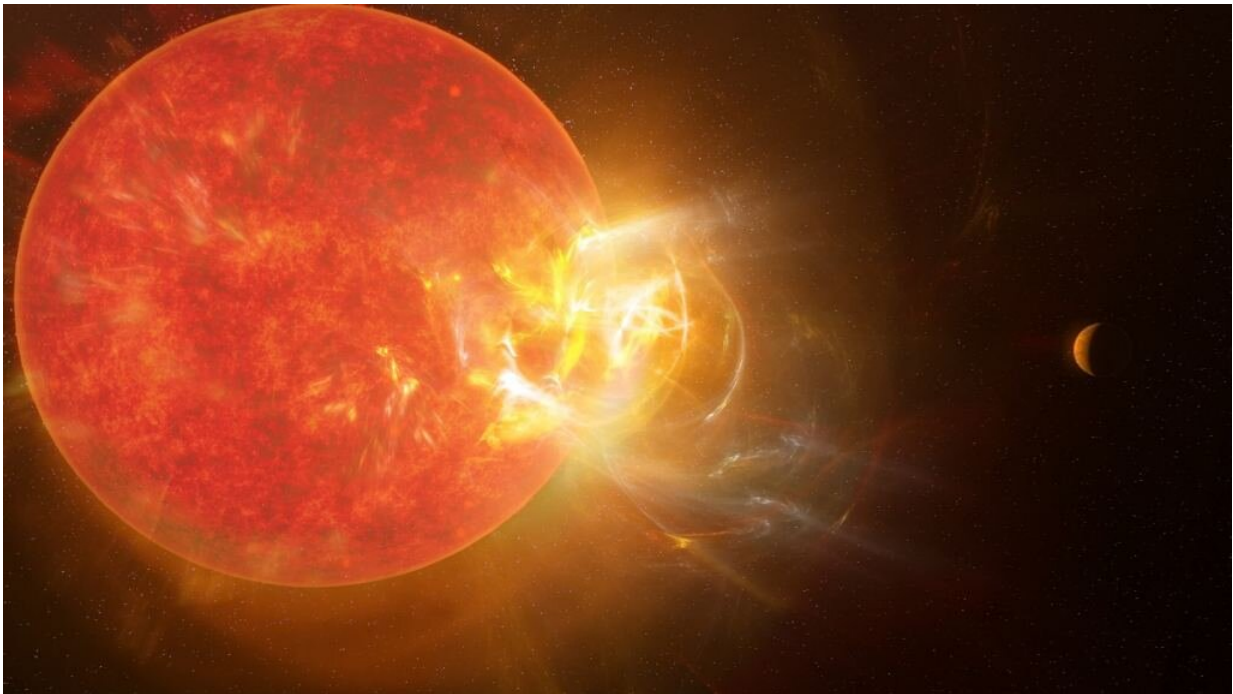


Revisiting the space weather environment of Proxima Centauri b

December 19 2022, by Paul M. Sutter



Artist's conception of a violent stellar flare erupting on neighboring star, Proxima Centauri. The flare is the most powerful ever recorded from the star, and is giving scientists insight into the hunt for life in M dwarf star systems, many of which have unusually lively stars. Credit: NRAO/S. Dagnello

The nearest known exoplanet to Earth, the planet orbiting Proxima Centauri, experiences some pretty nasty space weather from its parent star. But previous work on the space weather of Proxima relied on a lot

of assumptions. The bad news is that new research has confirmed the grim picture.

The nearest star to Earth, Proxima Centauri, hosts a small rocky world in the habitable zone of that star. The [habitable zone](#) is important because that's the region that astronomers believe where a planet can potentially host liquid water. Too close to a star and the intense radiation will simply boil away any water. Too far from a star and the planet won't receive enough warmth, and all of its water will just turn to ice.

Astronomers are very interested in [habitable zones](#) around stars because that's where life as we know it has the best chance of appearing. So it's no wonder that astronomers are incredibly interested in Proxima b, the name we give to our nearest known exoplanet.

Unfortunately for any life that may call that planet home, they're going to have a rough time of it. Proxima Centauri is a red dwarf star, with only a fraction of the mass of the sun. Because of their small sizes, the nuclear fusion cores of red dwarf stars are much closer to their surfaces. This makes their surfaces much more chaotic than stars like the sun, and that increased turbulence amplifies incredibly [strong magnetic fields](#).

In turn those strong magnetic fields can launch extremely strong blasts of high-energy radiation and particles into the surrounding system. At far enough distances away from a star this isn't a big deal. But because stars like Proxima Centauri aren't nearly as luminous as the sun, their habitable zones are much closer—close enough that "habitable" might be too generous of a word.

Even though [astronomers](#) already had a sense that life on Proxima b would be very difficult, they didn't know the exact magnetic field situation around Proxima Centauri, and instead had to rely on observations of similar stars.

A new study, published in *The Astrophysical Journal Letters*, used high resolution maps of the magnetic field of Proxima Centauri to develop a model of the solar wind emanating from that star. They found that with the more accurate information, the situation is just as grim as we had thought. All told, Proxima b receives about 1,000 times more solar wind radiation than the Earth does.

This would make it extremely difficult for the planet to host an atmosphere, let alone [liquid water](#). While it doesn't completely rule out the possibility of life on that world, it does mean that any life that gained a foothold there has a much harder time than us.

More information: Cecilia Garraffo et al, Revisiting the Space Weather Environment of Proxima Centauri b, *The Astrophysical Journal Letters* (2022). [DOI: 10.3847/2041-8213/aca487](https://doi.org/10.3847/2041-8213/aca487)

Provided by Universe Today

Citation: Revisiting the space weather environment of Proxima Centauri b (2022, December 19) retrieved 10 April 2024 from <https://phys.org/news/2022-12-revisiting-space-weather-environment-proxima.html>

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