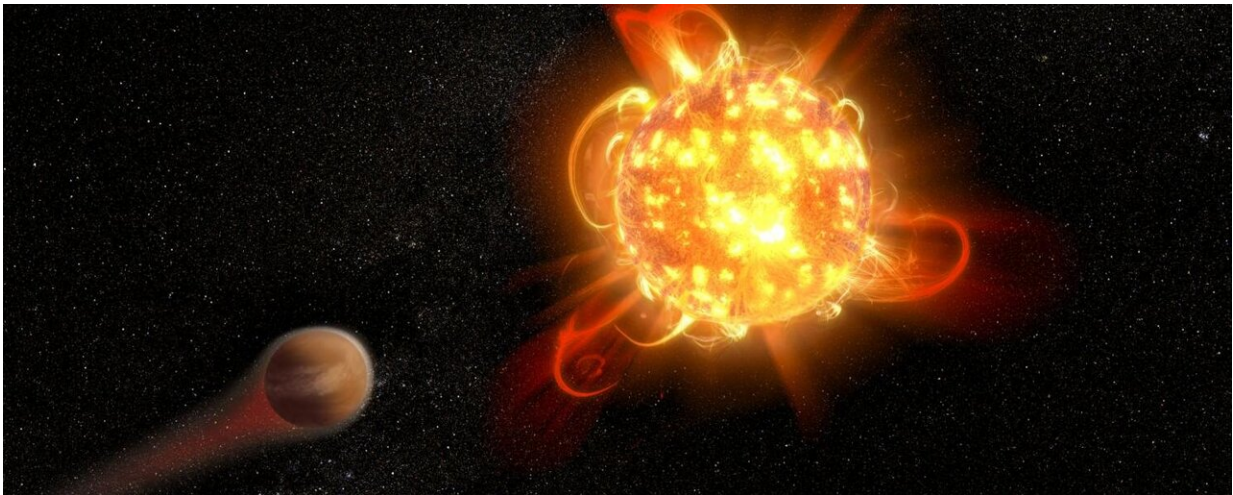


# Rare 'superflares' could one day threaten Earth

June 11 2019, by Daniel Strain

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An artist's depiction of a superflare on an alien star. Credit: NASA, ESA and D. Player

Astronomers probing the edges of the Milky Way have in recent years observed some of the most brilliant pyrotechnic displays in the galaxy: superflares.

These events occur when [stars](#), for reasons that scientists still don't understand, eject huge bursts of energy that can be seen from hundreds of [light years](#) away. Until recently, researchers assumed that such explosions occurred mostly on stars that, unlike Earth's, were young and active.

Now, new research shows with more confidence than ever before that superflares can occur on older, quieter stars like our own—albeit more rarely, or about once every few thousand years.

The results should be a wake-up call for life on our planet, said Yuta Notsu, the lead author of the study and a visiting researcher at CU Boulder.

If a superflare erupted from the sun, he said, Earth would likely sit in the path of a wave of high-energy radiation. Such a blast could disrupt electronics across the globe, causing widespread black outs and shorting out communication satellites in orbit.

Notsu will present his research at a press briefing today at the 234th meeting of the American Astronomical Society in St. Louis.

"Our study shows that superflares are rare events," said Notsu, a researcher in CU Boulder's Laboratory for Atmospheric and Space Physics. "But there is some possibility that we could experience such an event in the next 100 years or so."

Scientists first discovered this phenomenon from an unlikely source: the Kepler Space Telescope. The NASA spacecraft, launched in 2009, seeks out planets circling stars far from Earth. But it also found something odd about those stars themselves. In rare events, the light from distant stars seemed to get suddenly, and momentarily, brighter.

Researchers dubbed those humongous bursts of energy "superflares."

## **Close to home**

Notsu explained that normal-sized flares are common on the sun. But what the Kepler data was showing seemed to be much bigger, on the

order of hundreds to thousands of times more powerful than the largest flare ever recorded with modern instruments on Earth.

And that raised an obvious question: Could a superflare also occur on our own sun?

"When our sun was young, it was very active because it rotated very fast and probably generated more powerful flares," said Notsu, also of the National Solar Observatory in Boulder. "But we didn't know if such large flares occur on the modern sun with very low frequency."

To find out, Notsu and an international team of researchers turned to data from the European Space Agency's Gaia spacecraft and from the Apache Point Observatory in New Mexico. Over a series of studies, the group used those instruments to narrow down a list of superflares that had come from 43 stars that resembled our sun. The researchers then subjected those rare events to a rigorous statistical analysis.

The bottom line: age matters. Based on the team's calculations, younger stars tend to produce the most superflares. But older stars like our sun, now a respectable 4.6 billion years old, aren't off the hook.

"Young stars have superflares once every week or so," Notsu said. "For the sun, it's once every few thousand years on average."

The group published its latest results in May in *The Astrophysical Journal*.

Notsu can't be sure when the next big solar light show is due to hit Earth. But he said that it's a matter of when, not if. Still, that could give humans time to prepare, protecting electronics on the ground and in orbit from radiation in space.

"If a [superflare](#) occurred 1,000 years ago, it was probably no big problem. People may have seen a large aurora," Notsu said. "Now, it's a much bigger problem because of our electronics."

**More information:** Yuta Notsu et al. Do Kepler Superflare Stars Really Include Slowly Rotating Sun-like Stars?—Results Using APO 3.5 m Telescope Spectroscopic Observations and Gaia-DR2 Data, *The Astrophysical Journal* (2019). [DOI: 10.3847/1538-4357/ab14e6](https://doi.org/10.3847/1538-4357/ab14e6)

Provided by University of Colorado at Boulder

Citation: Rare 'superflares' could one day threaten Earth (2019, June 11) retrieved 28 January 2023 from <https://phys.org/news/2019-06-rare-superflares-day-threaten-earth.html>

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