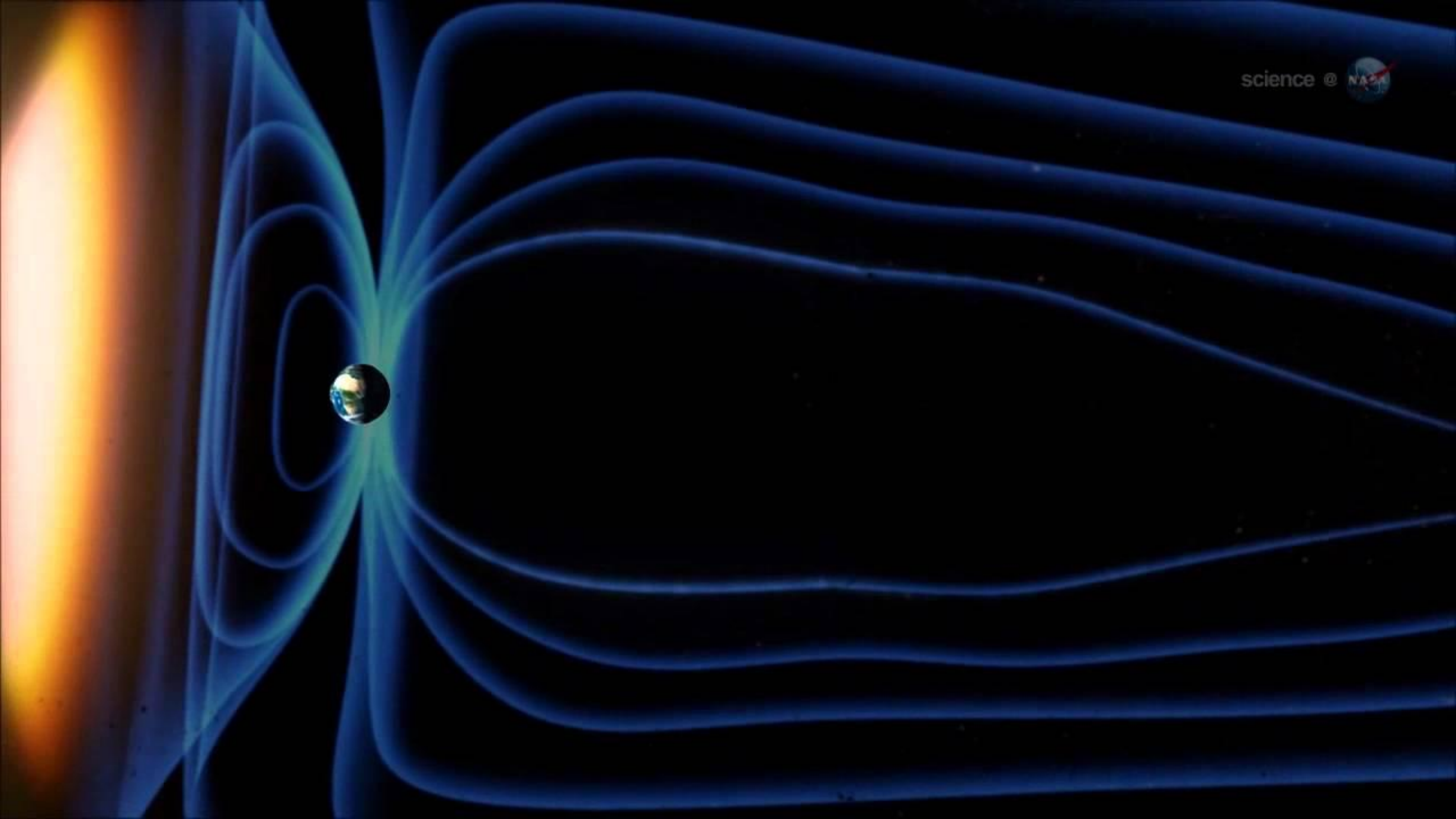
science @ NASA

1
00:00:10,390 --> 00:00:07,030
the surprising power of a solar storm

2
00:00:12,390 --> 00:00:10,400
presented by science at nasa

3
00:00:14,950 --> 00:00:12,400
solar storms are best known for the

4
00:00:18,150 --> 00:00:14,960
effect they have on arctic skies the

5
00:00:20,070 --> 00:00:18,160
aurora borealis is a wonder to behold

6
00:00:22,710 --> 00:00:20,080
satellites however are finding more

7
00:00:24,950 --> 00:00:22,720
power up there than meets the human eye

8
00:00:27,349 --> 00:00:24,960
nasa-funded researchers say a flurry of

9
00:00:29,509 --> 00:00:27,359
solar storms from march 8th to 10th

10
00:00:31,830 --> 00:00:29,519
dumped enough energy in earth's upper

11
00:00:34,709 --> 00:00:31,840
atmosphere to power every residence in

12
00:00:36,470 --> 00:00:34,719
new york city for two years

13
00:00:39,270 --> 00:00:36,480

this was the biggest dose of heat we've

14
00:00:41,750 --> 00:00:39,280
received from a solar storm since 2005

15
00:00:43,110 --> 00:00:41,760
says martin malenchak of nasa langley

16
00:00:45,590 --> 00:00:43,120
research center

17
00:00:48,310 --> 00:00:45,600
it was a big event and shows how solar

18
00:00:50,389 --> 00:00:48,320
activity can directly affect our planet

19
00:00:52,790 --> 00:00:50,399
melinchak is the associate principal

20
00:00:55,590 --> 00:00:52,800
investigator for the sabre instrument on

21
00:00:57,990 --> 00:00:55,600
board nasa's timed satellite

22
00:00:59,910 --> 00:00:58,000
saber monitors infrared emissions from

23
00:01:03,270 --> 00:00:59,920
earth's upper atmosphere

24
00:01:05,670 --> 00:01:03,280
in particular from carbon dioxide co2

25
00:01:08,149 --> 00:01:05,680
and nitric oxide no

26
00:01:10,390 --> 00:01:08,159
two substances that play a key role in

27
00:01:12,789 --> 00:01:10,400
the energy balance of air more than a

28
00:01:14,310 --> 00:01:12,799
hundred kilometers above our planet's

29
00:01:16,469 --> 00:01:14,320
surface

30
00:01:18,870 --> 00:01:16,479
carbon dioxide and nitric oxide are

31
00:01:21,190 --> 00:01:18,880
natural thermostats explains james

32
00:01:23,190 --> 00:01:21,200
russell of hampton university sabres

33
00:01:24,870 --> 00:01:23,200
principal investigator

34
00:01:26,630 --> 00:01:24,880
when the upper atmosphere or

35
00:01:29,270 --> 00:01:26,640
thermosphere heats up

36
00:01:32,230 --> 00:01:29,280
these molecules try as hard as they can

37
00:01:34,149 --> 00:01:32,240
to shed that heat back into space

38
00:01:37,670 --> 00:01:34,159

that's what happened on march 8th when a

39
00:01:40,469 --> 00:01:37,680
coronal mass ejection or cme propelled

40
00:01:43,510 --> 00:01:40,479
in our direction by an x5 class solar

41
00:01:45,670 --> 00:01:43,520
flare hit earth's magnetic field

42
00:01:47,990 --> 00:01:45,680
energetic particles rained down on the

43
00:01:49,429 --> 00:01:48,000
upper atmosphere depositing their energy

44
00:01:52,149 --> 00:01:49,439
where they hit

45
00:01:54,789 --> 00:01:52,159
the action produced spectacular auroras

46
00:01:58,069 --> 00:01:54,799
around the poles and significant upper

47
00:02:00,069 --> 00:01:58,079
atmospheric heating all around the globe

48
00:02:02,550 --> 00:02:00,079
the thermosphere lit up like a christmas

49
00:02:05,190 --> 00:02:02,560
tree says russell it began to glow

50
00:02:07,670 --> 00:02:05,200
intensely at infrared wavelengths as the

51
00:02:09,830 --> 00:02:07,680
thermostat effect kicked in

52
00:02:12,470 --> 00:02:09,840
for the three-day period march 8th

53
00:02:16,630 --> 00:02:12,480
through 10th the thermosphere absorbed

54
00:02:19,990 --> 00:02:16,640
26 billion kilowatt hours of energy

55
00:02:21,670 --> 00:02:20,000
infrared radiation from co2 and no the

56
00:02:24,949 --> 00:02:21,680
two most efficient coolants in the

57
00:02:27,190 --> 00:02:24,959
thermosphere re-radiated 95 of that

58
00:02:30,070 --> 00:02:27,200
total back into space

59
00:02:31,830 --> 00:02:30,080
in human terms this is a lot of energy

60
00:02:34,070 --> 00:02:31,840
according to the new york city mayor's

61
00:02:37,110 --> 00:02:34,080
office an average new york household

62
00:02:38,390 --> 00:02:37,120
consumes just under 4 700 kilowatt hours

63
00:02:40,790 --> 00:02:38,400

annually

64
00:02:42,869 --> 00:02:40,800
this means the geomagnetic storm dumped

65
00:02:45,030 --> 00:02:42,879
enough energy into the atmosphere to

66
00:02:46,630 --> 00:02:45,040
power every home in the big apple for

67
00:02:48,790 --> 00:02:46,640
two years

68
00:02:50,710 --> 00:02:48,800
unfortunately there's no practical way

69
00:02:53,589 --> 00:02:50,720
to harness this kind of energy says

70
00:02:56,309 --> 00:02:53,599
melinchak it's so diffuse and out of

71
00:02:58,390 --> 00:02:56,319
reach high above the earth's surface

72
00:03:01,350 --> 00:02:58,400
plus the majority of it has been sent

73
00:03:02,949 --> 00:03:01,360
back into space by the action of co2 and

74
00:03:04,470 --> 00:03:02,959
no

75
00:03:05,990 --> 00:03:04,480
during the heating impulse the

76
00:03:08,470 --> 00:03:06,000
thermosphere puffed up like a

77
00:03:10,949 --> 00:03:08,480
marshmallow held over a campfire

78
00:03:12,630 --> 00:03:10,959
temporarily increasing the drag on low

79
00:03:14,949 --> 00:03:12,640
orbiting satellites

80
00:03:17,589 --> 00:03:14,959
this is both good and bad

81
00:03:19,750 --> 00:03:17,599
on the one hand extra drag helps clear

82
00:03:21,910 --> 00:03:19,760
space junk out of earth orbit

83
00:03:23,750 --> 00:03:21,920
on the other hand it decreases the

84
00:03:25,350 --> 00:03:23,760
lifetime of useful satellites by

85
00:03:26,949 --> 00:03:25,360
bringing them closer to the day of

86
00:03:29,270 --> 00:03:26,959
reentry

87
00:03:31,589 --> 00:03:29,280
the storm is over now but russell and

88
00:03:33,670 --> 00:03:31,599

lynchak expect more to come

89
00:03:35,430 --> 00:03:33,680
we're just emerging from a deep solar

90
00:03:37,509 --> 00:03:35,440
minimum says russell

91
00:03:40,470 --> 00:03:37,519
the solar cycle is gaining strength with

92
00:03:42,869 --> 00:03:40,480
a maximum expected in 2013.

93
00:03:45,190 --> 00:03:42,879
more sunspots flinging more cmes toward

94
00:03:47,030 --> 00:03:45,200
earth adds up to more opportunities for

95
00:03:48,710 --> 00:03:47,040
sabre to study the heating effect of

96
00:03:50,710 --> 00:03:48,720
solar storms

97
00:03:53,030 --> 00:03:50,720
this is a new frontier in the sun earth

98
00:03:56,149 --> 00:03:53,040
connection says melinchak and the data

99
00:03:58,550 --> 00:03:56,159
we're collecting are unprecedented