



JAPAN

science @ NASA

1
00:00:09,830 --> 00:00:06,309
aurora's underfoot

2
00:00:11,509 --> 00:00:09,840
presented by science at nasa

3
00:00:13,830 --> 00:00:11,519
glowing green and red shimmering

4
00:00:16,710 --> 00:00:13,840
hypnotically across the night sky the

5
00:00:18,390 --> 00:00:16,720
aurora borealis is a wonder to behold

6
00:00:20,150 --> 00:00:18,400
long time sky watchers say it is the

7
00:00:21,750 --> 00:00:20,160
greatest show on earth

8
00:00:23,029 --> 00:00:21,760
it might be the greatest show in earth

9
00:00:25,429 --> 00:00:23,039
orbit too

10
00:00:27,189 --> 00:00:25,439
some 400 kilometers above our planet

11
00:00:29,349 --> 00:00:27,199
astronauts on board the international

12
00:00:31,109 --> 00:00:29,359
space station enjoy a unique view of

13
00:00:32,150 --> 00:00:31,119

earth's polar lights up close and

14

00:00:34,389 --> 00:00:32,160

personal

15

00:00:36,549 --> 00:00:34,399

we can actually fly into the auroras

16

00:00:39,430 --> 00:00:36,559

says astronaut don pettit a flight

17

00:00:41,110 --> 00:00:39,440

engineer for iss expedition 30.

18

00:00:43,590 --> 00:00:41,120

it's like being shrunk down and put

19

00:00:46,069 --> 00:00:43,600

inside of a neon sign

20

00:00:47,910 --> 00:00:46,079

auroras are caused by solar activity

21

00:00:50,549 --> 00:00:47,920

gusts of solar wind and coronal mass

22

00:00:52,150 --> 00:00:50,559

ejections strike earth's magnetic field

23

00:00:53,830 --> 00:00:52,160

rattling our planet's protective shell

24

00:00:55,750 --> 00:00:53,840

of magnetism

25

00:00:57,670 --> 00:00:55,760

this causes charged particles to rain

26
00:00:59,430 --> 00:00:57,680
down over the poles lighting up the

27
00:01:01,189 --> 00:00:59,440
atmosphere where they hit

28
00:01:03,590 --> 00:01:01,199
the physics is akin to what happens in

29
00:01:05,509 --> 00:01:03,600
the picture tube of a color tv

30
00:01:07,590 --> 00:01:05,519
incoming particles are guided by earth's

31
00:01:10,149 --> 00:01:07,600
magnetic field to a pair of donut-shaped

32
00:01:11,910 --> 00:01:10,159
regions called auroral ovals

33
00:01:13,670 --> 00:01:11,920
there's one around the north pole and

34
00:01:15,830 --> 00:01:13,680
one around the south

35
00:01:17,990 --> 00:01:15,840
sometimes when solar activity is high

36
00:01:19,830 --> 00:01:18,000
the ovals expand and the space station

37
00:01:21,429 --> 00:01:19,840
orbits right through them

38
00:01:24,310 --> 00:01:21,439

that's exactly what happened in late

39
00:01:26,310 --> 00:01:24,320
january 2012 when a sequence of powerful

40
00:01:28,789 --> 00:01:26,320
solar flares sparked a light show that

41
00:01:30,710 --> 00:01:28,799
pettit says he won't soon forget

42
00:01:32,950 --> 00:01:30,720
the auroras could be seen as brightly as

43
00:01:34,310 --> 00:01:32,960
city lights on the earth below and even

44
00:01:36,069 --> 00:01:34,320
in the day night terminator of the

45
00:01:38,550 --> 00:01:36,079
rising and setting sun

46
00:01:41,030 --> 00:01:38,560
it was simply amazing

47
00:01:42,550 --> 00:01:41,040
pettit is a skilled astrophotographer he

48
00:01:44,710 --> 00:01:42,560
and other members of the crew video

49
00:01:46,550 --> 00:01:44,720
recorded the displays producing footage

50
00:01:48,950 --> 00:01:46,560
that officials say is some of the best

51

00:01:50,630 --> 00:01:48,960

ever taken from earth orbit

52

00:01:52,789 --> 00:01:50,640

the videos capture the full range of

53

00:01:55,590 --> 00:01:52,799

aurora colors red

54

00:01:57,190 --> 00:01:55,600

green and many shades of purple

55

00:01:59,350 --> 00:01:57,200

these hues correspond to different

56

00:02:01,109 --> 00:01:59,360

quantum transitions in excited atoms of

57

00:02:03,109 --> 00:02:01,119

oxygen and nitrogen

58

00:02:04,789 --> 00:02:03,119

the precise color at any altitude

59

00:02:06,630 --> 00:02:04,799

depends on the temperature and density

60

00:02:08,469 --> 00:02:06,640

of the local atmosphere

61

00:02:10,710 --> 00:02:08,479

red auroras reach all the way up to our

62

00:02:11,670 --> 00:02:10,720

altitude 400 kilometers above earth says

63

00:02:13,190 --> 00:02:11,680

pettit

64

00:02:14,630 --> 00:02:13,200

sometimes you feel like you can reach

65

00:02:16,309 --> 00:02:14,640

out and touch them

66

00:02:18,949 --> 00:02:16,319

green emissions on the other hand tend

67

00:02:20,790 --> 00:02:18,959

to stay below the space station he says

68

00:02:23,350 --> 00:02:20,800

they move like a living shag carpet of

69

00:02:25,430 --> 00:02:23,360

lights we fly right over them

70

00:02:26,630 --> 00:02:25,440

surprisingly pettit does not find this

71

00:02:28,790 --> 00:02:26,640

unsettling

72

00:02:30,150 --> 00:02:28,800

it is not disorienting to see auroras

73

00:02:31,670 --> 00:02:30,160

underfoot he says

74

00:02:32,869 --> 00:02:31,680

perhaps it is because i have been up

75

00:02:34,830 --> 00:02:32,879

here so long

76

00:02:37,270 --> 00:02:34,840

what he does find disorienting is the

77

00:02:39,270 --> 00:02:37,280

meteors occasionally we see a meteor

78

00:02:41,270 --> 00:02:39,280

burning up in the atmosphere below and

79

00:02:43,589 --> 00:02:41,280

this does look strange

80

00:02:44,630 --> 00:02:43,599

you should be looking up for meteors not

81

00:02:46,790 --> 00:02:44,640

down

82

00:02:48,229 --> 00:02:46,800

as marvelous as these sites are petit

83

00:02:50,150 --> 00:02:48,239

has seen better

84

00:02:52,710 --> 00:02:50,160

he was the science officer for iss

85

00:02:54,309 --> 00:02:52,720

expedition 6 back in 2003 when the

86

00:02:55,430 --> 00:02:54,319

auroras were even stronger than they

87

00:02:57,190 --> 00:02:55,440

were now

88

00:02:58,949 --> 00:02:57,200

but this expedition is not over yet he

89

00:03:01,350 --> 00:02:58,959

points out hopefully

90

00:03:02,949 --> 00:03:01,360

indeed more auroras are in the offing

91

00:03:05,589 --> 00:03:02,959

following some recent years of deep

92

00:03:07,509 --> 00:03:05,599

quiet the sun is waking up again

93

00:03:11,030 --> 00:03:07,519

solar activity is now trending upward

94

00:03:12,949 --> 00:03:11,040

with a maximum expected in early 2013.

95

00:03:15,110 --> 00:03:12,959

this means the greatest show on earth

96

00:03:16,309 --> 00:03:15,120

and in earth orbit is about to get even

97

00:03:18,070 --> 00:03:16,319

better

98

00:03:19,750 --> 00:03:18,080

for updates and more great video from