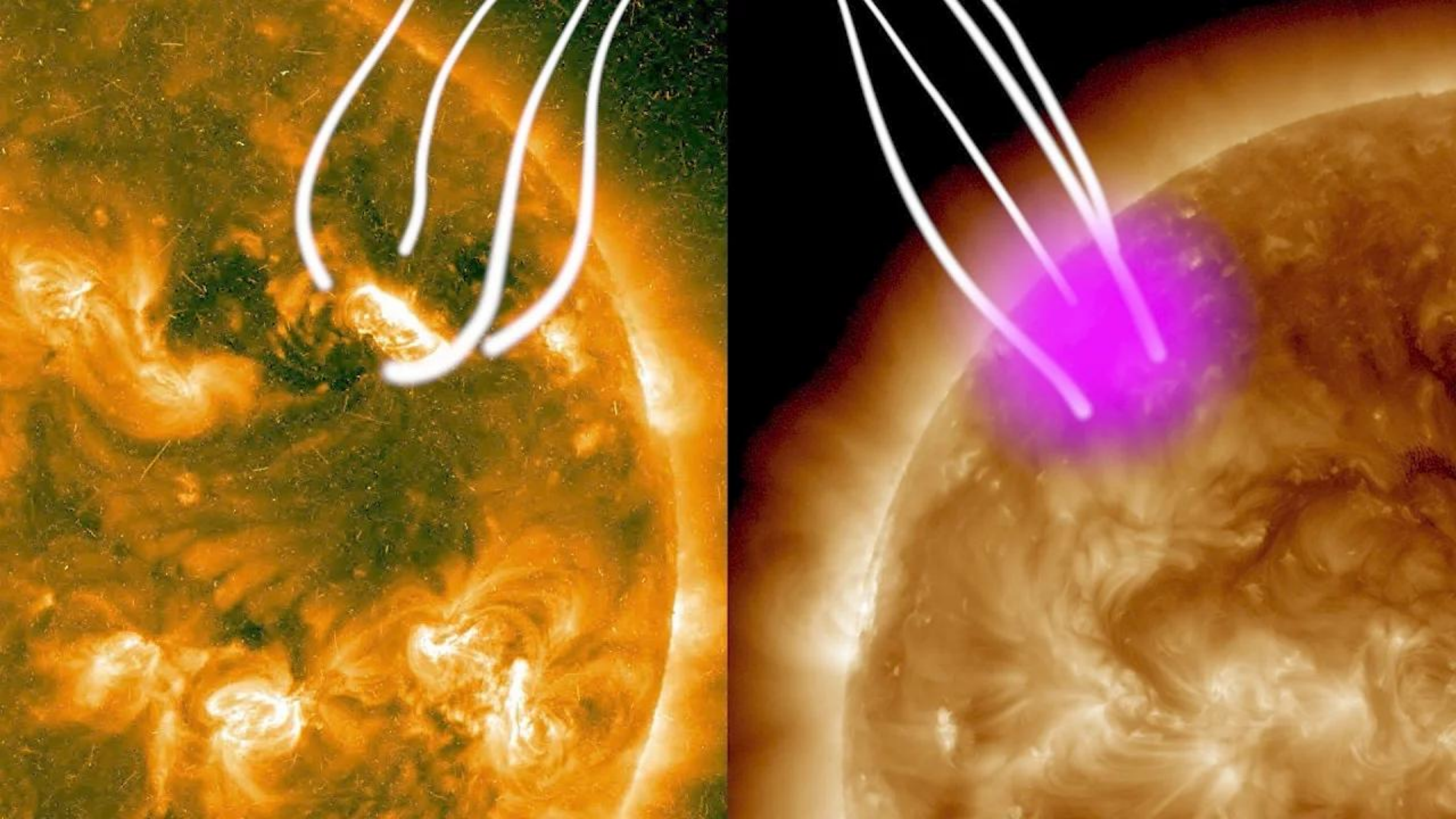

1
00:00:00,000 --> 00:00:03,990
Our sun's steady heat and light

2
00:00:04,010 --> 00:00:08,000
makes life on Earth possible, but instruments operating above

3
00:00:08,020 --> 00:00:11,600
our atmosphere see a more dynamic star. Magnetic

4
00:00:11,600 --> 00:00:16,000
activity associated with sunspots can fire off torrents of

5
00:00:16,030 --> 00:00:20,020
high-energy radiation and launch billion-ton clouds of plasma--

6
00:00:20,040 --> 00:00:23,520
called coronal mass ejection--into space.

7
00:00:23,520 --> 00:00:28,060
NASA's Fermi Gamma-ray Space Telescope orbits Earth and monitors the entire

8
00:00:28,080 --> 00:00:32,070
sky for gamma rays, the highest-energy light there is.

9
00:00:32,090 --> 00:00:36,080
Most of the time, the sun is merely a faint source of gamma rays,

10
00:00:36,100 --> 00:00:40,080
which are produced when high-energy particles called cosmic rays

11
00:00:40,100 --> 00:00:44,090
interact with either its surface gas or its lower-energy light.

12
00:00:44,110 --> 00:00:48,110
Occasionally, tangled magnetic fields near

13
00:00:48,130 --> 00:00:51,670

sunspots suddenly release their pent-up energy.

14
00:00:51,670 --> 00:00:56,120
This produces an explosion that rapidly accelerates charged particles to near

15
00:00:56,140 --> 00:01:00,130
the speed of light. Confined by magnetic fields,

16
00:01:00,150 --> 00:01:04,130
some of these particles toward the sun and excite gamma-ray emission.

17
00:01:04,150 --> 00:01:08,140
Suddenly, the sun may become the brightest object

18
00:01:08,160 --> 00:01:11,200
in Fermi's sky.

19
00:01:11,200 --> 00:01:16,140
Now, scientists say Fermi has caught gamma rays from solar storms located on the

20
00:01:16,170 --> 00:01:20,160
opposite side of the sun, where the spacecraft shouldn't be able to see them at all.

21
00:01:20,180 --> 00:01:24,190
Here's one of them.

22
00:01:24,210 --> 00:01:28,200
NASA's STEREO B spacecraft has a clear view of the solar flare, but

23
00:01:28,220 --> 00:01:32,220
the eruption cannot be seen by NASA's Solar Dynamics Observatory,

24
00:01:32,240 --> 00:01:36,220
which views the sun from the same direction as Earth and Fermi. Yet Fermi's

25
00:01:36,240 --> 00:01:40,230
Large Area Telescope detected gamma rays associated with this flare

26
00:01:40,250 --> 00:01:44,230
for nearly two hours. Here's what's going on.

27
00:01:44,250 --> 00:01:48,240
Magnetic field lines extend high above each active region on the sun

28
00:01:48,260 --> 00:01:52,240
and charged particles must travel along them.

29
00:01:52,260 --> 00:01:56,250
Some particles accelerated at the leading edge of a coronal mass ejection can

30
00:01:56,270 --> 00:02:00,260
follow these lines and strike the opposite side of the sun, traveling

31
00:02:00,280 --> 00:02:04,260
about 300,000 miles in less than five minutes.

32
00:02:04,280 --> 00:02:08,270
So far, Fermi has observed two additional

33
00:02:08,290 --> 00:02:12,280
farside flares, doubling the number of these rare detections.

34
00:02:12,300 --> 00:02:16,280
These observations will help scientists better understand how particles

35
00:02:16,300 --> 00:02:20,290
accelerate, travel, and interact to produce gamma rays

36
00:02:20,310 --> 00:02:24,290
during solar storms.

37
00:02:24,310 --> 00:02:28,310
[Music]