# Open Nighttime Lights

**A2 Inc group**

**General concept of Nighttime linghts**

**DMSP is a series of polar-orbiting satellites of the US Air Force. Its airborne sensors were originally designed to observe weather-related indicators in the visible and infrared wavelength ranges during the day and night.**

**In 1973, Croft [Cro73] first reported the use of the DMSP Operating Line Scan System (DMSP-OLS) visible light and near-infrared (VNIR) bands to collect information capable of capturing various low-light emission sources from the earth.**

**Day/Night Band (DNB): The follow-up sensor of DMSP-OLS is a new low-light imaging sensor that is part of the Visible Infrared Imaging Radiometer Suite (VIIRS).**

**The requirements of the traditional satellites of two American agencies, the National Oceanic and Atmospheric Administration (NOAA) and the National Aeronautics and Space Administration (NASA), are combined into a single unit called the Joint Polar Satellite System (JPSS).** The first official JPSS satellite (JPSS-1) was launched in late 2017 and was renamed NOAA-20 after reaching orbit.

**According to the time of the overpass, DMSP satellites can be classified as "day/night" or "dawn/dusk" satellites. The day/night satellite's orbital side images the day side of the earth, and the other side images the night side.**

**In 1992, when the digital archive began to be created, two DMSP satellites collected data, named F10 and F11. F10 is in day/night orbit and F11 is in dawn/dusk. Since then, 8 satellites have been launched, F12-F19, of which F12, F14, F15, F16 and F18 were launched in day/night orbits.**

**DMSP-OLS is an oscillating scanning radiometer with 2 spectral bands, a visible near infrared (VNIR) band with low-light imaging capability and a long-wave thermal infrared (TIR) band.**

**The OLS VNIR band is usually just referred to as the "VIS" band in DMSP documents, so let's continue to use that convention here.**

**Follow-up sensor to DMSP-OLS, namely VIIRS-DNB.**

**When imaging the Earth at night, the OLS VIS band is sensitive to the larger instantaneous field of view (IFOV) during the day. The IFOV of OLS VIS at night is approximately 4.9 kilometers, but OLS still performs the same sampling scheme as during the day, generating pixels that are 2.7 kilometers apart. Therefore, during the night collection period, OLS VIS only achieved a spatial resolution of about 4.9 kilometers, but has a ground sampling distance (GSD) of 2.7 kilometers.**

**Open Data**

**Cloud Optimized GeoTIFF format (COG)& TIFF or TIF**

**The Tagged Image File Format (TIFF or TIF) is a file format used to store raster files. GeoTIFF is a TIFF file that follows specific standards used to construct metadata, such as geographic reference information for images (such as map coordinates). Most remote sensing data will be stored as GeoTIFF files.**

**The metadata stored in TIFF is called tif tags. GeoTIFF usually contains the following tags:Spatial range，，Coordinate reference system，Resolution，Number of layers。**

**This tutorial on Earthdatascience.org provides a good overview of GeoTIFF and libraries such as Python rasterio that can be used to access and manipulate this file.**

**Rasterio is a Python library for reading and writing GeoTIFF files.**

**GeoTIFF**

**Cloud-optimized GeoTIFFS (COG) is GeoTIFF, and its data structured way allows you to query these files through web services.**

**SpatialTemporal Asset Catalog (STAC) standard**

**The data is published in the cloud-optimized GeoTIFF format (COG) and organized using the Spatio-temporal Asset Catalog (STAC) standard.**

**All content are from the World Bank – Lighttime Every Lights.**