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ILS 655

Digital Library Project Review Paper 02

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NASA – “The Blue Marble”

**Visible Earth:** A catalog of NASA images and animation of our home planet

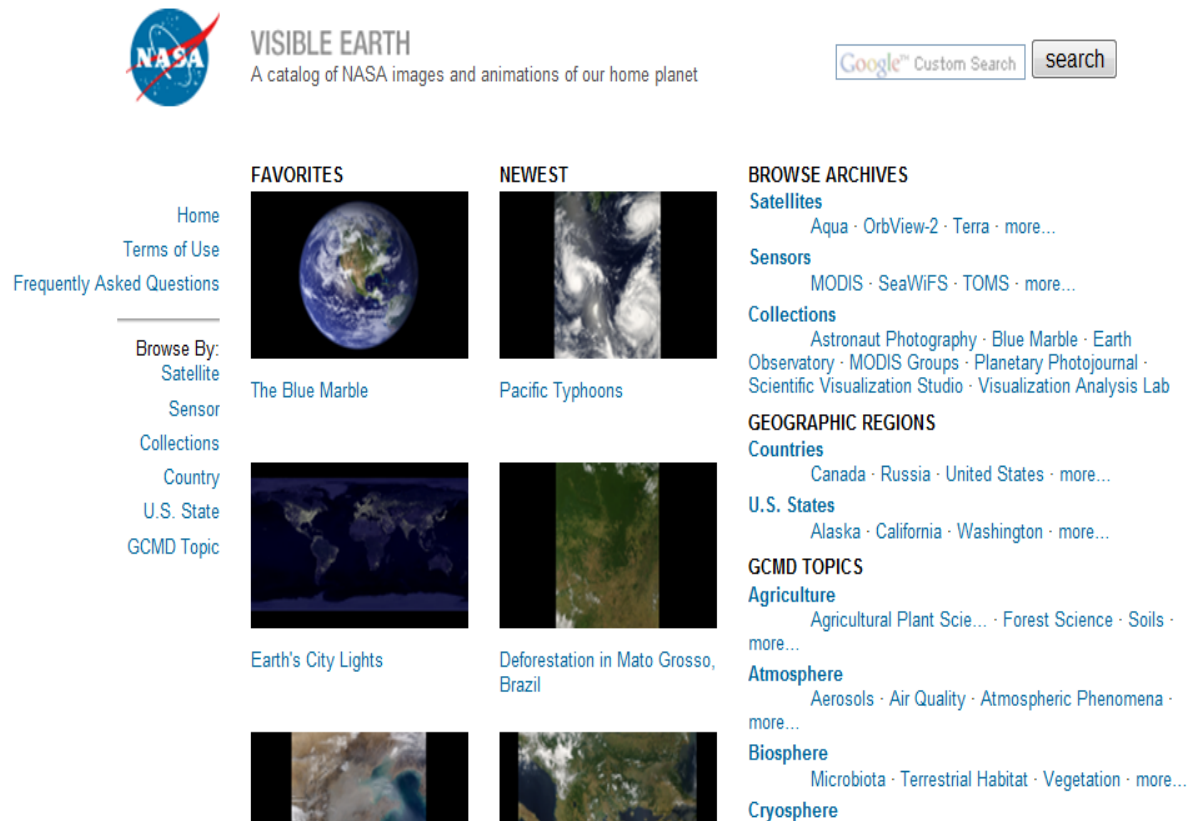
<http://visibleearth.nasa.gov/>

**Project Background:**

Visible Earth is a searchable directory of images, visualizations, and animations of Earth. The site is a collaborative effort of the Earth Observing System (EOS) Project Science Office, the Scientific Visualizations Studio and the Visualization Analysis Laboratory, all of which are located at NASA’s Goddard Space Flight Center. The site was created in response to frequent requests for images. The library contains more than 20,000 records and 102,521 images, most available for public use. The file size of the site is 360.6GB. The site receives more than 100,000 visitors each month. Images are provided at maximum resolutions in standard file types. New images are uploaded daily and featured on the home page. Images are considered in the public domain and are freely available to all.

## Organization of Resources:

The database can be easily searched by keyword. It can also be browsed by satellite, sensor, collection, country, U.S. state, or topic. The topics -- which include subjects such as agriculture, biosphere, and solar physics -- are further organized into sub-topics. The images are also searchable using a full-text search engine powered by Google. Results may be sorted by data date, visualization date, or ID.



The screenshot shows the NASA Visible Earth website. At the top left is the NASA logo. To its right is the text "VISIBLE EARTH" and "A catalog of NASA images and animations of our home planet". On the top right is a "Google Custom Search" box with a "search" button. On the left side, there is a navigation menu with links: "Home", "Terms of Use", "Frequently Asked Questions", "Browse By:", "Satellite", "Sensor", "Collections", "Country", "U.S. State", and "GCMD Topic". The main content area is divided into several sections: "FAVORITES" with a thumbnail of "The Blue Marble"; "NEWEST" with a thumbnail of "Pacific Typhoons"; "Earth's City Lights"; "Deforestation in Mato Grosso, Brazil"; and two more thumbnails at the bottom. On the right side, there are sections for "BROWSE ARCHIVES" (Satellites, Sensors, Collections), "GEOGRAPHIC REGIONS" (Countries, U.S. States), "GCMD TOPICS" (Agriculture, Atmosphere, Biosphere, Cryosphere), and "Biosphere".

Selecting an image will allow the user to download the image or view an animation. Extensive background information is also available for each image. Users have the opportunity to select *Details and More Imagery* to view file information and statistics including HTTP feed and download time. Metadata such as sensor and visualization date can be viewed alongside a

thumbnail of the image. Some of the file formats require special plug-ins, such as QuickTime, which can be downloaded at the site.

#### EARTH'S CITY LIGHTS



#### Images & Animations

[4320 x 2160 GIF \(362.5KB\)](#)  
[30000 x 15000 GIF \(5.9MB\)](#)  
[540 x 270 JPEG \(23.2KB\)](#)  
[2400 x 1200 JPEG \(534.4KB\)](#)  
[2048 x 1024 TIFF \(1.2MB\)](#)  
[Details and More Imagery](#)

#### Metadata

Sensor DMSP/DMSP  
Visualization Date 2000-10-23

Credit Data courtesy Marc Imhoff of NASA GSFC and Christopher Elvidge of NOAA NGDC. Image by Craig Mayhew and Robert Simmon, NASA GSFC.

This image of Earth's city lights was created with data from the Defense Meteorological Satellite Program (DMSP) Operational Linescan System (OLS). Originally designed to view clouds by moonlight, the OLS is also used to map the locations of permanent lights on the Earth's surface.

The brightest areas of the Earth are the most urbanized, but not necessarily the most populated. (Compare western Europe with China and India.) Cities tend to grow along coastlines and transportation networks. Even without the underlying map, the outlines of many continents would still be visible. The United States interstate highway system appears as a lattice connecting the brighter dots of city centers. In Russia, the Trans-Siberian railroad is a thin line stretching from Moscow through the center of Asia to Vladivostok. The Nile River, from the Aswan Dam to the Mediterranean Sea, is another bright thread through an otherwise dark region.

Even more than 100 years after the invention of the electric light, some regions remain thinly populated and unlit. Antarctica is entirely dark. The interior jungles of Africa and South America are mostly dark, but lights are beginning to appear there. Deserts in Africa, Arabia, Australia, Mongolia, and the United States are poorly lit as well (except along the coast), along with the boreal forests of Canada and Russia, and the great mountains of the Himalaya.

The Earth Observatory article [Bright Lights, Big City](#) describes how NASA scientists use city light data to map urbanization.

### Service Features:

In addition to viewing images categorized as *Favorites* and *Newest*, users may also browse archives, geographic regions, and GCMD topics. The archives are divided into three categories: satellites, sensors, and collections. Geographic regions may be searched by country or U.S. States. The most extensive section of the digital library is located under GCMD Topics. The thirteen subcategories include agriculture, atmosphere, biosphere, cryosphere, human dimensions, hydrosphere, land surface, oceans, paleoclimate, radiance or imagery, solar physics, solid earth, and sun earth interactions.

## **Technologies:**

Prior to the relaunch of the site in 2005, all files were kept on a single server. All imagery on the site was available for immediate HTTP download. This generated maintenance problems as users downloading larger imagery (~400M) would be connected to the server for long periods of time. Often times, they would be forced to abort their downloads due to disconnections. Due to the massive size of the collection, users are now redirected to another server when downloading images. According to the site, "both servers can be optimized for handling their tasks, providing a better end user experience."

The site utilizes a distributed peer-to-peer filesharing protocol known as BitTorrent. It allows many people to download an object without straining the hosting server. Like HTTP and FTP, BitTorrent is a protocol that allows for the distribution of large files. BitTorrent files, called torrents, are downloaded and then opened by the BitTorrent program. The program will connect to the peer network and find places to start fetching the file from. BitTorrent will only provide files to other users that you tell it to allow.

**Analysis:** Educators, students, and those interested in earth science will find this site interesting. The database has thousands of records and provides access to NASA's Earth science-related images, animations, and data visualizations. Users can choose the size of image appropriate for their connections speed. According to the home page, the database was last updated February 25, 2008 whereas the CSS was last updated June 2006. This makes me wonder if NASA is still updating the collection on a routine basis. Perhaps the recent development of Google earth has somehow impacted their own development. A simple search box powered by Google is available on the home page; however, users do not have the opportunity to complete an advanced

search of the collection. Considering the extensive amount of images and animations available, this might make for a frustrating user experience. While perusing through parts of the collection, I was surprised to find some categories did not contain images. For example, selecting *Solar Activity* reveals several empty file folders. Perhaps these folders were created with the intent of images being added to them. Overall, Visible Earth contains an incredible library of images and animations that teachers, students, and the general public would find fascinating.

## References

Education World – Site Reviews: Visible Earth. Retrieved February 18, 2011 from <http://www.educationworld.com/awards/2004/r0904-08.shtml>.

NASA – Visible Earth. Retrieved February 18, 2011 from [http://www.nasa.gov/audience/foreducators/k-4/features/F\\_Visible\\_Earth.html](http://www.nasa.gov/audience/foreducators/k-4/features/F_Visible_Earth.html).

Visible Earth. Retrieved February 17, 2011 from <http://visibleearth.nasa.gov/>.