1
00:00:04,230 --> 00:00:03,429
d minus ten nine

2
00:00:05,269 --> 00:00:04,240
eight

3
00:00:06,309 --> 00:00:05,279
seven

4
00:00:07,349 --> 00:00:06,319
six

5
00:00:09,990 --> 00:00:07,359
five

6
00:00:10,950 --> 00:00:10,000
four go for main engine start three

7
00:00:11,990 --> 00:00:10,960
two

8
00:00:15,589 --> 00:00:12,000
one

9
00:00:18,070 --> 00:00:15,599
zero and ignition and liftoff of the

10
00:00:20,630 --> 00:00:18,080
atlas 5 with the solar dynamics

11
00:00:25,990 --> 00:00:20,640
observatory

12
00:00:27,910 --> 00:00:26,000
launched on february 11 2010 and has

13
00:00:30,390 --> 00:00:27,920

been watching the sun for the last 10

14
00:00:32,549 --> 00:00:30,400
years providing key insights into what

15
00:00:34,310 --> 00:00:32,559
drives the sun's activity including the

16
00:00:36,549 --> 00:00:34,320
space weather that our astronauts and

17
00:00:38,229 --> 00:00:36,559
spacecraft must travel through

18
00:00:40,389 --> 00:00:38,239
during that time it has witnessed

19
00:00:42,310 --> 00:00:40,399
incredible solar events and enabled

20
00:00:44,389 --> 00:00:42,320
scientists to make many groundbreaking

21
00:00:46,630 --> 00:00:44,399
discoveries about the sun

22
00:00:49,190 --> 00:00:46,640
here are some of the highlights

23
00:00:51,270 --> 00:00:49,200
in 2011 scientists spotted a special

24
00:00:53,590 --> 00:00:51,280
kind of ripple on the sun called kelvin

25
00:00:55,110 --> 00:00:53,600
helmholtz waves which look like curling

26
00:00:56,869 --> 00:00:55,120
ocean waves

27
00:00:59,830 --> 00:00:56,879
they are also present on the earth but

28
00:01:03,270 --> 00:00:59,840
aren't the size of the united states

29
00:01:05,590 --> 00:01:03,280
on june 7 2011 sdo spotted a huge

30
00:01:07,510 --> 00:01:05,600
eruption of plasma on the sun this was

31
00:01:10,149 --> 00:01:07,520
the first time such a large event had

32
00:01:12,789 --> 00:01:10,159
been captured in such fine detail

33
00:01:14,789 --> 00:01:12,799
two months later on august 9th sdo

34
00:01:17,510 --> 00:01:14,799
observed one of the most powerful flares

35
00:01:19,429 --> 00:01:17,520
of this solar cycle flares are intense

36
00:01:22,310 --> 00:01:19,439
bursts of radiation caused by the

37
00:01:24,230 --> 00:01:22,320
release of magnetic energy sdo records

38
00:01:26,149 --> 00:01:24,240

in many different wavelengths including

39
00:01:28,149 --> 00:01:26,159
one tuned to some of the hottest parts

40
00:01:31,429 --> 00:01:28,159
of the sun allowing it to see the full

41
00:01:33,990 --> 00:01:31,439
extent of these solar explosions

42
00:01:36,149 --> 00:01:34,000
on december 15th comet lovejoy seemed to

43
00:01:38,710 --> 00:01:36,159
survive a close pass of the sun but

44
00:01:41,990 --> 00:01:38,720
broke apart a few days later

45
00:01:44,069 --> 00:01:42,000
in 2012 scientists used sdo's wealth of

46
00:01:45,990 --> 00:01:44,079
information to create a new and

47
00:01:48,870 --> 00:01:46,000
impressionistic way to further

48
00:01:51,590 --> 00:01:48,880
understand temperature change on the sun

49
00:01:54,630 --> 00:01:51,600
on june 5th venus transited the face of

50
00:01:57,429 --> 00:01:54,640
the sun an event so rare it won't happen

51
00:02:00,550 --> 00:01:57,439
again until 2117.

52
00:02:02,630 --> 00:02:00,560
in july sdo's high resolution and rapid

53
00:02:04,950 --> 00:02:02,640
imaging cadence captured a beautiful

54
00:02:07,109 --> 00:02:04,960
solar loop where hot plasma condensed

55
00:02:09,430 --> 00:02:07,119
out of the atmosphere or corona and

56
00:02:11,750 --> 00:02:09,440
stuck to the strong magnetic fields

57
00:02:14,070 --> 00:02:11,760
pushing through the surface

58
00:02:16,070 --> 00:02:14,080
on august 31st the sun had a huge and

59
00:02:19,830 --> 00:02:16,080
beautiful prominence eruption that

60
00:02:24,869 --> 00:02:22,710
early in 2013 sdo imagery helped

61
00:02:27,589 --> 00:02:24,879
astronomers see the early formation of a

62
00:02:29,830 --> 00:02:27,599
coronal mass ejection or cme and the

63
00:02:31,190 --> 00:02:29,840

reconnection events that result in solar

64
00:02:33,589 --> 00:02:31,200
flares

65
00:02:35,670 --> 00:02:33,599
cmes release giant plumes of material

66
00:02:36,630 --> 00:02:35,680
from the sun that speed across the solar

67
00:02:38,390 --> 00:02:36,640
system

68
00:02:39,910 --> 00:02:38,400
they can interact with earth's magnetic

69
00:02:43,110 --> 00:02:39,920
environment and are hazardous to

70
00:02:45,110 --> 00:02:43,120
spacecraft and astronauts

71
00:02:47,350 --> 00:02:45,120
the sun was very active in september and

72
00:02:49,110 --> 00:02:47,360
october first forming what almost looked

73
00:02:52,550 --> 00:02:49,120
like a canyon and then crackling with

74
00:02:54,550 --> 00:02:52,560
flares and cmes for a week

75
00:02:57,670 --> 00:02:54,560
comet ison made its way around the sun

76
00:02:59,350 --> 00:02:57,680
on november 28th thanksgiving day but

77
00:03:00,790 --> 00:02:59,360
unlike lovejoy it broke apart

78
00:03:03,270 --> 00:03:00,800
immediately

79
00:03:05,190 --> 00:03:03,280
the sun remained active in 2014 with

80
00:03:07,110 --> 00:03:05,200
many beautiful prominence eruptions and

81
00:03:08,869 --> 00:03:07,120
bright flares

82
00:03:10,949 --> 00:03:08,879
estio worked in tandem with the new

83
00:03:13,509 --> 00:03:10,959
satellite iris to help study these

84
00:03:15,750 --> 00:03:13,519
flashes

85
00:03:18,149 --> 00:03:15,760
on december 19th just in time for the

86
00:03:21,190 --> 00:03:18,159
holidays the sun put on its final light

87
00:03:25,750 --> 00:03:23,430
the sun has a cycle of activity lasting

88
00:03:26,789 --> 00:03:25,760

an average of 11 years called the solar

89
00:03:28,789 --> 00:03:26,799
cycle

90
00:03:31,110 --> 00:03:28,799
2015 marked the beginning of the

91
00:03:31,870 --> 00:03:31,120
decrease in this cycle with fewer flares

92
00:03:34,229 --> 00:03:31,880
and eruptions

93
00:03:36,550 --> 00:03:34,239
[Music]

94
00:03:39,030 --> 00:03:36,560
on may 10 2016

95
00:03:40,149 --> 00:03:39,040
sdo saw another transit this time from

96
00:03:42,390 --> 00:03:40,159
mercury

97
00:03:44,390 --> 00:03:42,400
it looks much smaller because not only

98
00:03:46,789 --> 00:03:44,400
is the planet smaller than venus it's

99
00:03:49,110 --> 00:03:46,799
also farther away from earth where sdo

100
00:03:53,110 --> 00:03:49,120
is orbiting at 22 000 miles above the

101
00:03:55,429 --> 00:03:53,120
surface in a geosynchronous orbit

102
00:03:57,670 --> 00:03:55,439
the solar cycle had its last gasp of

103
00:03:59,990 --> 00:03:57,680
activity in 2017.

104
00:04:02,949 --> 00:04:00,000
in july a large sunspot made its way

105
00:04:05,270 --> 00:04:02,959
across the face as the sun rotated

106
00:04:07,429 --> 00:04:05,280
then in september a final burst of flare

107
00:04:12,070 --> 00:04:07,439
activity including the strongest flares

108
00:04:13,830 --> 00:04:12,080
since 2001 exploded off the sun

109
00:04:16,150 --> 00:04:13,840
since this activity the sun has been

110
00:04:18,870 --> 00:04:16,160
pretty quiet sinking into the lowest

111
00:04:20,629 --> 00:04:18,880
point of the solar activity cycle

112
00:04:22,950 --> 00:04:20,639
scientists were still able to go back

113
00:04:25,110 --> 00:04:22,960

through old sdo data and discover a new

114
00:04:26,950 --> 00:04:25,120
kind of explosion called forced magnetic

115
00:04:29,909 --> 00:04:26,960
reconnection

116
00:04:31,510 --> 00:04:29,919
on november 11 2019 mercury transited

117
00:04:33,189 --> 00:04:31,520
across the sun again

118
00:04:35,990 --> 00:04:33,199
this time with a much more sedate

119
00:04:40,070 --> 00:04:38,230
sdo scientists are aiming to continue

120
00:04:42,150 --> 00:04:40,080
watching the sun for at least another

121
00:04:44,469 --> 00:04:42,160
three years and the spacecraft could

122
00:04:46,310 --> 00:04:44,479
even last another decade

123
00:04:48,310 --> 00:04:46,320
during this time it should witness the

124
00:04:50,870 --> 00:04:48,320
rise of the next solar cycle and an

125
00:04:53,510 --> 00:04:50,880
increase in solar activity

126
00:04:55,270 --> 00:04:53,520
without a doubt sdo's last 10 years

127
00:04:57,590 --> 00:04:55,280
changed how we looked at and thought