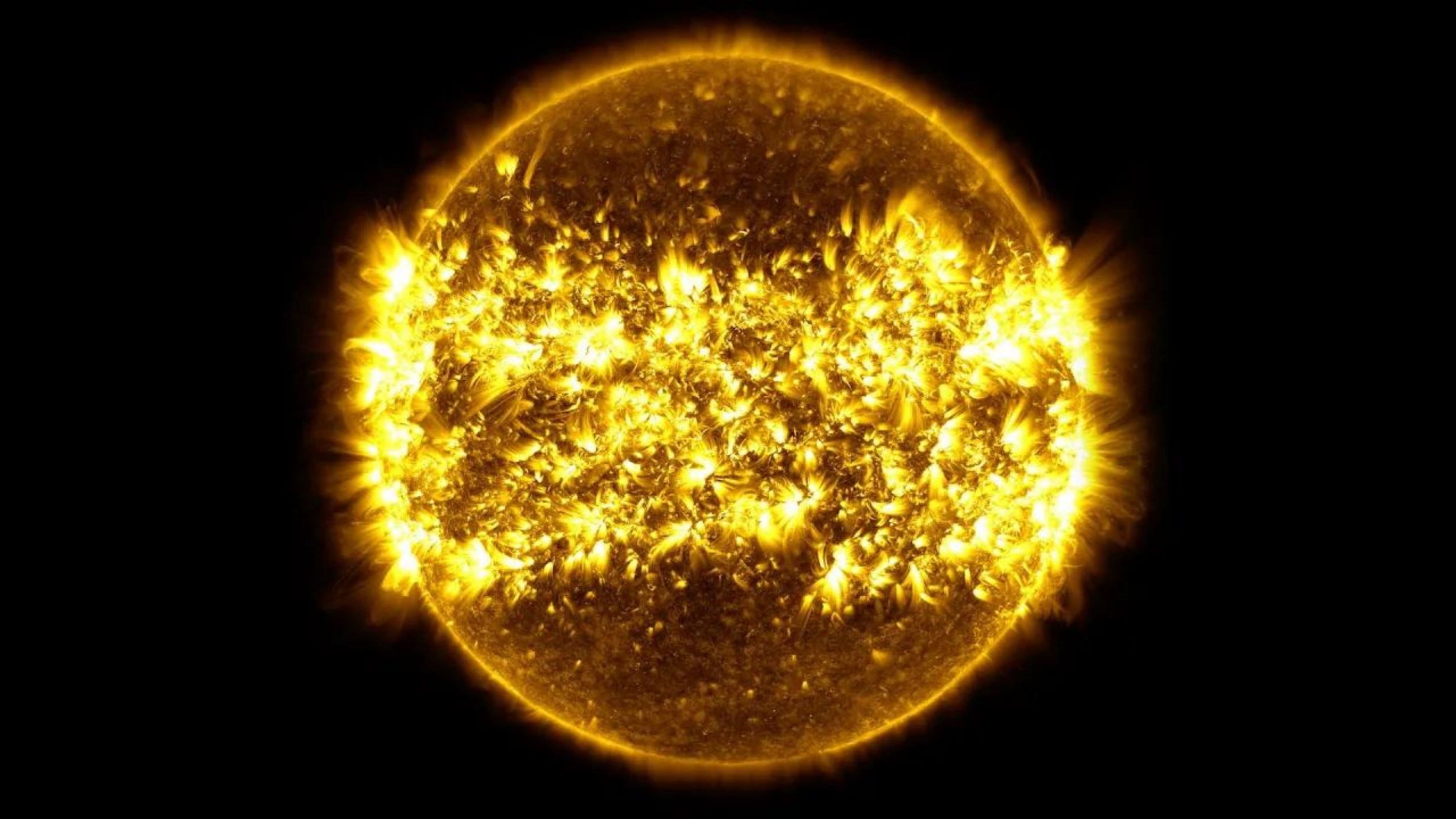

1
00:02:49,720 --> 00:00:04,020
[Music]

2
00:02:49,740 --> 00:02:53,740
Narrator: Hello, I'm Nicholeen Viall, and I'm

3
00:02:53,760 --> 00:02:57,810
a solar physicist at NASA's Goddard Space Flight Center.

4
00:02:57,830 --> 00:03:01,850
What we're looking at right now is imagery from the Solar Dynamics Observatory.

5
00:03:01,870 --> 00:03:05,910
All of the dynamics and activty that's going on in the

6
00:03:05,930 --> 00:03:09,920
solar corona, the sun's atmosphere, which is what I study.

7
00:03:09,940 --> 00:03:13,960
What we're seeing here is a filament and it looks very

8
00:03:13,980 --> 00:03:18,040
dark and it looks like it's actually maybe even on the surface of the sun.

9
00:03:18,060 --> 00:03:22,060
But we can see as the sun rotates around that actually it's

10
00:03:22,080 --> 00:03:26,130
suspended high up in the atmosphere, away from the surface. When viewed from

11
00:03:26,150 --> 00:03:30,230
this angle, we call them prominences. This material is

12
00:03:30,250 --> 00:03:34,260
held up in the corona by twisted magnetic fields

13
00:03:34,280 --> 00:03:38,310

We're looking at the solar corona in extreme ultraviolet

14
00:03:38,330 --> 00:03:42,380
at 171 angstroms, which is a wavelength that our

15
00:03:42,400 --> 00:03:46,410
eyes cannot see. My favorite thing is all of these

16
00:03:46,430 --> 00:03:50,470
magnetic loops that you can see on the sun, how dynamic

17
00:03:50,490 --> 00:03:54,480
these magnetic loops are, just telling us how much change

18
00:03:54,500 --> 00:03:58,530
and evolution and activity there is on the sun at all scales.

19
00:03:58,550 --> 00:04:02,600
We can see on the northern part

20
00:04:02,620 --> 00:04:06,630
of the sun that a prominence rotates onto the disk of the sun

21
00:04:06,650 --> 00:04:10,680
and then it erupts in a giant coronal mass ejection, and

22
00:04:10,700 --> 00:04:14,760
all of that magnetic energy and all of the plasma that was trapped on those magnetic field

23
00:04:14,780 --> 00:04:18,780
lines launches out into the solar system.

24
00:04:18,800 --> 00:04:22,840
[Music]

25
00:04:22,860 --> 00:04:26,910
We're watching the sun rotate right now, this is one of the basic features of the sun, and

26
00:04:26,930 --> 00:04:30,940
it takes about a month for sun to rotate fully around and to see the

27
00:04:30,960 --> 00:04:34,990
same spot on the sun come back. We're seeing the sun

28
00:04:35,010 --> 00:04:39,070
rotate so quickly in this movie because it's timelapsed.

29
00:04:39,090 --> 00:04:43,100
[Music]

30
00:04:43,120 --> 00:04:47,160
When the sun jumps around, that's actually

31
00:04:47,180 --> 00:04:51,180
the Solar Dynamics Observatory moving around and pointing

32
00:04:51,200 --> 00:04:55,220
different directions. Sometimes they have to point away from the sun so

33
00:04:55,240 --> 00:04:59,290
that they can calibrate their sensors, the cameras.

34
00:05:07,370 --> 00:05:03,320
[Music]

35
00:05:07,390 --> 00:05:11,440
When we see the frames go dark, that's eclipse

36
00:05:11,460 --> 00:05:15,480
season, so that's when the Solar Dynamics Observatory, which is orbiting the Earth,

37
00:05:15,500 --> 00:05:19,510
goes behind the Earth, and the Earth is between the Solar

38
00:05:19,530 --> 00:05:23,540

Dynamics Observatory and the sun, and so the Earth eclipses the images.

39
00:05:23,560 --> 00:05:27,620
These really bright spots, called

40
00:05:27,640 --> 00:05:31,660
active regions, have concentrated magnetic field and

41
00:05:31,680 --> 00:05:35,710
concentrated heating because of this extra magnetic field and the extra energy

42
00:05:35,730 --> 00:05:39,780
due to it. There are more active regions during solar maximum,

43
00:05:39,800 --> 00:05:43,810
and fewer active regions during solar minimum. And often these active regions

44
00:05:43,830 --> 00:05:47,860
can lead to solar eruptions such as solar flares and

45
00:05:47,880 --> 00:05:51,930
coronal mass ejections.

46
00:05:51,950 --> 00:05:55,950
I study the coronal heating problem. That is why

47
00:05:55,970 --> 00:06:00,000
the solar corona so much hotter than the solar surface below it.

48
00:06:00,020 --> 00:06:04,080
And we know that it has to do with the magnetic field, which is

49
00:06:04,100 --> 00:06:08,110
constantly dynamic and evolving and injecting

50
00:06:08,130 --> 00:06:12,160
energy into the solar corona, and you can really get a sense of that when you

51
00:06:12,180 --> 00:06:16,170
watch these Solar Dynamics Observatory movies.

52
00:06:16,190 --> 00:06:20,200
[Music][Beeping]