**Black Marble High Definition (BMHD) Nighttime Lights**

To monitor nighttime patterns at finer scales, higher-level (Level 4) Black Marble High-Definition (BMHD) nighttime lights. Input layers include the NASA Black Marble standard product (VNP46A2), Landsat-derived normalized index products (NDVI and NDWI), and OpenStreetMap (OSM) derived road layers. The output is a synthetic nighttime lights image that maintains the Landsat spatial resolution. The increased level of detail provided by the BMHD allows users to visualize and differentiate different types of human activity patterns (e.g., residential, commercial, industrial sectors) at the characteristic scale of urban processes (≤ 30m). In this sense, the product can be used to monitor seasonal and long-term changes in cities while also enabling visual assessment of specific sectors impacted by abrupt changes, e.g., those caused by disturbances in power delivery. A full summary of methods and demonstration studies concerning the Black Marble HD can be found in [Román et al., (2019)](https://doi.org/10.1371/journal.pone.0218883).

**Black Marble High-Definition (BMHD) input ancillary data**

3 channels corresponding to moderate resolution base layers ancillary data to produce BMHD product. Datasets are scaled at 30m spatial resolution.

* File name prefix: “<cityname>\_BMHD\_Ancillary.tif”
* Number of Images: 8
* Scaled resolution: 30 x 30m
* Band 1: NDVI Layer
* Band 2: NDWI Layer
* Band 3: Road Layer

**Black Marble High-Definition (BMHD) output dataset**

1 channel corresponding to the scaled 0-255 intensity value at 30m spatial resolution.

* File name prefix: “<cityname><month><year>\_BMHD\_Scale.tif”
* Number of images: 15 images for each city (total 8 cities)
* Scaled resolution: 30 x 30m
* Data processing reference source: [Link](https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0218883)

**Black Marble Nighttime Lights Standard Product Suite for Suomi-NPP**

NASA’s Black Marble represents a suite of two Nighttime Lights (NTL) products (VNP46A1 and VNP46A2) that offer vast improvements in sensor resolution and calibration over the previous era of Defense Meteorological Satellite Program/Operational Linescan System’s nighttime lights image products. Derived from the SNPP-VIIRS instrument’s Day-Night Band (DNB) sensor, the Top-of-Atmosphere (TOA-VNP46A1) and Lunar BRDF-Adjusted Nigttime Lights products (LBAN-VNP46A2) enable us to better monitor both the magnitude and signature of nighttime phenomena and anthropogenic sources of light emissions. The VNP46A1 product offers daily, top-of-atmosphere, at-sensor nighttime radiance, and the AVNP46A2 product provides data corrected for lunar bi-directional reflectance distribution function, atmospheric, thermal, terrain, and straylight effects. A full description of the products can be found in Román et al., (2018), and through: <https://blackmarble.gsfc.nasa.gov/>.

**Black Marble VNP46A1 and VNP46A2 dataset**

* VNP46A1 Data Info/Access: [Link](https://ladsweb.modaps.eosdis.nasa.gov/missions-and-measurements/products/VNP46A1/)
* VNP46A2 Data Info/Access: [Link](https://ladsweb.modaps.eosdis.nasa.gov/missions-and-measurements/products/VNP46A2/)
* Spatial resolution: 500 m
* User guide: [Link](https://ladsweb.modaps.eosdis.nasa.gov/missions-and-measurements/viirs/VIIRS_Black_Marble_UG_v1.1_July_2020.pdf)
* Data format: HDF5
* Helpful data conversion tool: [Link](https://blackmarble.gsfc.nasa.gov/Tools.html)
* ARSET Training webinar (How to access and process the data using QGIS/Python): [Link](https://appliedsciences.nasa.gov/join-mission/training/english/arset-introduction-nasas-black-marble-night-lights-data)

References:

Román, M.O. et al. (2019) [Satellite-based assessment of electricity restoration efforts in Puerto Rico after Hurricane Maria](http://dx.doi.org/10.1016/j.rse.2018.03.017). PLoS One, 14 (6).

Román, M.O. et al. (2018) [NASA’s Black Marble nighttime lights product suite](http://dx.doi.org/10.1016/j.rse.2018.03.017). Remote Sensing of Environment. 210, 113–143.