

Radiance Calibrated Night Lights Products that Reveal Unsaturated Urban Cores and Gas Flares

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One of the most obvious characteristics of the human-built environment is lighting at night. It is so prominent that cities can be confidently mapped by the light they emit to space at night (see Figure 1). The Defense Meteorological Satellite Program, run by the United States Air Force, has been monitoring the Earth at night and producing digital data for almost two decades. These data are archived at the National Oceanic & Atmospheric Administration/National Geophysical Data Center. The useful data record stretches back to 1992 and is ongoing. One limitation of the data is that it typically saturates over urban cores and other bright sources such as gas flares. There is a relatively small collection of data where the gain of the instrument is significantly reduced which allows resolution of bright sources. The goal is to blend the limited low-gain data with the operational data to optimize the value in each product (see Figure 2).

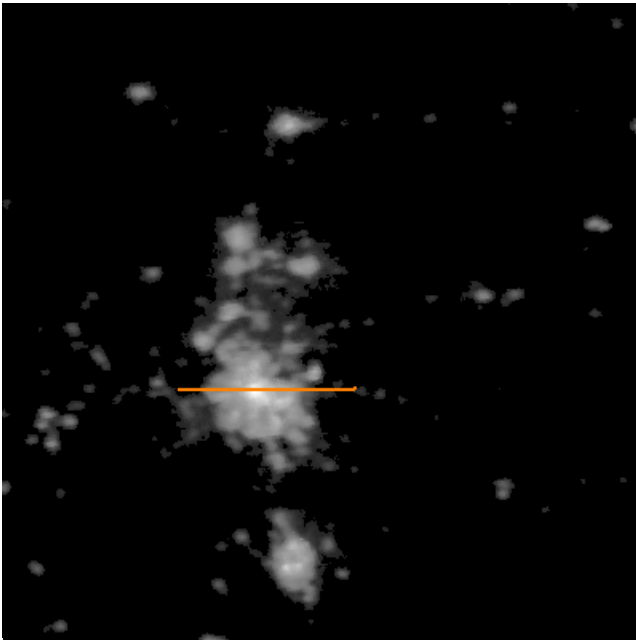


Figure 1. The Front Range of Colorado. Denver is in the center with Colorado Springs to the south and Fort Collins to the north. The orange line indicates a transect through the center of Denver.

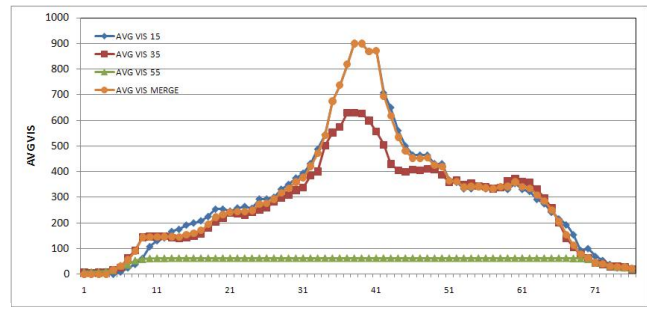


Figure 2. The Transect Data. The transect Digital Numbers are presented for each fixed gain setting. The green line (Gain = 55) is saturated at its maximum value for the entire urban portion of the transect. The red (Gain = 35) is less sensitive than the Gain 55 data by a factor of 10. It saturates in the urban core. The blue line is lower in gain by another factor of 10 (Gain = 15). That channel is able to resolve the lights from the brightest pixels in Denver. The Orange line is the merged product when a synthesis of these fixed gain products are combined.