Myanmar by Night 28 Years at a glance

"On the earth, even in the darkest night, the light never wholly abandons his rule. It is diffused and subtle, but little as may remain, the retina of the eye is sensible of it"

Jules Verne

Video comments

Nocturnal aerial view 1992 – 2020

Night-Time Satellite images



What is possible to study with nighttime remote sensing?

With moonlight:

- The reflectance of snow cover, smoke, airborne dust, sea ice, and land surface features are visible
- Imaging cloud cover to support short-term weather prediction is the primary purpose of nighttime sensors.



Without moonlight:

- Artificial lights like street and building lighting
- S Fishing boats
- 🕄 Gas flares
- 🕄 Fires
- 🕄 Aurora
- Bioluminescence
- Nightglow from the atmosphere



Introduction to NASA's "Black Marble" Night Lights Data - Miller et. al, 2013

Principles of Nighttime Remote Sensing

Unlike in daytime remote sensing:

- There are multiple light sources.
- Observations include moonlight, light directly emitted by a source (e.g., buildings and transport), and light scattered by the ground.
- Snow (both under moon-illuminated and moon-free conditions) can also increase the signal during winter months.
- Land features (such as buildings and trees) can also block the light source during different time periods.





- C Light sources have different angular emission and reflection profiles.
- O Different satellite viewing angles may change light sources captured.
- Angular differences are more prominent in city centers (downtown areas) with tall buildings.



Introduction to NASA's "Black Marble" Night Lights Data

Nighttime Sensors

International Space Station (ISS) Images

- Provides imagery information in 3 visible spectral bands (R,G,B).
- Astronaut photographs of the Earth at night.



Rome at Night -Acquired on April 8, 2015, with a Nikon D4 digital camera

- Images are not scientific data.
- Lack of georeferencing makes it difficult to locate a specific city among millions of images.
- No consistency across space or time.



Italy at Night - Acquired on October 21, 2014 with a Nikon D4 digital camera

Introduction to NASA's "Black Marble" Night Lights Data – Images by provided by the ISS Crew Earth Observations Facility and the Earth Science and Remote Sensing Unit, Johnson Space Center. (nasa.gov/mission_pages/station/images)



Defense Meteorological Satellite Program -Operational Linescan System - *DMSP – OLS*

- Longest running system of global nighttime light detection from satellites
- The digital data stream for the collection began in 1992 and continues to this day

2020

Visible Infrared Imaging Radiometer Suite Day/Night Band

- VIIRS – DNB

2012

Operational since 2012

One of the 5 instruments onboard the Suomi National Polar-orbiting Partnership (Suomi-NPP) and Joint Polar Satellite System (JPSS) satellite platform

Soint partnership between NASA and NOAA

Images



Images







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Credits

Satellite Images:

• Years 1992 – 2012

DMSP - OLS (Defense Meteorological Satellite Program - Operational Linescan System) https://eogdata.mines.edu/products/dmsp/#v4_dmsp_download

• Years 2013 – 2020

VIIRS – DNB – Annual VNL V2 (Visible and Infrared Imaging Suite - Day Night Band) https://eogdata.mines.edu/products/vnl/#annual_v2

Additional information:

ARSET - Introduction to NASA's "Black Marble" Night Lights Data
<u>https://appliedsciences.nasa.gov/join-mission/training/english/arset-introduction-nasas-black-marble-night-lights-data</u>

Stretch values for color ramp for NTL (RGB):

- Blue: 0,0,26
- Yellow 1: 237,197,138
- Yellow 2: 238, 239, 238

Display resampling: Cubic Convolution

The images are shown without any type of processing keeping their original integrity

Layers:

- Country Division: ESRI
- Water Surface: srtm_n_water_e.sdc ESRI srtm_void_filled\water
- Elevation: world.sid ESRI WORLD INFO\WORLD\world_elevation

Mapping:

- Software: Arcmap
- Scale: 1:10'000.000
- Center: 96.4335, 18.6983

Music:

 Ross Bugden – Olympus <u>https://www.youtube.com/c/RossBugden</u> Copyright Free CC BY 4.0 <u>https://creativecommons.org/licenses/by/4.0/</u>

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http://themimu.info/

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Myanmar

Supported by:

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