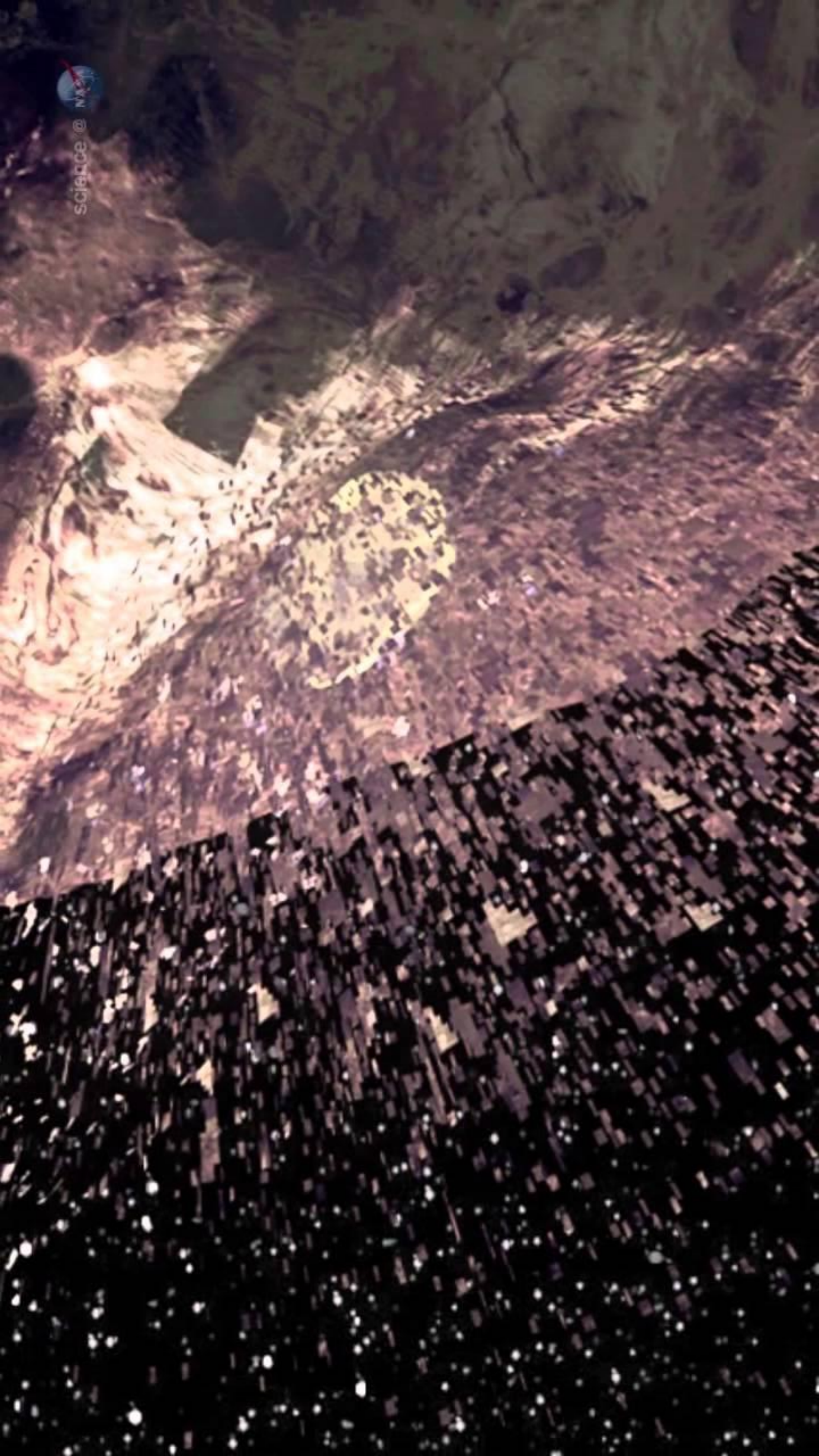
science @ NASA

1
00:00:10,150 --> 00:00:07,590
rock comet meteor shower presented by

2
00:00:12,629 --> 00:00:10,160
science at nasa

3
00:00:15,589 --> 00:00:12,639
every year in mid-december astronomers

4
00:00:17,590 --> 00:00:15,599
look up in the sky and witness a mystery

5
00:00:19,189 --> 00:00:17,600
it announces itself with a flurry of

6
00:00:21,109 --> 00:00:19,199
shooting stars

7
00:00:23,990 --> 00:00:21,119
for several nights in a row

8
00:00:26,230 --> 00:00:24,000
dozens to hundreds of meteors per hour

9
00:00:29,029 --> 00:00:26,240
cut across the glistening constellations

10
00:00:30,870 --> 00:00:29,039
of winter each one a piece of a puzzle

11
00:00:33,270 --> 00:00:30,880
waiting to be solved

12
00:00:35,990 --> 00:00:33,280
it's the geminid meteor shower set to

13
00:00:38,069 --> 00:00:36,000

peak on december 13th and 14th says bill

14
00:00:39,350 --> 00:00:38,079
cook of nasa's meteoroid environment

15
00:00:41,670 --> 00:00:39,360
office

16
00:00:44,150 --> 00:00:41,680
although the geminids come every year we

17
00:00:46,549 --> 00:00:44,160
still don't fully understand them most

18
00:00:48,709 --> 00:00:46,559
meteor showers are caused by icy comets

19
00:00:50,630 --> 00:00:48,719
which spew jets of meteoroids when they

20
00:00:52,790 --> 00:00:50,640
are heated by sunlight

21
00:00:55,189 --> 00:00:52,800
a recent example the orionid meteor

22
00:00:56,630 --> 00:00:55,199
shower of october was caused by halley's

23
00:00:58,470 --> 00:00:56,640
comet

24
00:01:01,029 --> 00:00:58,480
the geminids are different

25
00:01:05,109 --> 00:01:01,039
the parent is not a comet but a weird

26
00:01:07,429 --> 00:01:05,119
rocky object named 3200 phaethon

27
00:01:10,469 --> 00:01:07,439
when 3200 phaethon was discovered in

28
00:01:12,310 --> 00:01:10,479
1983 by nasa's iris satellite

29
00:01:14,789 --> 00:01:12,320
astronomers quickly realized that they

30
00:01:17,510 --> 00:01:14,799
had found the source of the geminids

31
00:01:19,270 --> 00:01:17,520
the orbit of 3200 phaethon was such a

32
00:01:20,469 --> 00:01:19,280
close match to that of the geminid

33
00:01:22,870 --> 00:01:20,479
debris stream

34
00:01:24,710 --> 00:01:22,880
no other conclusion was possible

35
00:01:27,510 --> 00:01:24,720
yet here was a puzzler

36
00:01:30,310 --> 00:01:27,520
everything about 3200 phaethon suggests

37
00:01:33,270 --> 00:01:30,320
it's an asteroid not a typical comet

38
00:01:35,910 --> 00:01:33,280

in fact 3200 phaethon resembles main

39
00:01:38,510 --> 00:01:35,920
belt asteroid palace so much it could

40
00:01:41,190 --> 00:01:38,520
well be a five kilometer chip off that

41
00:01:43,429 --> 00:01:41,200
544 kilometer block

42
00:01:45,590 --> 00:01:43,439
if 3200 phaethon broke apart from

43
00:01:46,550 --> 00:01:45,600
asteroid palace as some researchers

44
00:01:48,870 --> 00:01:46,560
believe

45
00:01:51,749 --> 00:01:48,880
then geminid meteoroids might be debris

46
00:01:54,710 --> 00:01:51,759
from the breakup speculates cook

47
00:01:59,109 --> 00:01:54,720
there is however another possibility

48
00:02:01,190 --> 00:01:59,119
perhaps 3200 phaethon is a rock comet

49
00:02:03,670 --> 00:02:01,200
a rock comet is a new kind of object

50
00:02:06,149 --> 00:02:03,680
being discussed by some astronomers

51
00:02:09,109 --> 00:02:06,159
it is essentially an asteroid that comes

52
00:02:11,190 --> 00:02:09,119
very close to the sun so close that

53
00:02:13,589 --> 00:02:11,200
solar heating scorches dusty debris

54
00:02:15,670 --> 00:02:13,599
right off its rocky surface

55
00:02:17,510 --> 00:02:15,680
rock comets could thus grow comet like

56
00:02:20,070 --> 00:02:17,520
tails made of gravelly debris that

57
00:02:22,390 --> 00:02:20,080
produce meteor showers on earth

58
00:02:24,390 --> 00:02:22,400
could this be the answer

59
00:02:26,949 --> 00:02:24,400
to test the idea researchers turn to

60
00:02:29,750 --> 00:02:26,959
nasa's twin stereo spacecraft which are

61
00:02:33,030 --> 00:02:29,760
designed to study solar activity

62
00:02:35,910 --> 00:02:33,040
in june 2009 stereo watched 3200

63
00:02:37,750 --> 00:02:35,920

phaethon passing only 15 solar diameters

64
00:02:39,990 --> 00:02:37,760
from the sun's surface

65
00:02:42,470 --> 00:02:40,000
what happened next surprised ucla

66
00:02:45,350 --> 00:02:42,480
planetary scientists david jewett and

67
00:02:47,990 --> 00:02:45,360
jing li who analyzed the data

68
00:02:50,550 --> 00:02:48,000
3200 phaethon unexpectedly brightened by

69
00:02:52,550 --> 00:02:50,560
a factor of two they wrote the most

70
00:02:55,030 --> 00:02:52,560
likely explanation is that phaethon

71
00:02:57,030 --> 00:02:55,040
ejected dust perhaps in response to a

72
00:02:58,790 --> 00:02:57,040
breakdown of surface rocks through

73
00:03:00,869 --> 00:02:58,800
thermal fracture and decomposition

74
00:03:03,670 --> 00:03:00,879
cracking of hydrated minerals in the

75
00:03:06,390 --> 00:03:03,680
intense heat of the sun

76
00:03:09,110 --> 00:03:06,400
so according to the stereo observations

77
00:03:10,550 --> 00:03:09,120
3200 phaethon does behave like a rock

78
00:03:16,309 --> 00:03:10,560
comet

79
00:03:19,030 --> 00:03:16,319
but jude and lee point out a problem

80
00:03:22,030 --> 00:03:19,040
the amount of dust 3200 phaeton ejected

81
00:03:24,949 --> 00:03:22,040
during its sun encounter added a paltry

82
00:03:26,390 --> 00:03:24,959
0.01 percent to the mass of the geminid

83
00:03:28,229 --> 00:03:26,400
debris strain

84
00:03:29,830 --> 00:03:28,239
not enough to keep the debris stream

85
00:03:33,110 --> 00:03:29,840
stocked up with meteoroids for the

86
00:03:35,589 --> 00:03:33,120
annual display of shooting stars 3200

87
00:03:37,589 --> 00:03:35,599
phaethon is not spewing enough dust to

88
00:03:39,190 --> 00:03:37,599

account for the geminids

89
00:03:41,910 --> 00:03:39,200
could the rock comet have been more

90
00:03:43,270 --> 00:03:41,920
active in the past we just don't know

91
00:03:45,589 --> 00:03:43,280
says cook

92
00:03:48,390 --> 00:03:45,599
forecasters expect geminid meteor rates

93
00:03:50,309 --> 00:03:48,400
to top 100 per hour when the shower

94
00:03:53,270 --> 00:03:50,319
peaks on the moonless nights of december

95
00:03:55,990 --> 00:03:53,280
13th and 14th 2012.

96
00:03:56,949 --> 00:03:56,000
cook encourages skywatches to go out

97
00:03:59,190 --> 00:03:56,959
look up

98
00:04:00,869 --> 00:03:59,200
and savor the mystery

99
00:04:03,270 --> 00:04:00,879
for more news about mysterious