

EOSDIS

Earth Observing System Data and Information System

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EOSDIS (Earth Observing System Data and Information System) is a NASA initiative that provides access to a vast array of Earth science data collected by satellites. It supports the collection, processing, archiving, and distribution of Earth observation data to enable research and application in various fields such as climate, weather, natural disasters, and ecosystems.

Worldview, a tool within EOSDIS, allows users to visualize this data interactively, enabling easy exploration of satellite imagery and environmental data in near-real time.

EOSDIS Worldview uses the Global Imagery Browse Services (GIBS) to rapidly retrieve its imagery for an interactive browsing experience. While EOSDIS Worldview uses Open Layers as its mapping library.

This open source code app from NASA's ESDIS provides the capability to interactively browse over 1000 global, full-resolution satellite imagery layers and then download the underlying data. Many of the imagery layers are updated daily and are available within three hours of observation - essentially showing the entire Earth as it looks "right now". This supports time-critical application areas such as wildfire management, air quality measurements, and flood monitoring. Arctic and Antarctic views of many products are also available for a "full globe" perspective.

Geostationary imagery layers are also now available. These are provided in ten minute increments for the last 90 days. These full disk hemispheric views allow for almost real-time viewing of changes occurring around most of the world. Browsing on tablet and smartphone devices is generally supported for mobile access to the imagery.

Interesting layers

- **Land Surface Temperature**

Land Surface Temperature is the temperature of the land surface in Kelvin (K). This measurement differs from air temperature measurements as it provides the temperature of whatever is on the surface of the Earth for example, bare sand in the desert, ice and snow covered area, a leaf covered tree canopy and even the temperature of man-made buildings and roads. Land Surface Temperature is useful for monitoring changes in weather and climate patterns and used in agriculture to allow farmers to evaluate water requirements for wheat, or determine frost damage in orange groves.

- **Carbon Dioxide**

The Carbon Dioxide (L3, Free Troposphere, Monthly) layer displays monthly Carbon Dioxide in the free troposphere. It is created from the AIRX3C2M data product which is the AIRS mid-tropospheric Carbon Dioxide (CO₂) Level 3

Monthly Gridded Retrieval, from the AIRS and AMSU instruments on board of Aqua satellite. It is monthly gridded data at 2.5x2 degreee (lon)x(lat) grid cell size. The data is in mole fraction units (data x 10⁶ =ppm in volume). This quantity is not a total column quantity because the sensitivity function of the AIRS mid-tropospheric CO2 retrieval system peaks over the altitude range 6 10 km. The quantity is what results when the true atmospheric CO2 profile is weighted, level-by-level, by the AIRS sensitivity function.

- **Relative Humidity**

Relative humidity is the ratio of the amount of water vapor in air to the total amount of water vapor the air can hold at specified temperature and pressure. Warm air can hold more water vapor than cold air, so the same amount of water vapor results in higher relative humidity in cool air than in warm air. AIRS relative humidity is derived from AIRS temperature and water vapor and is calculated as the fraction of retrieved humidity mixing ratio and temperature-dependent saturation mixing ratios.

- **Aboveground Biomass**

The Global Ecosystem Dynamics Investigation (GEDI) Level 4B (L4B) dataset provides estimates of aboveground biomass density (AGBD) and associated uncertainty per 1 km x 1 km EASE-Grid 2.0 grid cells globally within -52 and 52 degrees latitude. GEDI L4B uses a hybrid model-based inference, accounting for uncertainty due to GEDI's sampling of the 1km grid area and Level 4A footprint-level biomass modeling. Accurate estimation of AGBD helps assess the carbon sequestration potential of forests and the impacts of land-use changes on atmospheric carbon dioxide concentrations.

- **Canopy Characteristics**

The GEDI L3 Gridded Land Surface Metrics dataset provides Global Ecosystem Dynamics Investigation (GEDI) Level 3 (L3) gridded mean canopy height, standard deviation of canopy height, mean ground elevation, standard deviation of ground elevation, and counts of laser footprints per 1 km x 1 km grid cells globally within -52 and 52 degrees latitude.

L3 gridded products can be used to characterize important carbon and water cycling processes, biodiversity, habitat and can also be of immense value for climate modeling, forest management, snow and glacier monitoring, and the generation of digital elevation models.

- **Vegetation Indices**

Vegetation indices are used for monitoring of vegetation conditions and can be used to identify areas undergoing land cover changes. These data may be used as input for modeling global biogeochemical and hydrologic processes and global and regional climate. These data also may be used for characterizing land surface biophysical properties and processes including primary production and land cover conversion. Vegetation indices also provide information on the health of vegetation and can assist farmers and resource managers monitor the health and development of their crops and fields over the growing season.

- **Flood Hazard**

The Flood Hazard: Frequency and Distribution layer indicates the relative distribution and frequency of flood hazard. Global Flood Hazard Frequency and Distribution is a 2.5 minute grid derived from a global listing of extreme

flood events between 1985 and 2003 (poor or missing data in the early/mid 1990s) compiled by Dartmouth Flood Observatory and georeferenced to the nearest degree. The resultant flood frequency grid was then classified into 10 classes of approximately equal number of grid cells. The greater the grid cell value in the final data set, the higher the relative frequency of flood occurrence.

Population Density

The purpose of the data set is to provide estimates of population count for the years 2000, 2005, 2010, 2015, and 2020, consistent with national censuses and population registers with respect to relative spatial distribution, but adjusted to match United Nations country totals.

- **Soil Moisture**

The Soil Moisture (Normalized Polarization Difference, Day) layer displays gridded estimates of soil moisture in the top 1 cm of soil, averaged over the AMSR-E retrieval footprint, and is measured in grams per centimeter by volume (g/cm) Soil moisture is estimated from AMSR-E/Aqua L2A brightness temperature (Tb) measurements using the Normalized Polarization Difference algorithm (NPD) approach.

- **Earth at Night**

Viewing the Earth at night affords us a different view of the Earth's surface.

<https://nasa-gibs.github.io/gibs-api-docs/>

<https://github.com/nasa-gibs/worldview>

Accessing via Python

<https://nasa-gibs.github.io/gibs-api-docs/python-usage/>