The Washington Post
Democracy Dies in Darkness

The sun is crackling with 'solar flares'. Here's what that means.

The sudden flare-up of activity bodes well for a potentially active solar cycle and colorful aurora displays

By Matthew Cappucci and Joe Kunches
January 12, 2023 at 2:28 p.m. EST

After a long period of relative slumber, the sun is waking up and sputtering with unrest. Experts say the start of the new "solar cycle" could be roaring in like a lion — with impacts possible here on Earth.

In just the past week, three X-class solar flares — the strongest bracket on the scale — have erupted on the sun's surface. Solar flares are bursts of energy that travel at the speed of light, composed of electromagnetic radiation that can affect radio communications. None has been aiming toward Earth, but that could change in the weeks ahead.

The sudden flare-up of activity may also be a sign that experts grossly underestimated how busy Solar Cycle 25 — the current iteration of the sun's magnetic rhythm — will be. A few bold solar physicists have deviated from the consensus expectations, calling instead for a spike of robust storminess on the sun in the years ahead. This new flurry shows those outliers may wind up being right.

What is a solar flare?

Solar flares come from sunspots, or bruiselike discolorations on the surface of the sun that pulsate with energy. They're also regions from which magnetic flux pours out; those magnetic field lines loop back and reconnect elsewhere on the sun's surface.

Like stretched rubber bands, sometimes magnetic fields get contorted, causing pent-up energy that must be released. When that happens, a burst of electromagnetism known as a flare is ejected from the parent "sunspot."

Flares can cause radio blackouts and sometimes interfere with or even damage satellites. They can also deliver harmful radiation to passengers on aircraft passing near the poles.

Sometimes a CME, or coronal mass ejection, can occur as well. CMEs are accompanied by magnetic disturbances that can rattle Earth's geomagnetic field, triggering vibrant displays of the Northern and Southern lights (aurora borealis and australis). CMEs only affect us if they are Earth-directed.

How often do they occur?

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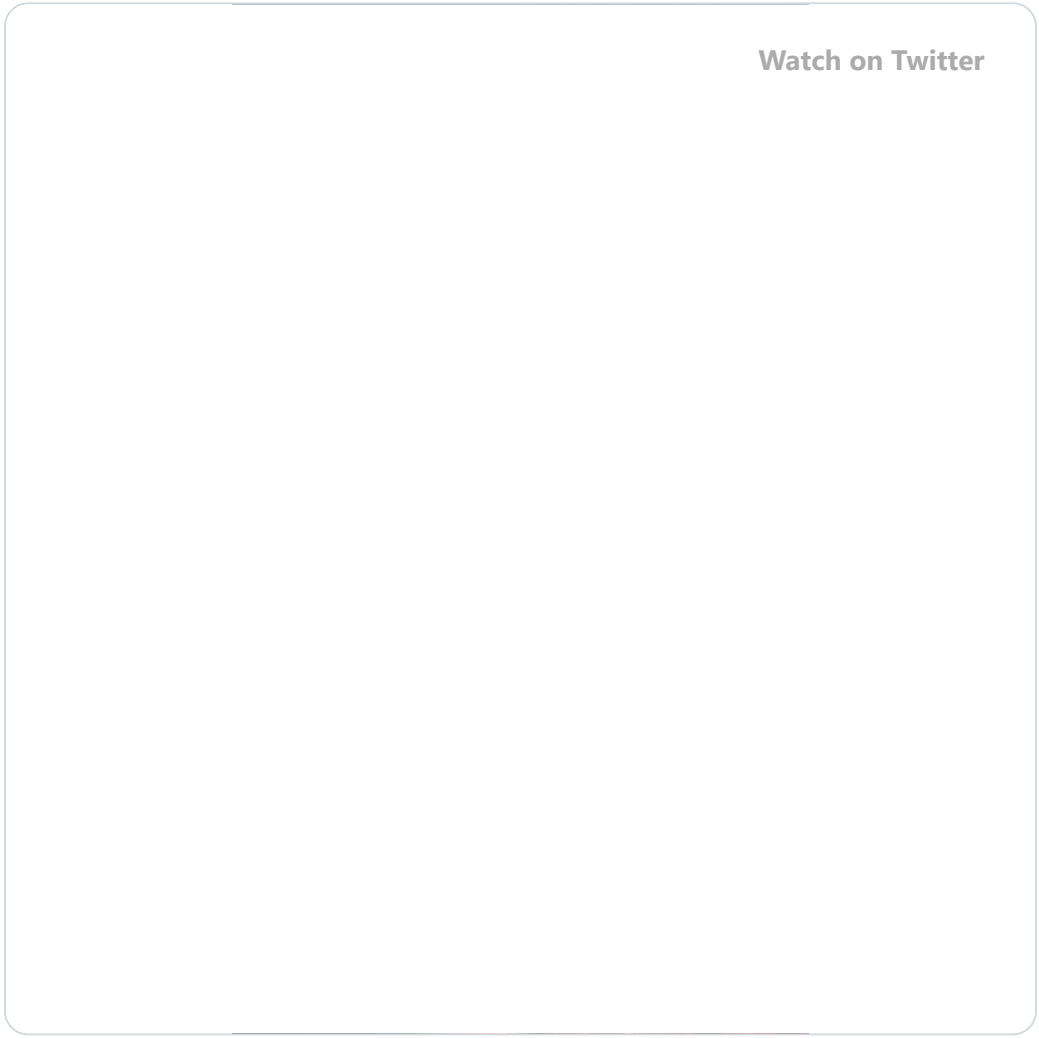
Unbelievable, the Sun just produced its third X-class #SolarFlare in almost as many days! However, this time from a different active region than the first two. The Sun has two X-class-producing active regions on disk, making it difficult for observers choosing where to point 🔭



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The number of flares and CMEs that occur is proportional to the number of sunspots on the solar disk. Those sunspots are most common at the peak of each 11-year “solar cycle,” which solar physicists have confirmed is actually a subset of several overlapping cycles on both shorter and longer time frames.

At “solar maximum,” which is estimated to occur in July 2025 (give or take), NASA and NOAA forecasters are anticipating about 115 sunspots per month. But a pair of researchers — Scott McIntosh, deputy director of the National Center for Atmospheric Research, and Bob Leamon, a researcher at the University of Maryland Baltimore County and NASA Goddard — predict twice as many. So far, current trends are on pace for their prediction.

In either case, the number of sunspots, and subsequently flares and CMEs, will increase over the coming two-plus years. It’s a stark change from 2019, during which 77 percent of the year — 281 days total — showed not a single blemish anywhere on the sun.

What’s going on right now?

Over the past week, three X-class flares have spurted off from two eruptive sunspot groups. The sunspot clusters have been named “active region 3186” and “active region 3184,” according to NOAA. Both are located in the eastern hemisphere of the sun; the former is north of the equator, and the latter to the south. Both will rotate more directly toward the center of the solar disk (what’s facing us head-on), and could find themselves in position to affect Earth’s “space weather” in the weeks ahead.

On Tuesday, at least one X flare caused a strong radio blackout. Amateur radio operators and those using sensitive navigation equipment near the poles might may have noticed. Minor shortwave radio blackouts are unlikely to be disruptive to the most people.

In the event of an Earth-directed flare and CME, there’s a chance for more serious geomagnetic storming, which could force power companies and satellite operators to take precautions to protect valuable, sensitive electronics. More pronounced displays of the Northern and Southern lights, possibly down to the mid-latitudes (including the northern United States), may also be in the offing.