into custom grids with any temporal or spatial resolution. AS2GT is not a standalone toolkit, but is part of the NSIDC Passive Microwave Swath Data Tools (PMSDT). <ul style="list-style-type: none"> • http://nsidc.org/data/tools/pmsdt/as2gt.html
WebGIS	ORNL DAAC	Three Web map servers enable users to select sites for accessing net primary productivity, FLUXNET, and MODIS ASCII Subset data at the ORNL DAAC. The map servers help users find site-based data for locations around the world. Users "Query" the map and select a site or group of sites; the server provides links to the data sets associated with that site. Users can view one of fifteen map layers, zoom in on areas of interest, and query multiple sites. <ul style="list-style-type: none"> • http://www.daac.ornl.gov/mapserver.shtml

Data Visualization & Analysis Tools		
Data Tool/Service	Data Center	Description
Giovanni	GES DISC	<p>Giovanni is a Web-based application developed by the GES DISC that 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. Giovanni features currently available include:</p> <ul style="list-style-type: none"> • Plot Types for Single Parameters • Area plots of time-averaged parameters • Time series plots of area-averaged parameters • Meridional averages • Zonal averages • Vertical profiles • Longitude-latitude-pressure-time cross sections • Plot Types for Multi-Parameter Intercomparisons: <ul style="list-style-type: none"> o Area plots of overlain time-averaged parameters o Time series plots of area-averaged parameters o Difference plots o Scatter plots with regression o Temporal correlation maps o Animations o Climatology and anomalies o ASCII output for maps and plots o Web services for downloading subsetted data <p>Giovanni supports an ever growing set of EOS and heritage data collections. Examples of these include aerosol data from MODIS (both Aqua and Terra), MISR, and GOCART models; precipitation data from TRMM, multi-satellite analyses, and ground observations; atmospheric chemistry data from OMI, MLS, TOMS, and HALOE; ocean color data from Aqua MODIS and SeaWiFS; and atmospheric temperature and humidity profiles from AIRS. In addition, Northern Eurasia Earth Science Partnership Initiative (NEESPI) monthly products are available, as well as CloudSat cloud and MODIS Aqua temperature and humidity data along the A-Train track.</p> <ul style="list-style-type: none"> • http://disc.sci.gsfc.nasa.gov/techlab/giovanni
Hurricane Archive	GES DISC	<p>Provides data information, data sets, animations, maps and profiles from past tropical storms and hurricanes</p> <ul style="list-style-type: none"> • http://daac.gsfc.nasa.gov/hurricane/gallery.shtml
Hurricane Portal	GES DISC	<p>Designed for viewing and studying hurricanes by utilizing various measurements by the NASA remote-sensing instruments. The portal consists of four main components: 1) Current Conditions (in preselected regions and updated daily): the latest maps and profiles from NASA satellites, such as, TRMM, AIRS, etc. 2) Event based: the latest maps and profiles for an active tropical storm or hurricane, 3) Science focus: Examples/stories describing the data usage in hurricane monitoring and research and 4) Archives: maps and profiles from past tropical storms and hurricanes.</p> <ul style="list-style-type: none"> • http://disc.gsfc.nasa.gov/hurricane
Hurricane Viewer	GES DISC	<p>Application for animating hurricane path, their varying levels of intensity and atmospheric information occurring at the time of the event. Available as a beta (experimental) version, with additional features and animation options to be added.</p> <ul style="list-style-type: none"> • http://disc.gsfc.nasa.gov/hurricane

Data Visualization & Analysis Tools		
Data Tool/Service	Data Center	Description
Algorithm Development and Mining System (ADaM)	GHRC	The Algorithm Development and Mining (ADaM) system is designed with the goal of mining large scientific data sets for geophysical phenomena detection and feature extraction, and has continued to be expanded and improved for over 10 years. ADaM's mining and image processing toolkits consist of over 100 interoperable components that can be linked together in a variety of ways for application to diverse problem domains. ADaM includes not only traditional data mining capabilities such as pattern recognition, but also image processing and optimization capabilities, and many supporting data preparation algorithms that are useful in the mining process. Each component is provided with a C, C++, or other application programming interface (API), an executable in support of generic scripting tools (e.g. Perl, Python, shell scripts) and SOAP web service interfaces to support distributed architectures including web and grid applications. <ul style="list-style-type: none"> • http://datamining.itsc.uah.edu/adam
NAMMA Real Time Mission Monitor (RTMM)	GHRC	Integrates satellite and radar imagery, model output data, lightning location observations, aircraft navigation data, overlays (e.g., dropsonde analyses), and other data sets into a user-friendly visualization display (Google Earth). A key feature during NAMMA was to provide, for the first time, a local RTMM capability on the DC-8 aircraft itself during the flights. This enabled on-board scientists and air crew personnel to have access to in-flight imagery and data sets that were unavailable during prior campaigns. <ul style="list-style-type: none"> • http://namma.msfc.nasa.gov/flighttracks.html
Image Gallery	LaRC ASDC	The ASDC Imagery Gallery provides access to images and color graphics of AirMISR, CERES, MISR, NVAP, POAM II, and SSM/I data products. <ul style="list-style-type: none"> • http://eosweb.larc.nasa.gov/HPDOCS/imagery.html
MISR Browse Tool	LaRC ASDC	Allows easy access to images from the MISR instrument. The browse images are produced from the ellipsoid product for each camera, reduced to 2.2 km resolution. The MISR red, green, and blue bands are used to create a color image, which has been intentionally clipped and gamma-stretched to make cloud, ocean, and land features visible. The images are JPEG format. <ul style="list-style-type: none"> • http://eosweb.larc.nasa.gov/MISRBR
MISR Level 3 Imagery	LaRC ASDC	Visualization of parameters contained in the MISR Level 3 global data products such as radiances, aerosol optical depth, surface reflectance, and vegetation indices are available. The Level 3 products are averages of select Level 1 and Level 2 parameters over daily, monthly, seasonal and annual time periods. MISR Level 3 data are available for viewing, animating, and downloading from the Web. <ul style="list-style-type: none"> • http://eosweb.larc.nasa.gov/PRODOCS/misr/level3/overview.html
misr_view	LaRC ASDC	A freely available IDL-based display and analysis tool, can be used with many types of MISR and AirMISR data. It was specifically designed for use with files that use the HDF-EOS "grid" interface. <ul style="list-style-type: none"> • http://eosweb.larc.nasa.gov/PRODOCS/misr/tools/misr_view.html
MOPITT Level 2 Viewer	LaRC ASDC	IDL-based tool for creating plots of MOPITT Level 2 data products. <ul style="list-style-type: none"> • http://eosweb.larc.nasa.gov/PRODOCS/mopitt/tools/moppitt_level2_viewer.html
view_hdf	LaRC ASDC	A freely available IDL-based display and analysis tool for accessing data stored in HDF and HDF-EOS format. Variables from either Science Data Sets or vdata structures in a HDF file, can be subset, rendered as two and three-dimensional graphics, and plotted as geolocated data onto various world map projections. Other features include multiple variable plots, difference plots, and simple statistics. <ul style="list-style-type: none"> • http://eosweb.larc.nasa.gov/HPDOCS/view_hdf.html
MODIS LDOPE Tools	LP DAAC	The MODIS Land Data Operational Product Evaluation (LDOPE) software tools were developed to assist in the quality assessment of MODIS land products. These tools are invoked as standalone executables from a command-line interface. The software is supported on Irix, Solaris, Linux, and Windows operating systems. <ul style="list-style-type: none"> • http://LPDAAC.usgs.gov/landdaac/tools/ldope

Data Visualization & Analysis Tools		
Data Tool/Service	Data Center	Description
EOS-IT	NSIDC DAAC	The HDF-EOS Imaging Tool (EOS-IT) interface has two modes. One mode opens, geolocates, and visualizes multiple swath or grid products in separate but dynamically linked windows. Another mode allows users to examine individual bits from data fields. (Users must have IDL 5.6 to run EOS-IT.) <ul style="list-style-type: none"> • http://nsidc.org/data/tools/eosit
IDL Visualizer	NSIDC DAAC	The IDL Visualizer reads data from an ICESat/GLAS file making the file viewable as graphical summaries of variables. <ul style="list-style-type: none"> • http://nsidc.org/data/icesat/tools.html
MODIS Land Product Subsets (Beta Test Version)	ORNL DAAC	Web-based tool to obtain data for global field sites or flux towers which allows you to choose sites by country, continent, network, or land use classification. Selected data can be viewed in Google Map, Google Earth, MODIS-WebGIS, or Tile Mapper. Data are displayed for the composite period at 250-m, 500m, and 1-km resolutions, as a time plot for the entire period is provided, and the data can be downloaded in ASCII. Additional features are in development. <ul style="list-style-type: none"> • http://daac.ornl.gov/MODIS/modis.html
Data Set Browse Image Tool	PO.DAAC	A Web-based calendar interface browse image tool may be used with the following PO.DAAC data sets to select and display browse images in GIF format: <ul style="list-style-type: none"> • SeaWinds on QuikSCAT • SeaWinds on ADEOS-II • NAVOCEANO MCSST L3 http://podaac.jpl.nasa.gov/TOOLS/index.html#BROWSE
NEREIDS	PO.DAAC	The Near-Real-Time Image Distribution Server (NEREIDS) provides sea surface temperature, ocean surface topography, ocean vector winds, and land and sea ice satellite browse images within a few hours of capture. Binary data files are available for some images. Satellite missions include NOAA AVHRR, TOPEX/POSEIDON, Jason, and SeaWinds on QuikSCAT. <ul style="list-style-type: none"> • http://nereids.jpl.nasa.gov
POET	PO.DAAC	Data subsetting and visualization for many PO.DAAC products are available from the PO.DAAC Ocean ESIP Tool (POET) Web-based interface. Output is returned as a latitude-longitude map, animation, time-series graph, or space-time profile. Output formats include: Image (GIF, PNG, JPEG), scientific (HDF, netCDF), GIS (GeoTIFF, ArcGrid), binary (UNIX/Mac or PC), and ASCII. Users can also create and download MPEG movies. POET data also can be accessed by any Web Map Server (WMS) viewer. This feature enables you to combine or overlay POET data with data from any other source that complies with this standard. A sample viewer of POET data is available at http://viewer.digitalearth.gov . POET was developed by the Ocean ESIP (Earth Science Information Partner). <ul style="list-style-type: none"> • http://poet.jpl.nasa.gov
SeaWiFS Data Analysis System (SeaDAS) 5.05	OBPG*	SeaDAS is a comprehensive image analysis package for the processing, display, analysis, and quality control of ocean color data. Supported sensors are MODIS, SeaWiFS, OCTS, and CZCS. Key features include variety of data processing, data visualization, and data projection capabilities and selection of data output formats. <ul style="list-style-type: none"> • http://oceancolor.gsfc.nasa.gov/seadas
SEDAC Map Client	SEDAC	The SEDAC Map Client is an online global spatial data visualization tool. Users can map data that is held by SEDAC. The mapping tool also supports Web Map Context (WMC) specification of the Open Geospatial Consortium (OGC), which means users can store data layers and geographical extent for future use, and load predefined contexts from other clients. <ul style="list-style-type: none"> • http://sedac.ciesin.columbia.edu/wdc

* OBPG=Ocean Biology Processing Group

An Alphabetized List of Tools (showing the various uses for each tool)

Data Tool/Service	Data Center	Search & Order	Data Handling	Subsetting & Filtering	Geolocation, Reprojection, & Mapping Tools	Data Visualization & Analysis Tools
AIRS Online Channel/ Variable Subsetter	GES DISC			X		
Algorithm Development and Mining System (ADaM)	GHRC					X
NOESIS	GHRC	X				
ASDC Data Pool	LaRC ASDC	X		X		
ASDC Order Tool	LaRC ASDC	X		X		
URSA	ASF DAAC	X				
ASF MapReady Tool	ASF DAAC		X		X	
ASF SAR Training Processor	ASF DAAC		X			
Atlas of the Cryosphere	NSIDC DAAC	X			X	X
Atmospheric Composition Data and Information Services Center (ACDISC)	GES DISC	X				
Coarse Grain Subsetter	GHRC		X			
Coincidence Search Engine	GHRC	X				
Data Pool	GHRC	X				
Data Pool	LP DAAC	X		X	X	
Data Pool	NSIDC DAAC	X		X	X	
Data Set Browse Image Tool	PO.DAAC					X
EASE-Grid Geolocation Tools	NSIDC DAAC				X	
ENTRI	SEDAC	X		X		
EOS-IT	NSIDC DAAC		X	X		X
Giovanni	GES DISC					X
GISMO	NSIDC DAAC	X		X	X	
GloVIS	LP DAAC	X				X
HDF-EOS Subsetter	GHRC			X		
hdfscan	LaRC ASDC		X			X
HE5Subset	GES DISC			X		
Hurricane Archive	GES DISC					X
Hurricane Portal	GES DISC					X
Hurricane Viewer	GES DISC					X
HyDRO	GHRC	X				
ICESat/GLAS Subsetter	NSIDC DAAC			X		
IDL Visualizer	NSIDC DAAC		X			X
Image Gallery	LaRC ASDC					X
Map Server	ORNL DAAC	X	X	X	X	
Mercury	ORNL DAAC	X				
Mirador	GES DISC	X				

An Alphabetized List of Tools (showing the various uses for each tool)						
Data Tool/Service	Data Center	Search & Order	Data Handling	Subsetting & Filtering	Geolocation, Reprojection, & Mapping Tools	Data Visualization & Analysis Tools
MISR Browse Tool	LaRC ASDC					X
MISR ENVI Tool	LaRC ASDC		X		X	X
MISR Level 3 Imagery	LaRC ASDC	X				X
mISR_view	LaRC ASDC			X		X
MISR Toolkit	LaRC ASDC		X	X	X	X
MODextract	LP DAAC	X				
MODIS ASCII Subsets Available	ORNL DAAC	X	X	X	X	X
MODIS L1 and Atmospheres Archive and Distribution System (LAADS)	MODAPS	X		X	X	X
MODIS Land Product Subsets, Collection 5 (Beta Test Version)	ORNL DAAC	X	X	X	X	X
MODIS Subsetting and Visualization Tool for North America	ORNL DAAC	X		X	X	
MODIS LDOPE Tools	LP DAAC					X
MOPITT Level 2 Viewer	LaRC ASDC					X
MRT	LP DAAC				X	
MRTSwath	LP DAAC				X	
MS2GT	NSIDC DAAC				X	
Multi-angle Imaging SpectroRadiometer (MISR) Order and Customization Tool	LaRC ASDC	X	X	X	X	
NAMMA Real Time Mission Monitor (RTMM)	GHRC					X
GHRSSST Master Metadata Repository	PO.DAAC	X				
NEREIDS	PO.DAAC					X
NGAT	NSIDC DAAC		X			
NLDN Movie Maker	GHRC					X
NLDN Subsetter	GHRC			X		
POET	PO.DAAC		X	X	X	X
PSQ	NSIDC DAAC	X				
READ_HDF	GES DISC		X	X		
SAGE II Binary File Subset Tool	LaRC ASDC			X		
SeaWiFS Data Analysis System (SeaDAS) 5.05	OBPG*	X	X	X	X	X
SEDAC Map Client	SEDAC				X	X

* OBPG=Ocean Biology Processing Group

An Alphabetized List of Tools (showing the various uses for each tool)						
Data Tool/Service	Data Center	Search & Order	Data Handling	Subsetting & Filtering	Geolocation, Reprojection, & Mapping Tools	Data Visualization & Analysis Tools
SPOT	GHRC			X		
TES Read Software	LaRC ASDC		X			
view_hdf	LaRC ASDC		X	X	X	X
“Which CERES Data Product Do I Want?” Interface	LaRC ASDC	X	X	X	X	X
“Which MISR Data Product Do I Want?” Interface	LaRC ASDC	X	X	X	X	X
WHOM	GES DISC	X		X		

Section 7

NASA Portal

<http://www.nasa.gov>

This Web site provides the opportunity to learn more about NASA as an agency. Explore the many facets of NASA, from our administration and leadership, to our mission and vision for the future, to business, research, and career opportunities.

NASA Science Mission Directorate

<http://science.hq.nasa.gov>

NASA's Science Mission Directorate conducts the scientific exploration of planet Earth, the solar system, and the universe beyond. The Science Mission Directorate (SMD) engages the Nation's science community, sponsors scientific research, and develops and deploys satellites and probes in collaboration with NASA's partners around the world to answer fundamental questions requiring the view from and into space. SMD seeks to understand the origins, evolution, and destiny of the universe and to understand the nature of the strange phenomena that shape it. SMD also seeks to understand:

- the nature of life in the universe and what kinds of life may exist beyond Earth;
- the solar system, both scientifically and in preparation for human exploration; and
- the Sun and Earth, changes in the Earth-Sun system, and the consequences of the Earth-Sun relationship for life on Earth.

The four science divisions within the Directorate are: 1) Earth Science Division, 2) Heliophysics Division, 3) Planetary Science Division and 4) Astrophysics

Through a portfolio of programs and projects the Directorate provides opportunities for research, data analysis, and development of new flight missions.

NASA Applied Sciences Program

<http://science.hq.nasa.gov/earth-sun/applications/index.html>

Earth is changing on all spatial and temporal scales. The purpose of NASA's Earth science program is to develop a scientific understanding of Earth's system and its response to natural or human-induced changes and to improve prediction of climate, weather, and natural hazards.

NASA's partnership efforts in global modeling and data assimilation over the next decade will shorten the distance from observations to answers for important, leading-edge science questions. NASA's Applied Sciences Program (ASP) will continue the Agency's efforts in benchmarking the assimilation of NASA research results into policy and management decision-support tools that are vital for the Nation's environment, economy, safety, and security.

Through selected areas of national priority, the NASA ASP extends the benefits of increased knowledge and capabilities resulting from NASA research and development of Earth science satellite observations, model predictive capabilities, and technology, into partners' decision support systems for enhanced management and policy decisions.

NASA Earth Science Technology Office(ESTO)

<http://esto.nasa.gov>

ESTO is the lead technology office within the NASA Earth Science Division and is responsible for cultivating the technologies that are needed for future Earth science measurements. With a portfolio of over 530 past and current investments and a rate of infusion that is approaching 30%, ESTO continues to build NASA's reputation for leading-edge technology development. ESTO's continued success is driven by three simple factors: a commitment to competitive, peer-reviewed solicitations; a focus on active technology management; and interaction with a diverse research community – principal investigators are drawn from more than 100 organizations in 33 states.

NASA's Earth Observing System Project Science Office

<http://eospsso.nasa.gov>

The Earth Observing System (EOS) is a coordinated series of polar-orbiting and low inclination satellites for long-term global observations of the land surface, biosphere, solid Earth, atmosphere, and oceans. EOS is a major component of the Earth Science Division of NASA's Science Mission Directorate. EOS enables an improved understanding of the Earth as an integrated system. The EOS Project Science Office (EOSPSO) is committed to bringing program information and resources to program scientists and the general public alike.

NASA Earth Observing System Data and Information System(EOSDIS)

NASA's Earth Observing System (EOS) comprises a series of satellites, a science component and a data system which is called The Earth Observing System Data and Information System (EOSDIS). Eleven data centers distribute more than 2,400 Earth system science data products and associated services for interdisciplinary studies. These data centers process, archive, document, and distribute data from NASA's past and current Earth system science research satellites and field programs. Each center serves one or more specific Earth science disciplines and provides its user community with data products, data information, services, and tools unique to its particular science. Presently, EOSDIS supports the daily production of over 3 terabytes (TB) of interdisciplinary Earth system science data. These data are either from EOS missions (e.g. Aqua, Aura, ICESat, Jason, QuikSCAT, SORCE, Terra), pre-EOS missions (e.g., SeaWiFS, TOMS-EP, TOPEX/POSEIDON, TRMM, UARS), other Earth system science data (e.g., Pathfinder data sets), NASA funded field campaigns (e.g., BOREAS, FIFE, SAFARI), and human dimensions derived data (e.g., Gridded Population Data, GRUMP). For more information about the data centers see, *<http://nasadaacs.eos.nasa>*.

The National Space Science Data Center

<http://nssdc.gsfc.nasa.gov/>

The National Space Science Data Center (NSSDC) is NASA's permanent archive for Space Science Mission data. It provides multidiscipline data and information services, including a large digital data archive from past NASA space science missions along with directories, catalogs, and access to widely distributed science data resources. The NSSDC is responsible for the long term archiving and preservation of all space science data. The NSSDC works closely in federation with the other Office of Space Science (OSS) sponsored discipline data centers. This federation is responsible for providing a coherent and coordinated OSS-wide data environment to improve quality, accessibility, and usability of NASA's space data holdings for scientists, educators, and the general public.

NASA Funding Opportunities for Researchers, Applied Sciences and Graduate Students

Funding for Research and Applied Sciences

<http://nspires.nasaprs.com>

Supporting research in science and technology is an important part of NASA's overall mission. NASA solicits this research through the release of various research announcements in a wide range of science and technology disciplines. NASA uses a peer review process to evaluate and select research proposals submitted in response to these research announcements. Researchers can help NASA achieve national research objectives by submitting research proposals and conducting awarded research. This site facilitates the search for NASA research opportunities.

Funding for Graduate Students

NASA's Earth System Science (ESS) Fellowship Program sponsors fellowships for students pursuing Master of Science or Doctoral degrees in Earth System Science and related disciplines. The program's purpose is to ensure continued training of interdisciplinary scientists to support the study of the Earth as a system. NASA places particular emphasis on the applicant's ability and interest in pursuing academic training and research using observations and measurements from NASA's Earth orbiting satellites, and in developing inter or cross-disciplinary research about the Earth system that is not currently emphasized in the research and development portfolio of NASA's Science Mission Directorate. The annual program announcement is released in the fall and posted at <http://inspires.nasaprs.com>.

For additional NASA grants and fellowships see, <http://www.nasa.gov/audience/foreducators/postsecondary/grants/index.html>

NASA Education Program

<http://education.nasa.gov>

NASA's commitment to education places special emphasis on increasing elementary and secondary education participation in NASA programs; enhancing higher education capability in science, technology, engineering and mathematics (STEM) disciplines; increasing participation by underrepresented and underserved communities; expanding e-Education; and expanding NASA's participation with the informal education community. NASA Education supports education at all levels, with linkages to NASA research as a central part of our focus.

NASA's Science Education Program

<http://science.hq.nasa.gov/education>

NASA's Science Education Program creates products using NASA's results in Earth-Sun system science, solar system research, universe exploration, and the development of new technologies to support learning. The program sponsors educational activities at all levels of formal and informal education to provide opportunities for learners to investigate their world and their universe using unique NASA resources.

Image Galleries and Multimedia

NASA Multimedia Gallery

<http://www.nasa.gov/multimedia/highlights>

Provides a selection of images, video, and interactive features.

Science Mission Directorate Multimedia Gallery

<http://science.hq.nasa.gov/multimedia/index.html>

This web site links to all other core NASA Earth science and Space science image galleries. For example, it includes the NASA GSFC Scientific Visualization Studio (SVS) and the Visible Earth.

EOSDIS Data Center Image Galleries

ASF DAAC–SAR Image Gallery

<http://www.asf.alaska.edu/gallery>

This web site enables users to search for SAR images by keyword or by category (Interferometry, Land, Man and Environment, Ocean, and Topographic).

GES DISC -Image Galleries

<http://disc.gsfc.nasa.gov/gallery/index.shtml>

This link takes you to the Goddard Earth Sciences Data & Information Services Center (GES DISC). The page contains links to hurricane imagery (both current and historical) and selected atmospheric and ocean related data imagery.

LP DAAC–ASTER Image Gallery

<http://asterweb.jpl.nasa.gov/gallery.asp>

The Land Processes DAAC performs higher-level processing, archiving, and distribution of ASTER data. This will take you to the Jet Propulsion Laboratory Web site on which this high-resolution land processes oriented imagery resides.

ASDC Image Gallery

<http://eosweb.larc.nasa.gov/HPDOCS/imagery.html>

A collection of Atmospheric Science Data Center product imagery (e.g. CERES, MISR, POAM, SSM/I).

NSIDC DAAC–Image and Photo Gallery

<http://nsidc.org/gallery>

Links to data imagery, satellite imagery, and historic photos, of snow, ice, glaciers, ice shelf and iceberg images and more are included in the NSIDC Image and Photo Gallery. The site also provides links to the NASA Earth Observatory and other sites.

SEDAC –World Data Center Map Gallery

http://sedac.ciesin.columbia.edu/wdc/map_gallery.jsp

A gallery of global maps based on data distributed by SEDAC. The maps cover themes such as climate, conservation, governance, hazards, health, population, poverty and sustainability.



Section 8

Section 8

- AATSR** Advanced Along-Track Scanning Radiometer
- ACCP** Accelerated Canopy Chemistry Program
- ACDISC** Atmospheric Composition Data and Information Services Center
- ACRIM** Active Cavity Radiometer Irradiance Monitor
- ADaM** Algorithm Development and Mining System
- ADEOS** Advanced Earth Observing Satellite
- AirMISR** Airborne Multi-angle Imaging SpectroRadiometer
- AIRS** Atmospheric Infrared Sounder
- AIRSAR** Aircraft SAR (JPL imaging radar system)
- ALT** Altimeter (TOPEX/POSEIDON)
- ALOS** Advanced Land Observing Satellite
- AMSR-E** Advanced Microwave Scanning Radiometer-EOS
- AMSU** Advanced Microwave Sounding Unit
- AMSU-A** Advanced Microwave Sounding Unit A
- API** Application Program Interface
- ASCII** American Standard Code for Information Interchange
- AS2GT** AMSR-E Swath-to-Grid Toolkit
- ASDC** Atmospheric Science Data Center
- ASF** Alaska Satellite Facility
- ASTER** Advanced Spaceborne Thermal Emission and Reflection Radiometer
- AVHRR** Advanced Very High Resolution Radiometer
- AVIRIS** Airborne Visible/Infrared Imaging Spectrometer
- BADC** British Atmospheric Data Centre
- BGC** BioGeochemical Cycles
- BIL** Band Interleaved by Line
- BIOME** Biogeochemical Information Ordering Management Environment
- BOREAS** Boreal Ecosystem-Atmosphere Study
- BRF** Bidirectional Reflectance Factor
- CAD** Computer Aided Design
- CALIOP** Cloud-Aerosol Lidar with Orthogonal Polarization
- CALIPSO** Cloud-Aerosol Lidar and Infrared Pathfinder Satellite Observations
- CAMEX** Convection and Moisture Experiment
- CEOS** Committee on Earth Observation Satellites
- CERES** Clouds and the Earth's Radiant Energy System
- CFC** Chlorofluorocarbons
- CIESIN** Center for International Earth Science Information Network
- CLAES** Cryogenic Limb Array Etalon Spectrometer
- CLPX** Cold Land Processes Experiment
- CLS** Cloud Lidar System
- CMG** Climate Modeling Grid
- CNES** Centre National d'Etudes Spatiales
- CODMAC** Committee on Data Management, Archiving, and Computation
- CSA** Canadian Space Agency
- CZCS** Coastal Zone Color Scanner
- DAAC** Distributed Active Archive Center
- DDC** Data Distribution Centre (of the IPCC)
- deg** Degree
- DEM** Digital Elevation Model
- DHR** Directional Hemispheric Reflectance
- DIF** Directory Interchange Format (GCMD)

DISC Data and Information Services Center

DMSP Defense Meteorological Satellite Program

EASE Equal Area Scalable Earth

ECHO EOS Clearinghouse

ECS EOSDIS Core System

EDG EOS Data Gateway

EDOS EOS Data and Operations System

ENTRI Environmental Treaties and Resource Indicators

ENVI Environment for Visualizing Images

EOS Earth Observing System

EOSDIS EOS Data and Information System

EOS-IT HDF-EOS Imaging Tool

EP Earth Probe

EPI Environmental Performance Index

ERBE Earth Radiation Budget Experiment

EROS Earth Resources Observation Systems

ERS European Remote Sensing Satellite

ESA European Space Agency

ESI Environmental Sustainability Index

ESIP Earth Science Information Partner

FIFE First ISLSCP Field Experiment

FIND Federation Interactive Network for Discovery

FIRE First ISCCP Regional Experiment

FLASHFlux Fast Longwave And SHortwave radiative Fluxes

FLUXNET Global Flux Tower Network

FM1 Flight Model 1 (CERES)

FM2 Flight Model 2 (CERES)

FOV Field Of View

FPAR Fraction of Photosynthetically Active Radiation

FTP file transfer protocol

GAC global area coverage

GBFM Global Boreal Forest Mapping

GCI Global Cloud Imagery

GCMD Global Change Master Directory

GEDEX Greenhouse Effect Detection Experiment

GES GSFC Earth Sciences

GHRC Global Hydrology Resource Center

GHRSSST-PP GODAE High Resolution Sea Surface Temperature Pilot Project

GHz gigahertz

GIF Graphics Interchange Format

Giovanni GES-DISC Interactive Online Visualization and Analysis Infrastructure

GIS Geographic Information System

GISMO Graphical Interface for Subsetting, Mapping, and Ordering

GLAS Geoscience Laser Altimeter System

GloVis Global Visualization Viewer

GODAE Global Ocean Data Assimilation Experiment

GPCP Global Precipitation Climatology Project

GPW Gridded Population of the World

GRACE Gravity Recovery and Climate Experiment

GRFM Global Rain Forest Mapping

GRUMP Global Rural Urban Mapping Project

GSFC Goddard Space Flight Center

GUI Graphical User Interface

HALOE Halogen Occultation Experiment

HANPP Human Appropriation of Net Primary Productivity

HDF Hierarchical Data Format

HDF-EOS HDF for the Earth Observing System

HE5Subset HDF-EOS5Subset

HEG HDF-EOS to GeoTiff

HIRDLS High Resolution Dynamics Limb Sounder

HRDI High Resolution Doppler Imager

HRPT High Resolution Picture Transmission

HSA HDF-EOS Subsetting Appliance

HSB Humidity Sounder for Brazil

HSE HDF-EOS Subsetting Engine

HyDRO Hydrologic Data Search, Retrieval, and Order (tool)

IBIS Integrated Biosphere Simulator

ICESat Ice, Cloud, and Land Elevation Satellite

IDL Interactive Digital Language

IFREMER Institut français de recherche pour l'exploitation de la mer (French Research Institute for Exploitation of the Sea)

IFREMER MED IFREMER Mediterranean

IIR Imaging Infrared Radiometer

IPCC Intergovernmental Panel on Climate Change

IR Infrared

ISAMS Improved Stratospheric and Mesospheric Sounder

ISCCP International Satellite Cloud Climatology Project

ISLSCP International Satellite Land Surface Climatology Project

IWG Investigator Working Group

JAXA Japan Aerospace Exploration Agency

JERS Japanese Earth Remote Sensing

JPEG Joint Photographic Experts Group

JPL Jet Propulsion Laboratory

km Kilometer

KWAJEX Kwajalein Experiment

LAADS Level 1 and Atmospheres Archive and Distribution System

LAC Local Area Coverage

LAI Leaf-Area Index

LaRC Langley Research Center

LBA Large-Scale Biosphere-Atmosphere Experiment in Amazonia

LDOPE Land Data Operational Product Evaluation

LECZ Low Elevation Coastal Zone

LIDAR Light Detection and Ranging

LIS Lightning Imaging Sensor

LP Land Processes

LTSRF Longterm Stewardship and Reanalysis Facility

m Meter

MAS MODIS Airborne Simulator

MCSST Multi-Channel Sea Surface Temperature

MGDR-B Merged Geophysical Data Record-B

MHz Megahertz

MISR Multi-angle Imaging SpectroRadiometer

MLS Microwave Limb Sounder

MMR Master Metadata Repository

MODIS Moderate Resolution Imaging Spectroradiometer

MOPITT Measurements of Pollution In The Troposphere

MPEG Moving Picture Experts Group

MRDC Moderate Resolution Data Center

MRT MODIS Reprojection Tool

MS2GT MODIS Swath-to-Grid Toolbox

NACP North American Carbon Program

NAMMA NASA African Monsoon Multidisciplinary Analyses

NASA National Aeronautics and Space Administration

NAVOCEANO Naval Oceanographic Office

NCSA National Center for Supercomputing Applications

NCDC National Climate Data Center

NEREIDS Near-Real-Time Image Distribution Server

netCDF network Common Data Form

NGAT NSIDC GLAS Altimetry elevation extractor Tool

NIR Near Infrared

NLDN National Lightning Detection Network

nm Nanometer

NOAA National Oceanic and Atmospheric Administration

NODC National Oceanographic Data Center

NPP Net Primary Productivity

NSCAT NASA Scatterometer

NSIDC National Snow and Ice Data Center

NVAP NASA Water Vapor Project

OCTS Ocean Color and Temperature Scanner

OGC Open Geospatial Consortium

OMI Ozone Monitoring Instrument

ORNL Oak Ridge National Laboratory

OSDR Operational Sensor Data Records

OTD Optical Transient Detector

OTTER Oregon Transect Ecosystem Research

PALSAR Phased Array type L-band Synthetic Aperture Radar

PAR Photosynthetically Active Radiation

PB Petabyte

PEM Particle Environment Monitor

PLACE Population, Landscape, and Climate Estimates

PMSDT Passive Microwave Swath Data Tools

PNet Photosynthesis, evapotranspiration, and net primary productivity model

PNG Portable Network Graphics

POAM Polar Ozone and Aerosol Measurement

PO.DAAC Physical Oceanography Distributed Active Archive Center

POES Polar Operational Environmental Satellite

POET PO.DAAC Ocean ESIP Tool

POLDER Polarization and Directionality of Earth's Reflectances

POLSAR Polarimetric SAR (JPL AIRSAR observing mode)

PR Precipitation Radar

PROVE Prototype Validation Exercise

PSQ Polar Spatial Query (tool)

PSR Polarimetric Scanning Radiometer

QuikSCAT Quick Scatterometer

RAMP RADARSAT Antarctic Mapping Project

RivDIS River Discharge

RTMM Real-Time mission Monitor (tool)

SAFARI Southern African Regional Science Initiative

SAGE Stratospheric Aerosol and Gas Experiment (I, II, and III)

SAR Synthetic Aperture Radar

SCF Scientific Computing Facility

SDP Standard Data Product

SDPS Science Data Processing Segment

SeaDAS SeaWiFS Data Analysis System

SeaWiFS Sea-viewing Wide Field-of-view Sensor

SEDAC Socioeconomic Data and Applications Center

SERF Service Entry Resource Format (GCMD)

SGP Southern Great Plains

SIM Spectral Irradiance Monitor

SIPS Science Investigator-led Processing System

SMMR Scanning Multichannel Microwave Radiometer

SNF Superior National Forest

SOAP Simple Object Access Protocol

SOLSTICE Solar Stellar Irradiance Comparison Experiment

SORCE Solar Radiation and Climate Experiment

SOM Space Oblique Mercator

SRB Surface Radiation Budget

SRTM Shuttle Radar Topography Mission

SSE Surface Meteorology and Solar Energy

SSH Sea Surface Height

SSHA Sea Surface Height Anomaly

SSM/I Special Sensor Microwave/ Imager

SST Sea Surface Temperature

SUSIM Solar Ultraviolet Spectral Irradiance Monitor

SWIR Shortwave Infrared

TB Terabyte

TCSP Tropical Cloud Systems and Processes

TEFLUN Texas Florida Underflights

TES Tropospheric Emission Spectrometer

TIFF Tagged Image File Format

TIM Total Irradiance Monitor

TIR thermal infrared

TMI TRMM Microwave Imager

TOA Top Of Atmosphere

TOMS Total Ozone Mapping Spectrometer

TOMS-EP Total Ozone Mapping Spectrometer-Earth Probe

TOPEX TOPography Experiment

TOPSAR Topographic SAR (JPL AIRSAR observing mode)

TRMM Tropical Rainfall Measuring Mission

UAH University of Alabama in Huntsville

UARS Upper Atmosphere Research Satellite

URSA User Remote Sensing Access (tool)

USGS U.S. Geological Survey

UV Ultraviolet

UVA Ultraviolet-A (0.32-0.40 micron band)

UVB Ultraviolet-B (0.29-0.32 micron band)

VEMAP Vegetation/Ecosystem Modeling and Analysis Project

VIL Volume Imaging Lidar

VIRS Visible/Infrared Scanner

VIS Visible

VIS/NIR Visible and Near Infrared

VNIR Visible and Near Infrared

WFC Wide Field Camera

WHOM Web-based Hierarchical Ordering Mechanism

WINDII Wind Imaging Interferometer

WIST Warehouse Inventory Search Tool

WMC Web Map Context

WMS Web Map Server

XPS Extreme Ultraviolet Photometer System

ZA Zonal Average

