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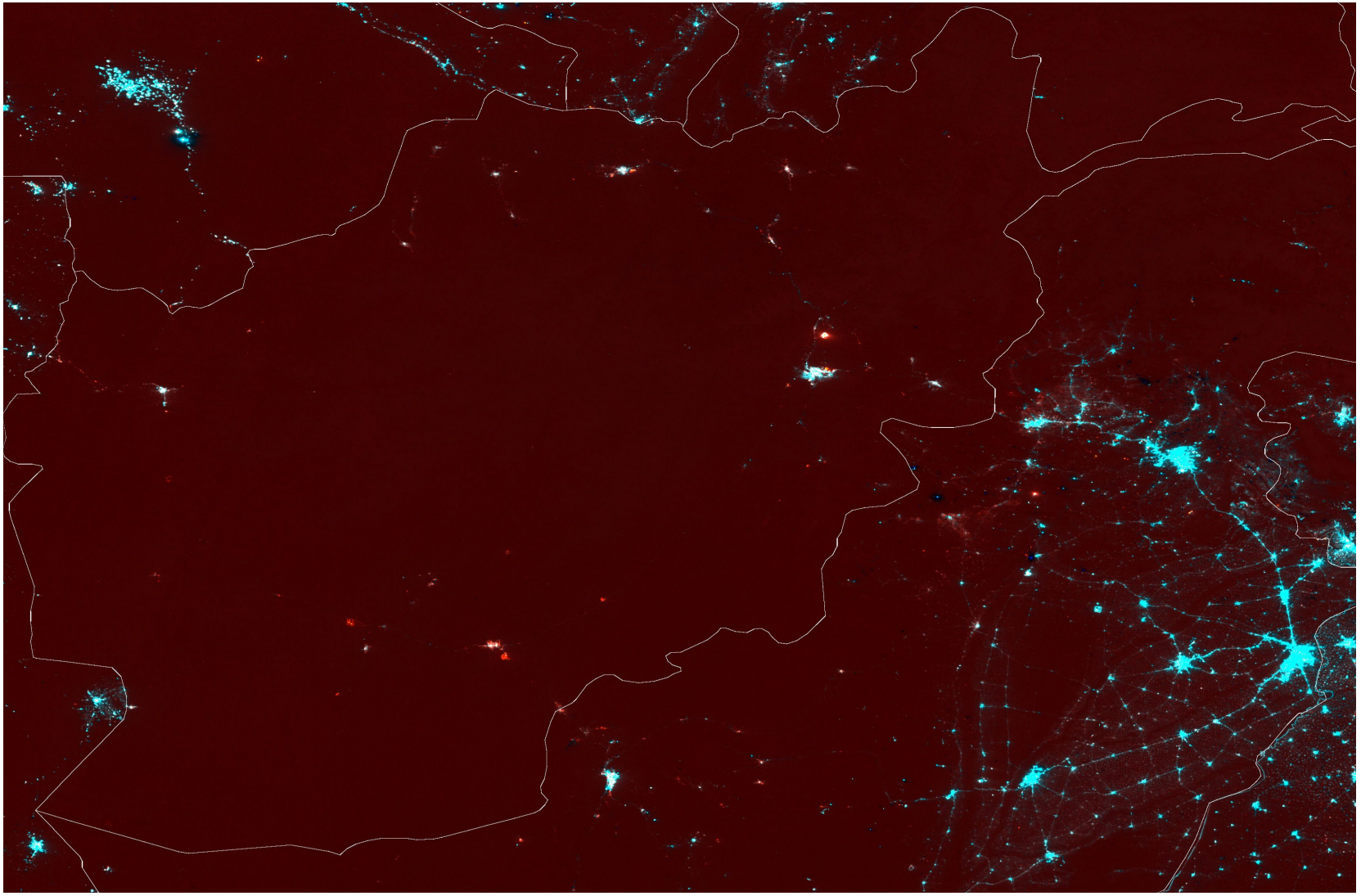
PAYNE COMMENTARY SERIES: **RESEARCH**

The Dimming of Lights in Afghanistan 2022 versus 2021

By Christopher D. Elvidge, Tilottama Ghosh, and Mikhail Zhizhin
Earth Observation Group
Payne Institute for Public Policy at Colorado School of Mines
June 17, 2022

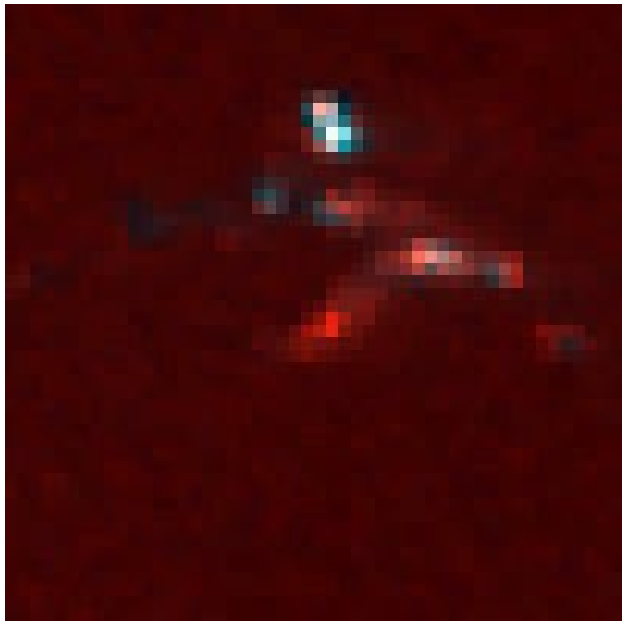


Areas where lighting has dimmed in 2022 have been identified using VIIRS day/night band (DNB) cloud-free average radiances

Blue = 202201 through 202205, Green = 202101 through 202105, Red = 2021 minus 2022

Dre Sarkalay and Shahrak, Ghor Province

34.5729 n, 69.7187 e



Blue = 202201 through 202205
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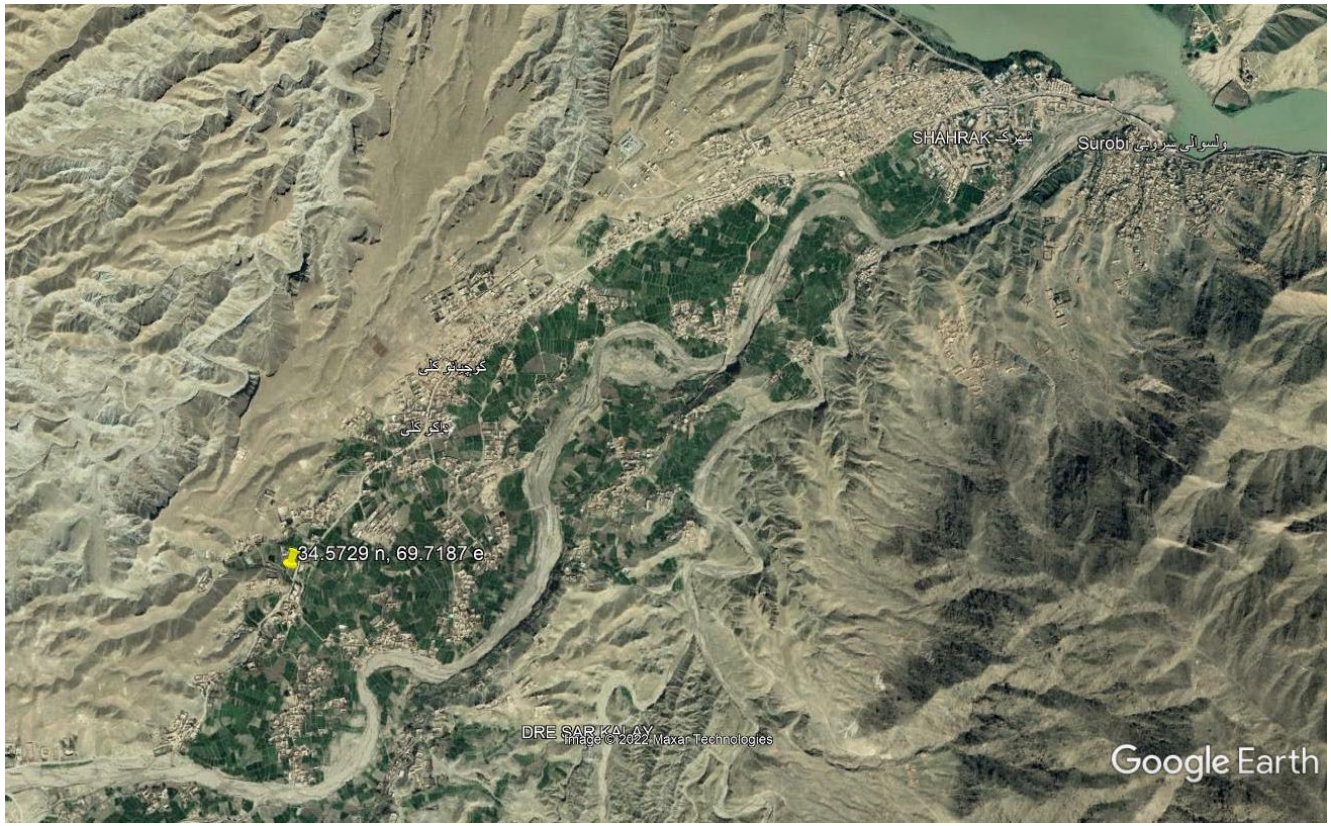
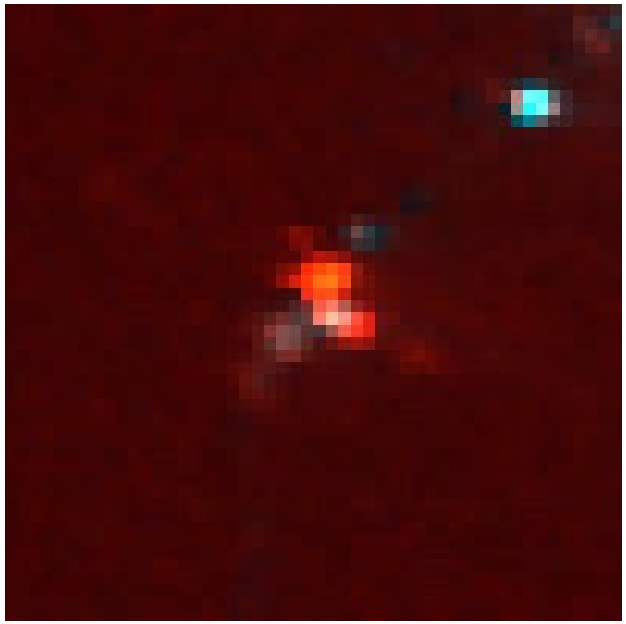


Sahqadam, Maidan Shahr Province

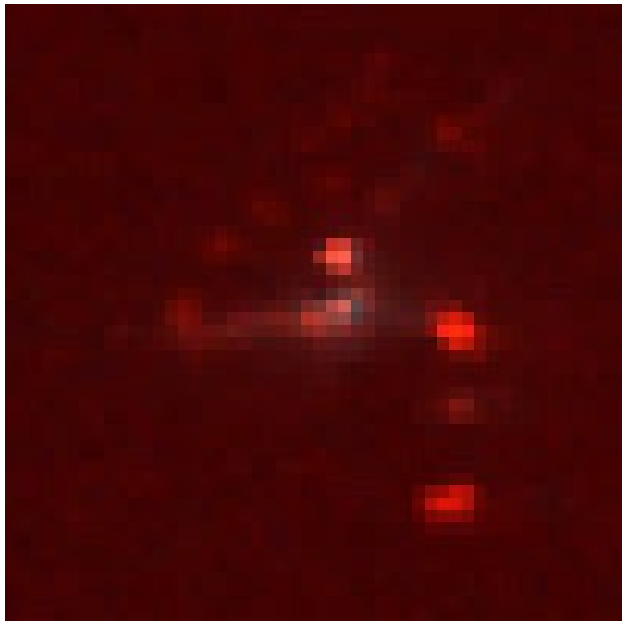
34.4146 n, 68.8771 e



Blue = 202201 through 202205
Green = 202101 through 202105
Red = 2021 minus 2022

Farah, Farah Province

32.3729 n, 62.1104 e



Blue = 202201 through 202205
Green = 202101 through 202105
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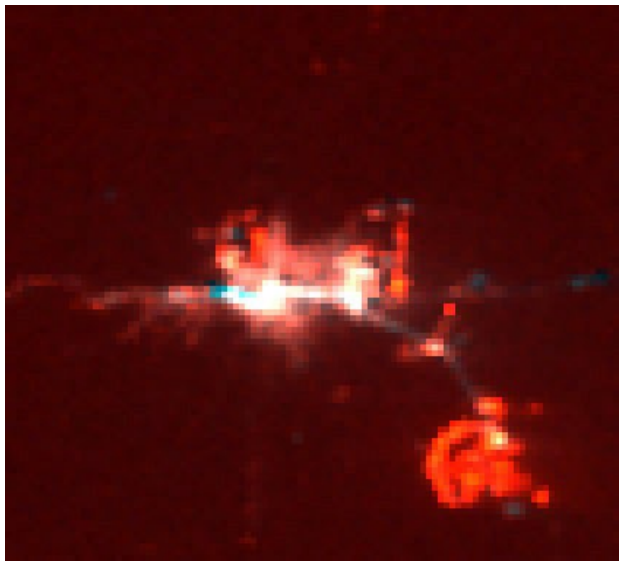
Kandahar, Kandahar Province

31.6396 n, 65.7271 e



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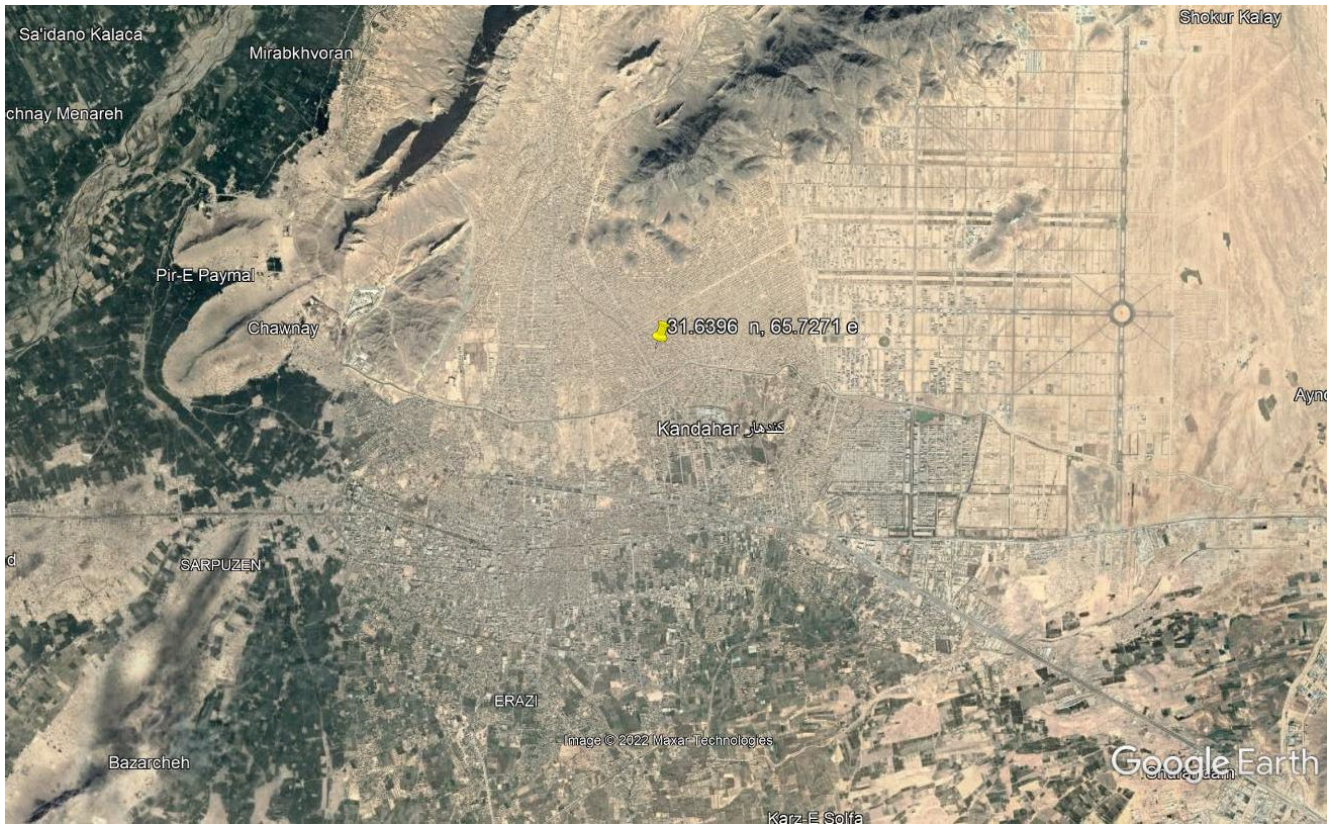
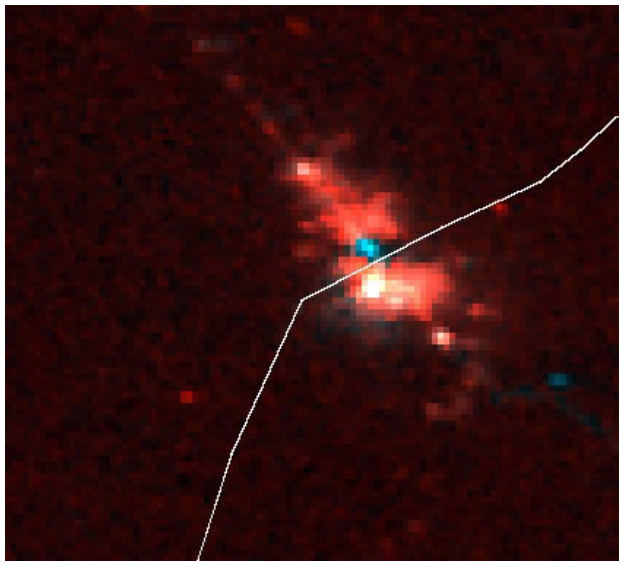


Spin Buldak, Kandahar Province

30.9771 n, 66.4271 e



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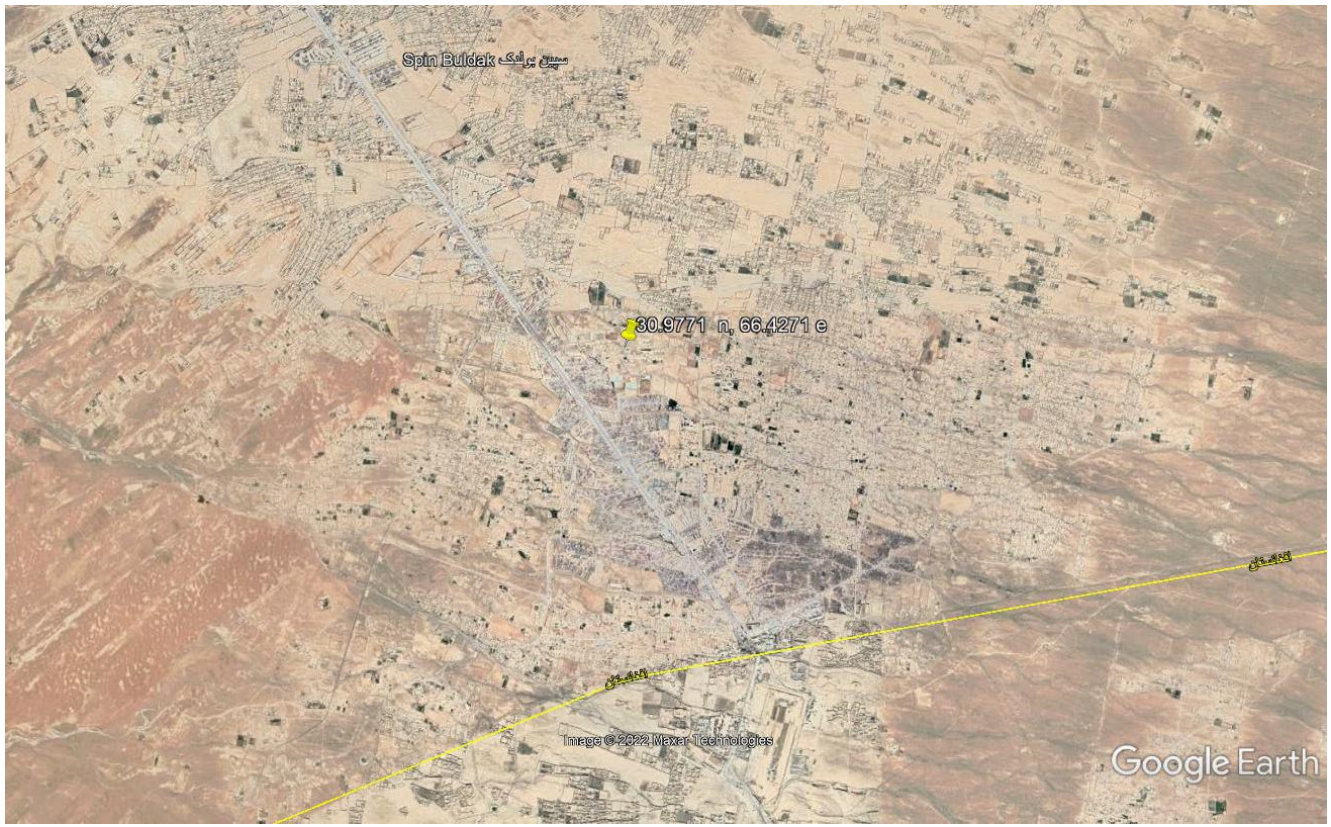

Summary

- EOG produces global monthly and annual cloud-free average radiance grids of nighttime lights.
- An analysis has been performed with the monthly radiances from 2021 and 2022 to identify locations in Afghanistan where electric power supplies are currently reduced as compared to conditions prior to the US withdrawal in August 2021.
- The analysis is based on two five-month average radiance grids made by combining the first five months of 2021 and 2022. Declines in the brightness of 2022 set is an indication of electric power losses.
- The most extreme losses are at military bases that were brightly lit in early 2021 and are currently quite dark.
- Other areas of dimming have been identified in human settlements, including Kandahar, Farah, Spin Buldak and many others.
- These dimmed areas may need additional attention in efforts to restore electric power supplies across Afghanistan.
- The best approach to future power supply monitoring across Afghanistan would be gridded nightly temporal profiles in all areas of detected lighting. These provide the most completed details of power outages, dimming, lighting recovery, seasonal cycling, trends, and lighting expansion.

ABOUT THE AUTHORS

Christopher Elvidge
Senior Research Associate, Director of Earth Observation Group

Christopher D. Elvidge has decades of experience with satellite low light imaging data, starting in 1994. He pioneered nighttime satellite observation on visible lights, heat sources including gas flares and wild fires, as well as bright lit fishing vessels. He led the development of these nighttime remote sensed products with images from DMSP, JPSS, and Landsat satellites. These data are very popular and used globally in both public and private sectors. As of February 2018, he has more than 11,000 scholarly publication citations.

Tilottama Ghosh
Research Associate, Earth Observation Group

Tilottama (Tilo) completed her PhD in geography from the University of Denver. Her training and educational background in geography, demography, economics, remote sensing, and Geographic Information Systems (GIS) helped to shape-up her interests, career and passion. Her research interests include nighttime lights, remote sensing, sustainable science, human geography, and spatio-temporal research using remote sensing, and Geographic Information Systems (GIS). She has about fourteen years of experience working with low light imaging data from the U.S. Air Force Defense Meteorological Satellite Program (DMSP), and Visible Infrared Imaging Radiometer Suite (VIIRS) data, from 2013 onwards. She is responsible for creating the nightly, monthly, and annual, VIIRS nighttime lights products, and the other two flagship products, VIIRS Boat Detection (VBD), and VIIRS Nightfire (VNF), as well as the processing of the DMSP monthly and annual cloud-free composites. Along with her team members she is responsible for conceptualizing, and testing of the processing algorithms, creating metadata documenting generated data products, fulfilling data requests related to the nighttime lights products and the DMSP archive, providing training in the use and implementation of nighttime lights software to scientists and researchers, documenting DMSP and VIIRS algorithms and accomplishments through manuals, conference proceedings, and journal submissions. She conducts socio-economic research using nighttime Earth Observation Group (EOG) products and official socio-economic data at local and global scales. She publishes such work in peer -reviewed journals, conference proceedings, and book chapters.

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Mikhail Zhizhin
Research Associate, Earth Observation Group

Zhizhin Mikhail Nikolaevich, M.Sci in mathematics from the Moscow State University in 1984, Ph.D. in computational seismology and pattern recognition from the Russian Acad. Sci. in 1992. Research positions from 1987 to 2012 in geophysics, space research and nuclear physics at Russian Acad. Sci., later at NOAA and CU Boulder. Currently he is a researcher at the Earth Observation Group at Colorado School of Mines. His applied research fields evolved from high performance computing in seismology, geodynamics, terrestrial and space weather to deep learning in remote sensing. He is developing new machine learning algorithms to better understand the Nature with Big Data.

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