



SCIENCE

California Has a Theory on Why Brown Pelicans Are Starving and Dying



By Alix Soliman May 23 Save Article



A rescued brown pelican perches on the edge of a pool at the SPCA of Monterey County on May 13, 2024. (Alix Soliman/KQED)

Emaciated brown pelicans are washing up on California shores in the hundreds. State officials and researchers aren't sure why, but they think it could be weather-related.

The state's working hypothesis is that this situation, similar to what happened in 2022 when nearly 800 starving pelicans were rescued, was likely caused by late spring storms hitting the coast.

"The waters were incredibly choppy, it was very windy, visibility was poor," said Tim Daly, spokesperson for the California Department of Fish and Wildlife. "Our strongest belief at this point is that the pelicans were simply having trouble reaching the fish that were below the surface."

He said there are plenty of fish and noted that anchovies are particularly abundant this year. The pelicans just can't find them in the murky water.

Monterey Bay is a particular hotspot in the state's rescue effort. The **Wildlife Rescue and Rehabilitation Center** at the SPCA of Monterey County has taken in more than 100 famished birds over the past month. Staff there have dedicated two outdoor enclosures to the pelicans and converted a staff bathroom into a heated recovery room for birds that can't regulate their body temperature. Rescue calls started coming in on April 19 and have not yet stopped.

Ciera Duits-Cavanaugh, manager of the wildlife center, said the birds are arriving at half the weight they should be and that most rescues are happening on piers.



Wildlife technicians at SPCA of Monterey County take a blood sample from the foot of a pelican. Like most of the rescued birds, the sample revealed the bird was anemic. *(Alix Soliman/KQED)*

“[The birds are] targeting places where there’s easy food, so boats that are off-loading fish onto docks, restaurants — anywhere that they can get a hand-out,” Duits-Cavanaugh said.

Cory Utter, the senior wildlife technician at the wildlife center, said they likely are not saving all the pelicans because most people can’t tell if a bird is struggling. There is one sure sign, though.

“If you can walk right up to it, and it doesn’t seem bothered by you, then there’s probably something wrong,” Utter said. Officials recommend people call local wildlife centers if that happens.

Last week, a mom and her young son reported a weak-looking pelican drooping its beak into a tide pool at Asilomar State Beach in Monterey County. Two SPCA volunteers crouched down on the rocks, scooped up the bird, and placed it in a dog crate. The pelican didn’t resist. After a short drive back to the wildlife center, the volunteers pulled out the crate. The bird’s eyes were open, but its head was cocked to one side, and it was motionless. It had died in transit.

Storms may be to blame

Rebecca Duerr, director of Research and veterinary science at International Bird Rescue, said the explanation that early spring storms limit the bird’s ability to find food makes sense, especially since they’ve tested dead pelicans and ruled out avian flu as a possible cause.

“Certainly, the visibility and catchability of fish can be an issue for them because they don’t dive very deep — even the biggest brown pelican can only grab fish about 6 feet deep,” she said.



Pelicans struggling to regulate their body temperature rest in a warming room at the SPCA Monterey County, between 75–80 degrees Fahrenheit. *(Alix Soliman/KQED)*

About one-third to a half of the starving pelicans arriving at rescue centers were injured, she added.

“I think that brown pelicans take more risks in their feeding — more likely to go after fishing gear and that sort of stuff — when they’re nutritionally stressed,” Duerr said. “A desperate, hungry pelican can get into trouble.”

After an odd weather event in 2010, she said, they were found landing in people’s yards and snatching food off of hot barbecue grills.

Pelicans back from the brink

California brown pelicans **almost went extinct** in the 1970s. Researchers found that the toxic chemical DDT entered coastal waters, where it was absorbed by the fish pelicans eat. The chemical changed the calcium metabolism in the birds' bodies, which made them lay eggs with shells too fragile to withstand the weight of incubation. After DDT was banned, the pelicans recovered and were removed from the endangered species list in 2009.

Brown pelicans' largest breeding colonies are in the Channel Islands and Baja California, Mexico. Nesting season peaks in March and April, and newborns typically arrive in the Bay Area around May. But Duerr said most of the starving pelicans she's seeing are older.

"The Channel Islands colony, we know, has done a lot of chick abandonment, so there probably won't be any fledglings arriving," Duerr said.

Daniel Anderson is a retired professor from UC Davis who has studied brown pelicans for over 50 years and helped prevent their extinction. He's planning to check on the Baja colony this month, but he said he's not optimistic after seeing how they fared earlier this year.

"The breeding birds in the Gulf of California are failing miserably," Anderson said. "Where there would be 20-30,000 nests, this year there were way less than 1000."



➡ **Sick Brown Pelicans Are Turning Up Along the Coast — and We Don't Know Why**



Nia Newcombe (left) with SPCA volunteers Nancy Cunningham and Philip Johnson after scooping up a starving pelican at Asilomar State Beach. The pelican did not survive. (Alix Soliman/KQED)

Anderson said the Baja population declined in 2014 during the marine heat wave scientists called “the blob” and has not really recovered since. He also said the pelican population tends to follow the El Niño and La Niña sea surface temperature cycles — doing worse with warm El Niño conditions and better with cold La Niña conditions.

California experienced a rare three-year run of La Niña from 2020 to 2023 before El Niño in 2024.

The National Oceanic and Atmospheric Administration **predicts** we’ll enter neutral conditions soon and may see La Niña emerge this summer. “The surface fish like anchovies, sardines seem to be more available to surface-feeding seabirds during La Niña conditions,” Anderson said.



Scraggly birds flap their wings in the breeze and preen their feathers in an enclosure at the SPCA of Monterey County. (Alix Soliman/KQED)

As climate change is expected to make El Niño cycles **more intense and frequent**, Anderson said pelicans may gradually move north to breed. “It’s a complex situation, and it’s dynamic and moving really fast.”

KQED
Get the best of KQED’s science coverage in your inbox weekly.

Email Address:

Sign Up

To learn more about how we use your information, please read our [privacy policy](#).

Copyright © 2024 KQED Inc. All Rights Reserved. [Terms of Service](#) [Privacy Policy](#) [Inside the Reporting Process](#) [Contact Us](#)



SCIENCE

How Solar Storms That Bring Northern Lights Can Also Cause Tech Chaos

By [Sarah Mohamad](#)  May 21  [Save Article](#)



Last weekend, a series of powerful solar storms brought the **northern lights to the Bay Area** and much of the world, illuminating the night skies with a mesmerizing display of color.

NASA's Solar Dynamics Observatory (SDO) captured this image of an X5.8 solar flare peaking at 9:23 p.m. EDT on May 10, 2024. The image shows a subset of extreme ultraviolet light that highlights the extremely hot material in flares. (NASA SDO)

As well as causing the aurora borealis, these solar storms also have the potential to bring widespread disruption to Earth’s electrical systems — something that originally happened all the way back in 1859 during one of the largest geomagnetic storms recorded in history. And it’s happened since, too.

Keep reading for a look back at the times that our planet has experienced technological chaos caused by solar storms — and what the chances might be of this happening again in the future.

Jump straight to:

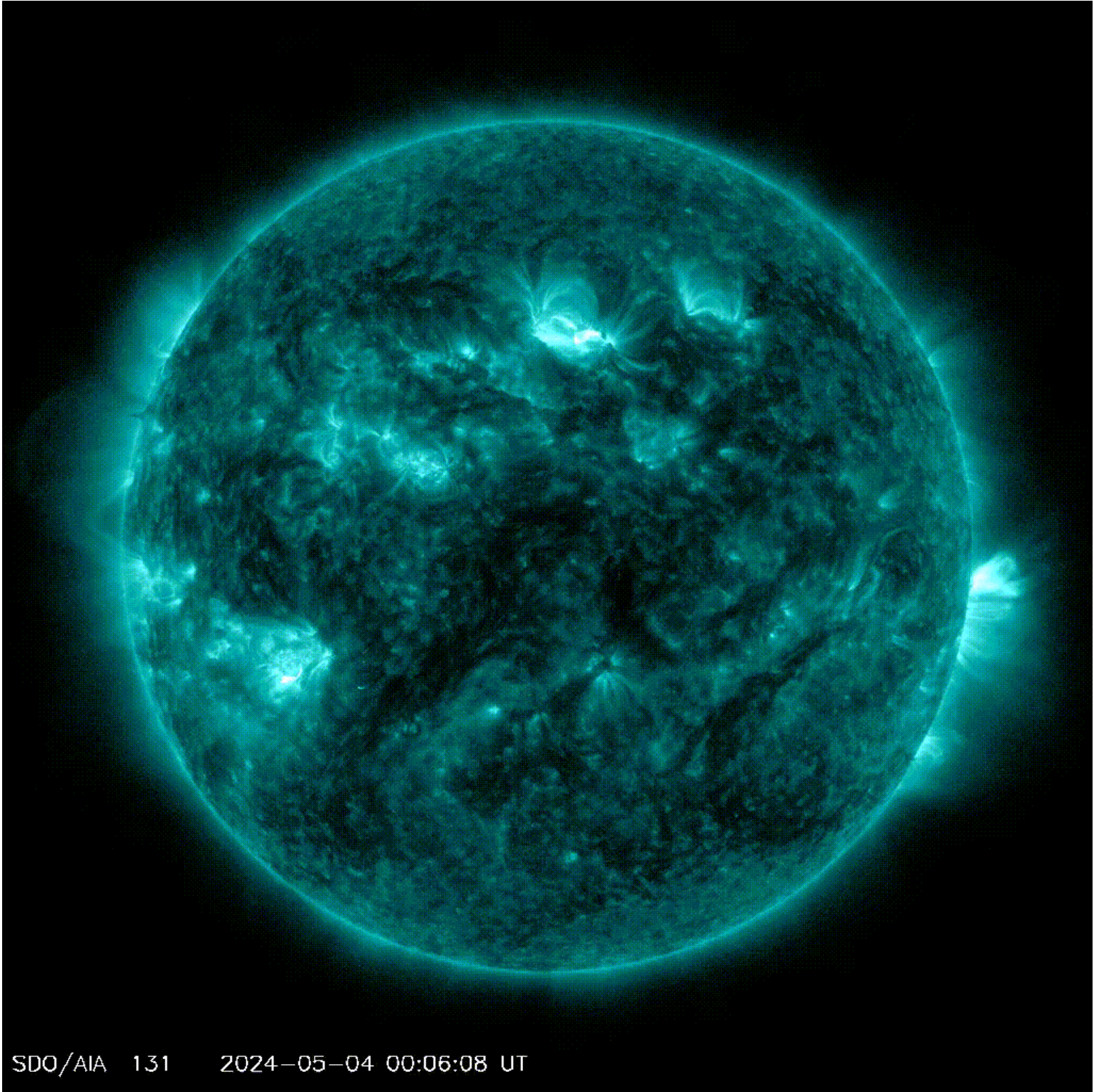
- **When could I see the northern lights again in California?**
- **The science behind solar storms**

The most intense solar storm in history: The Carrington event

One of the biggest **solar storms** in history happened in September 1859, just a few months before the solar maximum — the peak of the 11-year solar cycle — of 1860. The storm, also known as the Carrington Event, was after British astronomer Richard Carrington, who first observed a “**white light flare**” while looking for sunspots.

The geomagnetic storm that ensued in the next 17 hours caused chaos to that era’s version of the World Wide Web and shocked telegraph operators around the globe, who found their networks disrupted and even saw fires in multiple telegraph stations throughout Europe and North America.

According to contemporary newspaper reports, for hours, telegraph operators were even able to use the overflowing current present in the air to continue working their **unplugged telegraph machines**. One Portland operator reportedly said the machines worked “better than with our batteries on.”



The sun emitted three strong solar flares. The first flare peaked at 2:01 a.m. EDT on May 5, 2024, and the second peaked at 7:54 a.m. EDT on May 5, 2024. The third peaked at 2:35 a.m. EDT on May 6, 2024. NASA's Solar Dynamics Observatory, which watches the sun constantly, captured an image of the event. The imagery shows 131 Angstrom light, a subset of extreme ultraviolet light. The sequence culminates with an X4.5 flare. (NASA SDO)

But the solar storm also created spectacular auroral displays in places beyond the usual polar latitudes, as far as south as Mexico and Hawaii. In the northeastern U.S., the northern lights were so bright that people reported using **the storm's glow to read the newspaper at night.**

A report from the *Sonoma County Journal* in September 1859 described the beautiful view of the auroras seen in California as “exhibiting every hue from blood red to the faintest golden yellow, and extending from the horizon to the zenith in all directions.”

Scientists today believe that multiple **coronal mass ejections (CMEs)** hit Earth during the Carrington Event, arriving in the Earth’s atmosphere in just 17 hours — a journey that usually takes several days.

How would Carrington 2.0 affect us today?

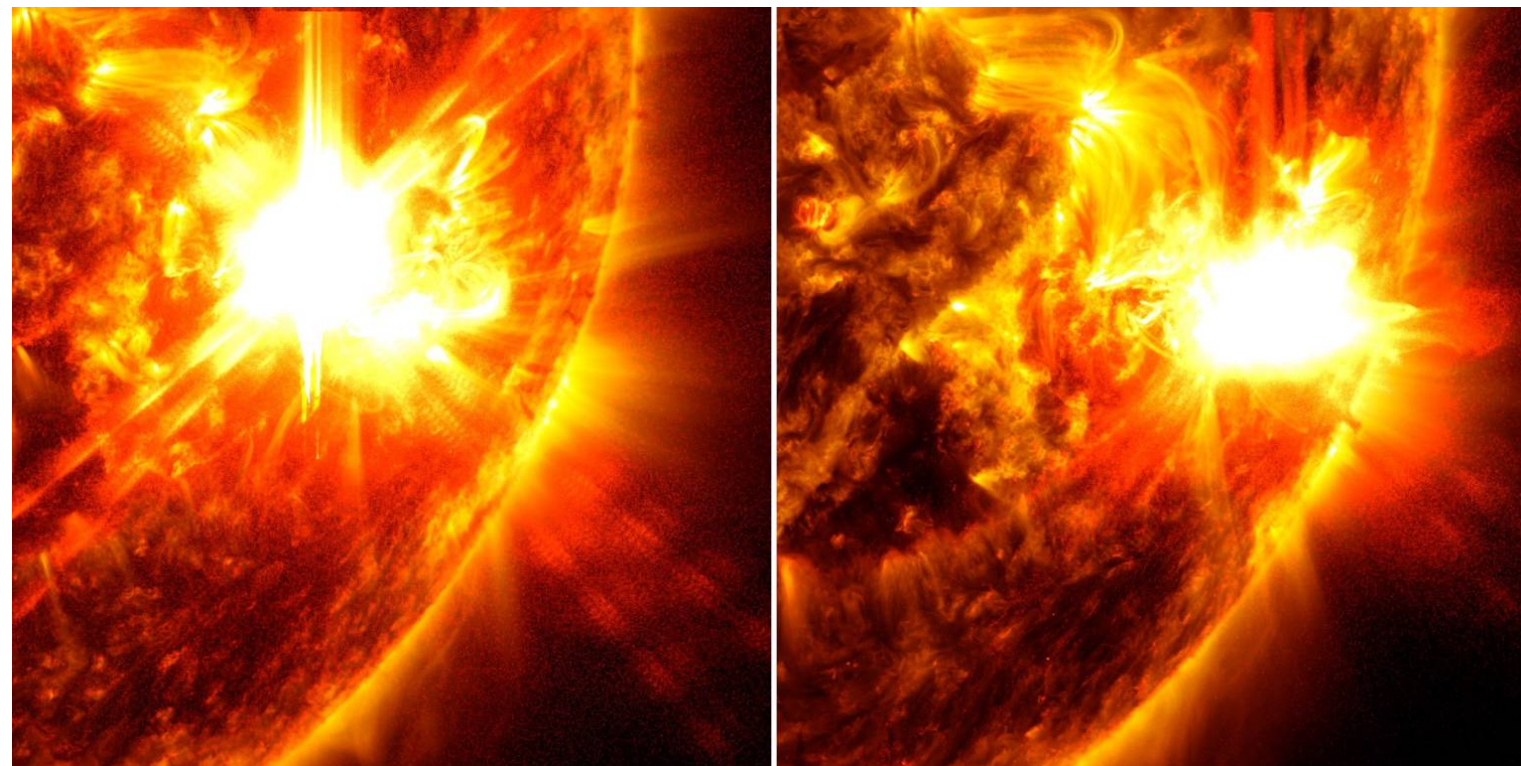
Luckily for us, solar storms like the Carrington Event only happen once every few centuries. So the likelihood of it happening during our lifetime is slim, according to Andrew Fraknoi, astronomer and professor at the University of San Francisco’s Fromm Institute.

“But, it could happen,” he said.

How would such an event today impact us, and are we prepared?

“Today, we are in a much more vulnerable place than they were in 1859,” Fraknoi said. And while not at the same scale as the Carrington Event, the solar storm of March 1989 could give a preview of that potential impact.

The storm caused a massive power outage of **Hydro-Québec’s electricity transmission system**, leaving 6 million Canadians in the dark for 9 hours and significantly interfering with the U.S. power grid.



NASA's Solar Dynamics Observatory captured images of the two solar flares on May 10 and May 11, 2024. The flares are classified as X5.8 and X1.5-class flares, respectively. The image shows a subset of extreme ultraviolet light that highlights the extremely hot material in flares created from a mixture of SDO's AIA 193, 171 and 131 channels. *(NASA SDO)*

A **2013 report by the National Academy of Sciences** estimates that such a storm now could cost one to two trillion dollars in the first year alone and take a decade to recover from.

“We’re dependent on GPS satellites, and the power grid is connected in very complicated ways among different parts of the U.S. and parts of North America,” Fraknoi said.

“If there were a huge amount of current coming from the sky, it could overwhelm or damage the power grid connections.”

The 2013 report lays out the potential disruption on satellites, power grids and infrastructure, as well as the socioeconomic impacts of another Carrington Event happening today. Depending on the scale of the solar storms, disruptions can last for weeks or even years, according to the report.

“If you can imagine a space weather storm strong enough to knock out power from New York down to the Carolinas for weeks, that’s not ‘a bad day’ anymore. That’s a national security risk,” said Bryan Brasher, Project Manager at the Space Weather Prediction Center for the National Oceanic and Atmospheric Administration (NOAA.)

Brasher works with the team that predicts space weather events like the recent solar storms we experienced.

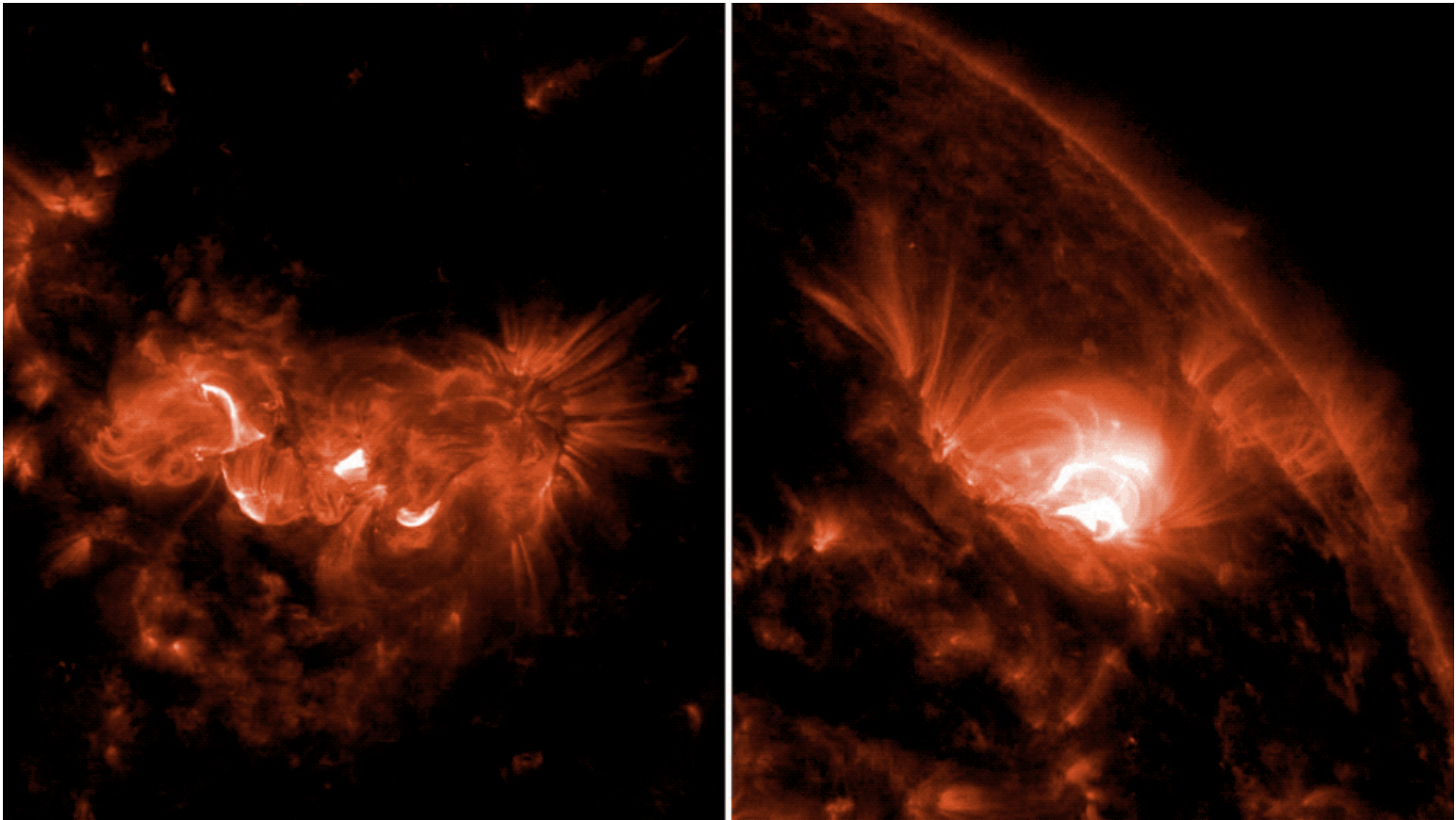
If a massive geomagnetic storm like the Carrington Event were to happen today, he said, it could interfere with radio communications and GPS signals and disrupt operations on spacecraft and even pipelines and railroads.

But Brasher is optimistic that our understanding of space weather prediction has improved over the last century — and more research is being done to mitigate any catastrophic events that could result from a large solar storm event.

“I think today we like to think that by doing our job to provide forecasts and information to these critical system operators, that they will take mitigating factors to help prevent failures,” he said.



➡ **See How the Northern Lights Lit Up the Bay Area This Weekend**



NASA's Solar Dynamics Observatory captured these images of the solar flares — as seen in the bright flashes in the left image (May 8 flare) and the right image (May 7 flare). The image shows 131 angstrom light, a subset of extreme ultraviolet light that highlights the extremely hot material in flares and is colorized in orange. (NASA SDO)

Other large solar storms that brought aurora sightings to California

Here’s a list of other large geomagnetic storms that disrupted technology in parts of the U.S. These storms may not necessarily have caused disruptions in California, but sightings of the aurora were visible in the region during most of these storms:

- **November 1882:** A report in the *SF Examiner* in 1882 mentions interruptions to telegraphic communications in places like New York, Chicago, and Boston, with sightings of the aurora visible from Mendocino. “**The hues are deep crimson, shading to light green on the horizon. It lasted several hours,**” wrote the *Examiner*.
- **May 1921:** A powerful solar storm known as the New York Railroad Storm caused a fire near the Grand Central Terminal in New York. There were reports of damages to telegraph systems in Europe and the Southern Hemisphere. Reports of aurora sightings in San Francisco, Oakland, and Santa Clara were described as “brilliant hued skies,” according to the *San Francisco Chronicle*.
- **August 1972:** Solar flares and coronal mass ejections (CMEs) caused solar storms that disrupted communication grids and satellite communications in North America, with **reports**

saying it caused the accidental detonation of a number of U.S. naval mines near North Vietnam.

- **March 1989:** Although no technological disruptions occurred here in California, a “night sky glow” that “varied in color from a whitish green to a brilliant red” was seen in Napa, Solano, Mendocino and San Luis Obispo, according to *SF Examiner*.
- **October 2003:** Also known as “the Halloween solar storms,” this event caused interruptions to satellite-based systems and communications and aircraft were advised to avoid high altitudes near the polar regions. Again, aurora was visible in California as reported by *Santa Cruz Sentinal*: “A mysterious light that appeared to fall from the sky over the Santa Cruz Mountains had many residents calling emergency dispatchers Thursday night.”



A view of the northern lights in Sonoma County on May 10, 2024. (Shreenivasan Manievannan)

The science behind solar storms: Understanding space weather

To understand space weather, we have to look at the (literal) star of the show: the sun. While this big ball of hot gas is more than 90 million miles away, its influence on Earth and our environment is massive.

Solar winds, flares and ‘cannonballs’

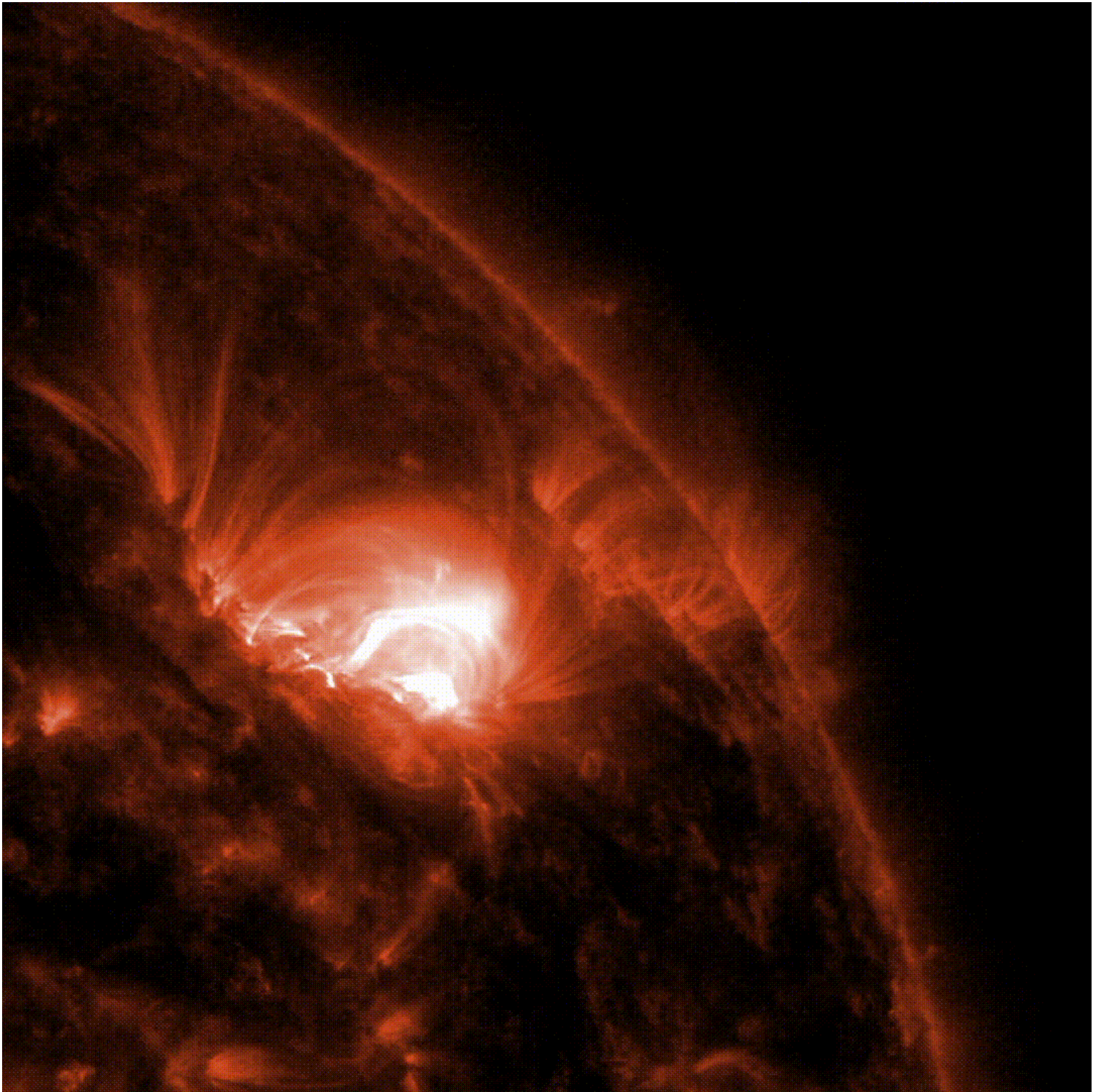
The sun’s dynamic and complex body continuously emits charged particles into space called solar wind, which astronomer Fraknoi describes as “kind of like a breeze of particles from the sun.”

“It goes in all directions from the sun, and it always comes toward the Earth,” he said.

“There’s a complex magnetic field woven throughout the sun,” Fraknoi said, thanks to these charged particles and the rotation of the sun. And as the magnetic field rotates with the sun, it stretches, twists and snaps like a rubber band.

When that snap happens, particles and energy from the sun are released into space, causing a giant flash of light called a solar flare — which travels at the speed of light in all directions and takes about eight minutes to reach Earth.

But when a larger amount of those same particles is released, that’s called a coronal mass ejection (CME) — which Fraknoi describes as “blobs of charged particles” hurled out in space. CMEs take one to three days to reach Earth — and unlike solar flares that appear as a flash of light, CMEs look more like explosions in space.



NASA's Solar Dynamics Observatory captured this imagery of solar flares from May 7–8, 2024. The imagery shows 131 Angstrom light, a subset of extreme ultraviolet light. (NASA SDO)

Solar flares almost always precede a CME. And because it can take days for a CME to reach Earth, flares let the team at Space Weather Prediction Center at NOAA send out early warnings to the masses, Fraknoi said.

Most times, these CMEs from the sun are pointed towards random directions in space. “But every once in a while, the coronal mass ejection is pointed toward Earth,” Fraknoi said. And when it is,

that’s when we get a strong geomagnetic storm.

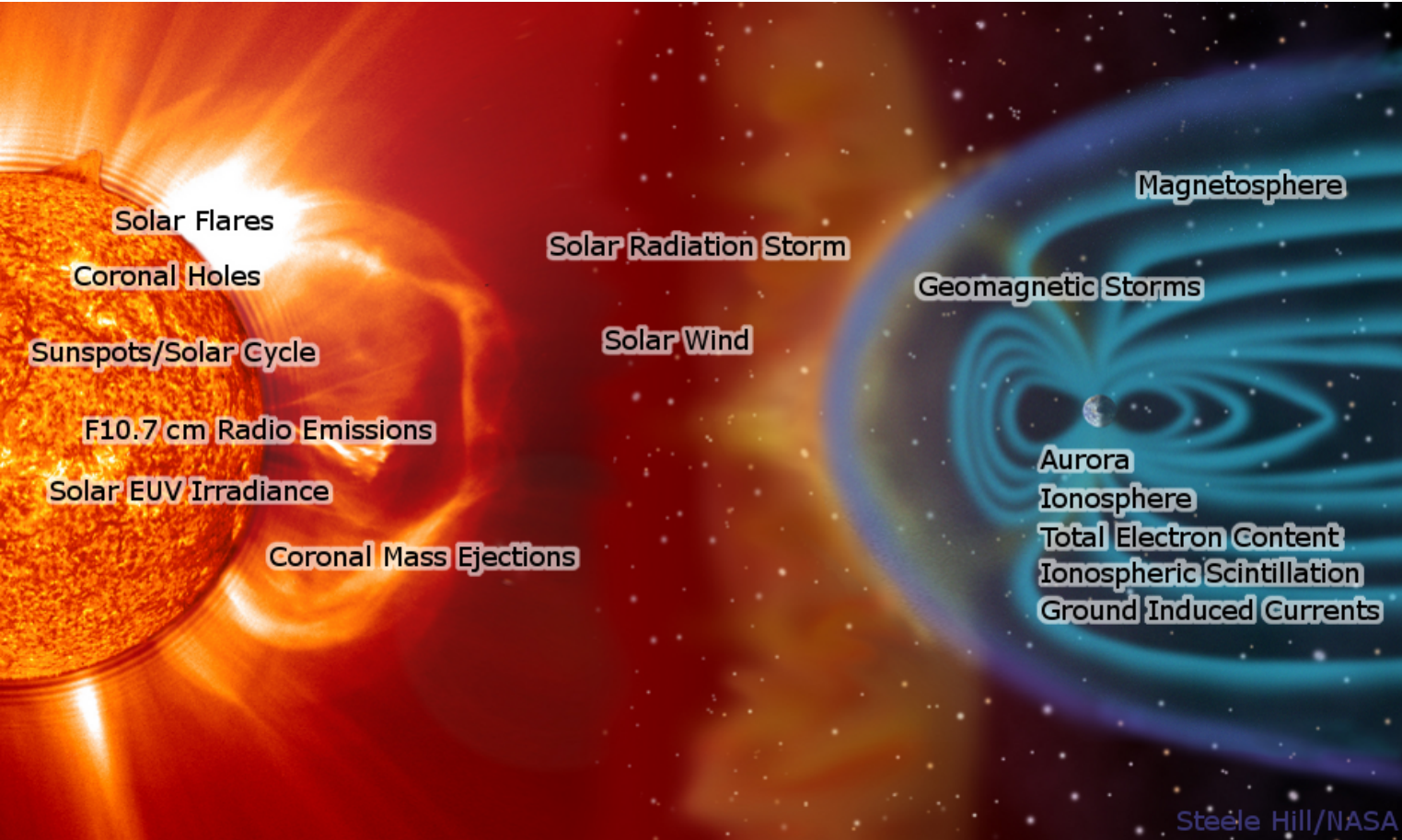
Brasher said he likes to think of solar flares like the flash at the end of a cannon when it shoots off — and “you can think of the cannonball as being like a CME,” he said. “It’s massive, it has weight. It travels much slower than the speed of light — and most importantly, has a direction component to it.”

The Earth also has its own magnetic fields that function as a “protective bottle” known as a magnetosphere. The Earth’s magnetosphere is weaker in the north and south poles, noted Fraknoi — making places like Alaska and Antarctica great spots to see the aurora more regularly.

What causes these aurora?

When charged particles flowing from the sun get caught up in the Earth’s magnetic field, it energizes the atmosphere’s molecules (like nitrogen and oxygen), excites them and creates a colorful display of light we know as the aurora, or the northern lights.

The different colors we see from Earth — the hues of green, red, purple, and blue — depend on which molecule is being excited by the charged particles and on how much energy is being exchanged.



The Earth’s magnetosphere deflects most solar energy and particles, but occasionally, some make it down into the auroral ovals at the North and South poles. (NOAA)

If the northern lights are most common around the poles, how do we see them all the way here in the Bay Area?

During strong geomagnetic storms like the one we experienced over a week ago — usually when a CME is involved — the aurora that is usually only visible in those polar regions is now supercharged and distributed even more geographically, making them visible in places you don’t normally see them.

When could be my next chance to see the northern lights in the Bay Area?

While many were lucky enough to clearly see the recent aurora caused by one of the largest solar storms in over 20 years, folks who weren’t so fortunate shared **memes on social media** about their **FOMO**, with one user calling this elusive glow the “**aurora fogealis**.”

But if that was you, there’s still hope. Experts say we might see more auroras in the next couple of years, thanks to the sun’s cycle.



Northern Lights (aurora borealis) illuminate the sky of San Francisco North Bay as seen from China Camp Beach in San Rafael, California on May 11, 2024. (Tayfun Coskun/Anadolu via Getty Images)

The sun undergoes an eleven-year solar cycle, with solar activity rising and falling. We are currently approaching the peak of the solar cycle, also known as the solar maximum. During this period, space weather events like solar flares and CMEs can happen more often.

“During the solar cycle, the sun’s magnetic field goes from being really uniform and easy to getting really complicated, intertwined and complex,” Brasher said.

Scientists predict these solar storms will reach their peak in 2025. But sometimes, **the biggest storms can hit years after the solar maximum.**

To stay up to date with the latest news on geomagnetic storms, you can **subscribe to email updates from the Space Weather Prediction Center at NOAA.** Brasher recommends subscribing to notifications of G4 and G5 storm alerts.

“The mysteries of the sun are still out there,” Brasher said. “We have a lot to understand about the dynamo, and the dynamics of it and how it impacts Earth.”

KQED

Get the best of KQED’s science coverage in your inbox weekly.

Email Address:

Sign Up

To learn more about how we use your information, please read our [privacy policy](#).



TV

Radio

Podcasts

Events

Newsletters

Mobile Apps

For Educators

News

Science

Arts & Culture

Crossword

Donate

Help Center

About

Staff DEI Report

Careers

Accessibility

Corporate Sponsorship

Financial and FCC Files

Contact Us

Copyright © 2024 KQED Inc. All Rights Reserved.

[Terms of Service](#) [Privacy Policy](#)