Hubble Views the Moon to Study Earth

1
00:00:05,110 --> 00:00:01,990
taking advantage of the total lunar

2
00:00:07,670 --> 00:00:05,120
eclipse of january 2019 astronomers

3
00:00:10,950 --> 00:00:07,680
using nasa's hubble space telescope have

4
00:00:13,270 --> 00:00:10,960
detected ozone in earth's atmosphere

5
00:00:16,150 --> 00:00:13,280
in this observation hubble did not look

6
00:00:18,230 --> 00:00:16,160
at earth directly instead astronomers

7
00:00:19,750 --> 00:00:18,240
use the moon as a mirror to reflect

8
00:00:21,349 --> 00:00:19,760
sunlight that passed through earth's

9
00:00:23,509 --> 00:00:21,359
atmosphere

10
00:00:25,269 --> 00:00:23,519
this method serves as a proxy for how

11
00:00:27,750 --> 00:00:25,279
they will observe planets around other

12
00:00:29,189 --> 00:00:27,760
stars in search for worlds similar to

13
00:00:30,630 --> 00:00:29,199

our own

14
00:00:32,709 --> 00:00:30,640
though numerous ground-based

15
00:00:34,790 --> 00:00:32,719
observations of this kind have been done

16
00:00:36,389 --> 00:00:34,800
previously this is the first time

17
00:00:38,389 --> 00:00:36,399
ultraviolet light passing through

18
00:00:39,430 --> 00:00:38,399
earth's atmosphere was observed from

19
00:00:41,030 --> 00:00:39,440
space

20
00:00:43,190 --> 00:00:41,040
the measurements from this experiment

21
00:00:44,869 --> 00:00:43,200
detected the strong spectral fingerprint

22
00:00:47,830 --> 00:00:44,879
of ozone

23
00:00:49,750 --> 00:00:47,840
on earth photosynthesis over billions of

24
00:00:52,470 --> 00:00:49,760
years is responsible for our planet's

25
00:00:54,229 --> 00:00:52,480
high oxygen levels and thick ozone layer

26
00:00:56,869 --> 00:00:54,239
that's one reason why scientists think

27
00:00:58,630 --> 00:00:56,879
ozone or oxygen could be a sign of life

28
00:01:00,869 --> 00:00:58,640
on another planet

29
00:01:02,630 --> 00:01:00,879
but finding ozone on distant worlds

30
00:01:04,869 --> 00:01:02,640
isn't an easy task

31
00:01:07,270 --> 00:01:04,879
ultraviolet observations like this can

32
00:01:08,950 --> 00:01:07,280
best be conducted from space telescopes

33
00:01:11,030 --> 00:01:08,960
above the limiting effects of looking

34
00:01:12,870 --> 00:01:11,040
through earth's skies because ozone

35
00:01:14,710 --> 00:01:12,880
blocks most ultraviolet light from

36
00:01:17,429 --> 00:01:14,720
beyond the atmosphere

37
00:01:20,469 --> 00:01:17,439
one of nasa's major goals is to identify

38
00:01:22,149 --> 00:01:20,479

habitable and inhabited planets but how

39
00:01:24,149 --> 00:01:22,159
would we know whether a distant planet

40
00:01:26,149 --> 00:01:24,159
has ozone or not

41
00:01:27,990 --> 00:01:26,159
the atmospheres of some extrasolar

42
00:01:29,749 --> 00:01:28,000
planets can be probed if that distant

43
00:01:32,230 --> 00:01:29,759
world passes across the face of its

44
00:01:34,469 --> 00:01:32,240
parent star called a transit

45
00:01:36,069 --> 00:01:34,479
during a transit starlight filters

46
00:01:37,190 --> 00:01:36,079
through the backlit exoplanet's

47
00:01:41,270 --> 00:01:37,200
atmosphere

48
00:01:43,830 --> 00:01:41,280
tell-tale signature by filtering out

49
00:01:45,190 --> 00:01:43,840
certain colors of starlight astronomers

50
00:01:47,429 --> 00:01:45,200
have used hubble to observe the

51
00:01:50,069 --> 00:01:47,439
atmospheres of several gas giant planets

52
00:01:51,910 --> 00:01:50,079
that transit their stars but terrestrial

53
00:01:53,670 --> 00:01:51,920
planets are much smaller objects and

54
00:01:54,950 --> 00:01:53,680
their atmosphere thinner like the skin

55
00:01:57,270 --> 00:01:54,960
on an apple

56
00:01:58,870 --> 00:01:57,280
therefore teasing out these signatures

57
00:02:00,469 --> 00:01:58,880
is much more difficult

58
00:02:02,709 --> 00:02:00,479
to prepare for future studies with

59
00:02:04,789 --> 00:02:02,719
larger telescopes astronomers used

60
00:02:06,630 --> 00:02:04,799
hubble to conduct experiments on a much

61
00:02:09,350 --> 00:02:06,640
closer and only known inhabited

62
00:02:11,190 --> 00:02:09,360
terrestrial planet earth

63
00:02:12,869 --> 00:02:11,200

our planet's perfect alignment with the

64
00:02:14,869 --> 00:02:12,879
sun and moon during a total lunar

65
00:02:16,790 --> 00:02:14,879
eclipse mimics the geometry of a

66
00:02:17,910 --> 00:02:16,800
transiting terrestrial planet with its

67
00:02:19,589 --> 00:02:17,920
star

68
00:02:21,350 --> 00:02:19,599
but the observations were also

69
00:02:23,350 --> 00:02:21,360
challenging because the moon is very

70
00:02:24,949 --> 00:02:23,360
bright and its surface is not a perfect

71
00:02:27,190 --> 00:02:24,959
reflector because it is modeled with

72
00:02:29,589 --> 00:02:27,200
bright and dark areas

73
00:02:31,350 --> 00:02:29,599
the moon is also so close to earth that

74
00:02:33,509 --> 00:02:31,360
it appears to move very quickly in the

75
00:02:36,550 --> 00:02:33,519
sky making it harder for hubble to stay

76
00:02:38,390 --> 00:02:36,560
pointed at the same location however in

77
00:02:40,710 --> 00:02:38,400
spite of the challenges the experiment

78
00:02:42,630 --> 00:02:40,720
was an incredible success and hubble is

79
00:02:44,790 --> 00:02:42,640
supporting the ongoing quest to find

80
00:02:47,830 --> 00:02:44,800
planets that are similar to our own and