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First Ever International Dark Sky Study Shows That Millennia-Old Cycles of Light Have Changed Drastically

How often do you think about the lamp on your bedside table? The invention of artificial light seems like the natural conclusion of progress – before humans could spend the night burning the midnight oil to ponder over grand questions of science and philosophy, first humans had to invent the midnight oil. Lighting up the night has had countless benefits for society, making it possible to be productive or social well after the sun has set in the sky. However, the bright lights of our cities and highways have become *too* effective. The natural cycles of day and night have been altered so much that the increase in the overall brightness of the night sky may have devastating impacts on both the environment and on human health. In the study "Worldwide variations in artificial skyglow," 43 researchers, headed by Christopher C. M. Kyba of the Deutsches Geoforschungszentrum GFZ, have compiled the first ever international collection of data on artificial nighttime skyglow. What these researchers have found is that there is a large amount of variation in skyglow radiance from sites around the world, and that there is a pressing need for a long-term sky brightness monitoring system to be instated worldwide.

There are many hypotheses that scientists have put forward about the effects of skyglow, some being "changes in the time partitioning patterns of animals; loss of key nighttime navigation signals for species; changes in predator-prey relationships; [and] loss of human cultural experiences associated with naturally lit night skies," according to Kyba et al[1]. Complete data on any of these hypotheses could completely change the way we live our lives. To research

[1] "Worldwide variations in artificial skyglow" 2.

these topics fully and effectively, there needs to be more comparisons done between different regions so that the specific patterns of skyglow in an area can be accounted for. Even over the course of a single night, the brightness of the sky can change significantly.[2] The four main qualities that the researchers in this study collected data on were: the overall level of skyglow experienced, how the predictions of skyglow matched up to observational data, the amplification of skyglow on cloudy nights, and how the levels of skyglow changed during the course of one night.

This study was done by using Sky Quality Meters (SQMs) at 44 sites around the world to monitor the brightness of the night sky at a multitude of different locations. SQMs quantitively describe how bright the sky is, where higher numbers indicate a darker sky. According to Kyba et al, "Radiance ranged over almost four orders of magnitude, from darkest values of 23.24 $mag_{SQM}/arcsec^2$ at Kitt Peak, USA...to brightest values of 13.26 $mag_{SQM}/arcsec^2$ at Schipluiden, Netherlands."[3] This is an incredible change from the 20-24 $mag_{SQM}/arcsec^2$ range of sky radiance seen before the introduction of artificial light. These experimental values showed that the current only database for international skyglow, the World Atlas of Artificial Night Sky Brightness, was overestimating its values by ~25%, showing that more research and data collection is absolutely necessary in this field.

As the first of its kind, this study was able to highlight the need for a more long-term and widespread international study of skyglow levels. This kind of monitoring would be immensely beneficial in finding out the effects of increased sky brightness on humans, which is an important question because research has already found that increased skyglow has a negative effect on

[2] "The dark side of light at night: physiological, epidemiological, and ecological consequences" 64–75.
[3] "Worldwide variations in artificial skyglow" 2.

human health and wellbeing.[4] Without a long-term program in place, it will become harder and harder to use our current modelling systems to project the effects of skyglow on humans, animals, and the environment overall. As with any great advancement in scientific progress, lighting up the night sky comes with the responsibility of learning what exactly that means for the world that we live in.

[4] "Night sky photometry and spectroscopy performed at the Vienna University observatory" 215-224.

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