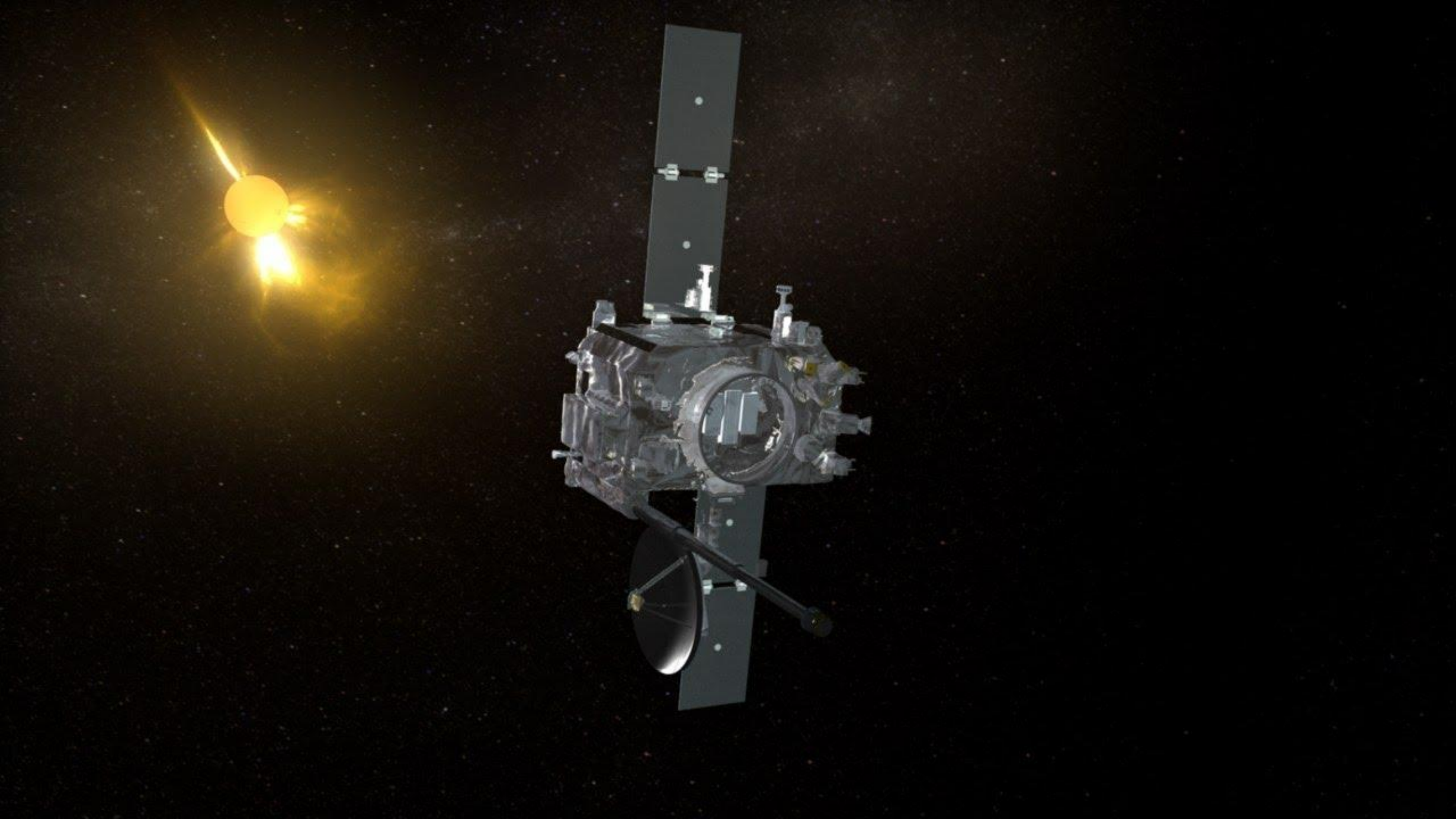

1
00:00:08,070 --> 00:00:04,040
Music

2
00:00:08,090 --> 00:00:12,120
NASA's STEREO spacecraft

3
00:00:12,140 --> 00:00:16,130
resolved a 40-year mystery about how coronal mass ejections, or

4
00:00:16,150 --> 00:00:20,160
CME's, change shape during their long journey. With new data

5
00:00:20,180 --> 00:00:24,190
processing techniques, STEREO scientists have succeeded in continuously

6
00:00:24,210 --> 00:00:28,220
tracking space weather events from the Sun's ultra hot corona to

7
00:00:28,240 --> 00:00:32,290
the Earth, 93 million miles away. A CME

8
00:00:32,310 --> 00:00:36,340
is a huge, magnetized cloud of electrified gas, or plasma,

9
00:00:36,360 --> 00:00:41,960
that bursts out of the sun's atmosphere. It can be as big as one-and-a-half trillion tons of

10
00:00:41,980 --> 00:00:46,000
gas and travel at 3 million miles per hour.

11
00:00:46,020 --> 00:00:50,050
If a powerful CME hits the Earth's protective magnetosphere, it

12
00:00:50,070 --> 00:00:54,080
makes brilliant aurora, and can disrupt satellites, radio communications,

13
00:00:54,100 --> 00:00:58,130

and even our electrical power grids. Despite decades of observations

14
00:00:58,150 --> 00:01:02,170
with NASA's Heliophysics fleet of spacecraft, the details

15
00:01:02,190 --> 00:01:06,200
of the connection between activity on the sun and its effect on Earth has

16
00:01:06,220 --> 00:01:10,240
been poorly understood. This is because CMEs change while traveling

17
00:01:10,260 --> 00:01:14,290
from the sun to Earth and it's difficult to track their movement with only a

18
00:01:14,310 --> 00:01:18,430
head-on perspective. Now, with STEREO's two spacecraft

19
00:01:18,450 --> 00:01:22,460
sitting on either side of the sun, we can monitor the sky at large

20
00:01:22,480 --> 00:01:26,480
angles from Earth, and can see the full ocean of empty space between the sun

21
00:01:26,500 --> 00:01:30,480
and Earth. But CME's are some 10 billion times

22
00:01:30,500 --> 00:01:34,510
fainter than the full moon and were still too dark to see until

23
00:01:34,530 --> 00:01:38,530
scientists applied cutting-edge image processing techniques to separate

24
00:01:38,550 --> 00:01:42,550
the CME's from the starfield.

25
00:01:42,570 --> 00:01:46,560
By applying this new technology scientists

26
00:01:46,580 --> 00:01:50,590
were able to measure the absolute brightness of detailed features in the first

27
00:01:50,610 --> 00:01:54,610
large Earth-directed CME seen by STEREO, which occurred

28
00:01:54,630 --> 00:01:58,620
in late 2008. By the time the data were collected,

29
00:01:58,640 --> 00:02:02,650
STEREO-A was nearly 45 degrees ahead of Earth in its orbit,

30
00:02:02,670 --> 00:02:06,690
affording a very clear view of the CME's path from

31
00:02:06,710 --> 00:02:10,710
sun to Earth. For the first time ever,

32
00:02:10,730 --> 00:02:14,740
scientists can watch a CME from its formation on the sun to its

33
00:02:14,760 --> 00:02:18,750
impact with Earth's magnetosphere ending decades of speculation

34
00:02:18,770 --> 00:02:22,810
about how features in the sun's corona cause the massive, complex shape of a

35
00:02:22,830 --> 00:02:26,850
CME as it expands to ten million times

36
00:02:26,870 --> 00:02:30,880
its size. This new ability to see developing space weather during

37
00:02:30,900 --> 00:02:34,900
its entire transit from the Sun will enable scientists to better predict when

38
00:02:34,920 --> 00:02:38,980

and how a CME will impact Earth and understand how

39
00:02:39,000 --> 00:02:43,010
CME's change between the sun and our home.

40
00:02:43,030 --> 00:02:47,020
Music