



THE BLACK MARBLE

EARTH AT NIGHT - THE BLACK MARBLE

<http://earthobservatory.nasa.gov/NightLights>

In daylight our big blue marble is all land, oceans and clouds. But the night – is electric.

These views of Earth's city lights show brightly shining cities, connected by illuminated webs of roads. In this cloud-free view from space, the spread of human activity comes alive with light.

Looking at the Earth at night dramatically shows the spread of humans on our planet.

This new image of the Earth at night is a composite of data acquired over nine days in April and thirteen days in October 2012 by the Suomi National Polar-orbiting Partnership Satellite – Suomi NPP. It took 312 satellite orbits and 2.5 terabytes of data to get a clear shot of every parcel of land surface.

A joint program by NASA and NOAA, Suomi NPP views the Earth at night with a newly designed instrument, the Visible Infrared Imaging Radiometer Suite – VIIRS. The nighttime images were captured by the VIIRS 'day-night' band, which detects light in a range of wavelengths from green to near infrared and uses filtering techniques to observe signals such as city lights, gas flares, wildfires, auroras and reflected moonlight.

These images are much clearer than previously available satellite views because the VIIRS is an order of magnitude more light-sensitive than the Operational Linescan System (OLS) that is currently flying aboard the satellite of the Defense Meteorological Satellite Program (DMSP).

Visible in these views are not only the lights from cities, town, roads and villages around the world, but also vast areas of wildfires in places like Australia and the light from gas flaring that occurs as a result of oil and gas extraction, visible most clearly in the Middle East. VIIRS is so sensitive it's even able to view individual fishing boats in the massive fleets off the coasts of places like China and Japan.

How VIIRS Views

Unlike a camera that captures a picture in one exposure, the day-night band on VIIRS produces an image by repeatedly scanning an area and resolving it as millions of individual picture elements, or pixels.

The day-night band goes further, however, to ensure that each pixel collects the right amount of light. If a pixel is very bright, a low-gain mode prevents the pixel from oversaturating. If the pixel is very dark, the signal will be strongly amplified.

It is similar to having three, simultaneous low-light cameras operating at once. As the images are collected, Suomi NPP analyzes all three and chooses which of three collects the best quality image. That allows VIIRS to capture images on nights with or without moonlight, and still achieve a crisp view of Earth's atmosphere, land and ocean surfaces at night.

NASA's Earth Observatory created these images by combining the VIIRS day-night data - processed by NOAA's National Geophysical Data Center - with a version of the Earth Observatory's Blue Marble: Next Generation which was created using data from the Moderate Resolution Imaging Spectroradiometer (MODIS) instrument that flies on NASA's Terra and Aqua satellites.

The VIIRS global image is processed to identify and remove pixels containing clouds, aurora, airglow, lightning and other transient sources of light that would obscure the lights of human activity.

Suomi NPP observes Earth's surface twice every day, once in daylight and once at night. The spacecraft flies 512 miles (824 kilometers) above the surface in a polar orbit, circling the planet about 14 times a day. Suomi NPP sends its data once an orbit to the ground station in Svalbard, Norway, and continuously to local direct broadcast users.

Named for satellite meteorology pioneer Verner Suomi, the Suomi NPP mission is co-managed by NASA and NOAA, with NOAA providing operational support and NOAA's Joint Polar Satellite System (JPSS) managing the satellite's ground system.

What can be seen in the Earth at Night image?

One of the brightest areas of the globe is the northeast coast of the United States. In this view, city lights stretch across the nation, strung together by highways that appear as thin, bright threads.

Lights along the Nile River snake south from the Aswan Dam to the Mediterranean Sea, ending in a fan shape at the river's delta.

One of the darkest areas of the globe is central Africa which is almost entirely dark but where lights are beginning to appear.

Geographic boundaries become apparent, for example, the Himalayan Mountain range to the north of India. Political boundaries also emerge, like that of between North and South Korea. Also visible are the vast areas of Australia that burned with wildfires in 2012.

Image Credits

Earth at Night – NOAA/NASA's Earth Observatory

VIIRS data processed by NOAA's National Geophysical Data Center

Media Contacts

Aries Keck, NASA
Aries.Keck@nasa.gov - cell: 301-814-8858

Mike Carlowicz, NASA's Earth Observatory
Michael.J.Carlowicz@nasa.gov - cell: 508-566-2620

John Leslie, NOAA Public Affairs
John.Leslie@noaa.gov - 301-713-0214

Rani Gran, NASA
Rani.C.Gran@nasa.gov - cell: 301-332-6975

NOAA National Geophysical Data Center
www.ngdc.noaa.gov

NASA Earth Science
www.nasa.gov/Earth