Observations of stellar visibility by citizen scientists accurately measure the brightness of the night sky

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A team of researchers from Germany, Italy, and the USA have shown that observations of stellar visibility by citizen scientists accurately measure the brightness of the night sky. The researchers published their results Thursday in Nature Publishing Group's open access journal, *Scientific Reports*. The researchers hope that such data can eventually be used to track changes in artificial night sky brightness, also known as skyglow, worldwide.

The data the researchers analyzed came from the GLOBE at Night citizen science project, which is coordinated by the U.S. National Optical Astronomy Observatory. Participants are asked to match the sky that they see with a series of star charts, that differ in how many stars are visible, and then report these observations online or with their smartphone. The researchers compared the participant's responses with nighttime satellite data and a worldwide simulation of skyglow, and showed that on average the results are very strongly related to the lighting in an area.

"Like other citizen science experiments, we find that the data is noisy but that aggregated data is accurate" said Christopher Kyba, physicist from Freie Universität Berlin and the lead author of the study. "The individual observations have a standard deviation of almost a factor of 3 in sky luminance, but we found that these errors tend to cancel each other out, leading to highly stable measurements when we combine the

data."

The researchers say that ground based observations of skyglow are important, because satellites that observe Earth at night measure the light that is radiating into the sky, not the brightness that is experienced by people and other organisms on the ground. Another drawback of the current satellites, according to the researchers, is that they aren't sensitive to blue light, so that areas lit by white LED lamps appear darker then they really are.

"The goal of GLOBE at NIGHT is to have citizen scientists produce a long-term time series of sky brightness observations." said Constance Walker, study author and Astronomer at the U.S. National Optical Astronomy Observatory. "Cameras and satellite sensors change all the time as technology develops, but time series based on the eye should be stable for centuries."

The researches hope to use future data from GLOBE at Night to estimate worldwide and regional trends in artificial skyglow. "We did the easy part, which is showing that there is a strong correlation between the stellar visibility reported and the amount of artificial light" said Kyba. "The challenge in determining trends will be to properly weight the data, particularly in areas with few or no observations."

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