



1  
00:00:04,870 --> 00:00:02,710  
astronomers using archival data from

2  
00:00:06,869 --> 00:00:04,880  
nasa's hubble space telescope found

3  
00:00:09,910 --> 00:00:06,879  
evidence of water vapor in the thin

4  
00:00:11,990 --> 00:00:09,920  
atmosphere of jupiter's moon ganymede

5  
00:00:14,310 --> 00:00:12,000  
ganymede is the largest moon in our

6  
00:00:16,470 --> 00:00:14,320  
solar system larger than mercury and

7  
00:00:17,510 --> 00:00:16,480  
pluto and three-quarters the size of

8  
00:00:19,510 --> 00:00:17,520  
mars

9  
00:00:21,830 --> 00:00:19,520  
it's an ice-covered world that may hold

10  
00:00:23,429 --> 00:00:21,840  
more water than all of earth's oceans

11  
00:00:26,230 --> 00:00:23,439  
combined

12  
00:00:30,630 --> 00:00:26,240  
but unlike earth ganymede's oceans are

13  
00:00:33,510 --> 00:00:30,640

below its 100-mile thick icy crust

14

00:00:36,630 --> 00:00:33,520

ultraviolet images taken in 1998 and

15

00:00:39,190 --> 00:00:36,640

2010 using hubble's space telescope

16

00:00:41,750 --> 00:00:39,200

imaging spectrograph revealed bands of

17

00:00:44,389 --> 00:00:41,760

charged particles at ganymede similar to

18

00:00:45,830 --> 00:00:44,399

earth's polar auroral ovals the regions

19

00:00:48,549 --> 00:00:45,840

that give us our northern and southern

20

00:00:50,869 --> 00:00:48,559

lights but the two observations revealed

21

00:00:53,110 --> 00:00:50,879

differences in ganymede's auroral bands

22

00:00:54,790 --> 00:00:53,120

over time the researchers thought these

23

00:00:58,229 --> 00:00:54,800

differences were due to the presence of

24

00:01:01,110 --> 00:00:58,239

atomic oxygen or single oxygen atoms in

25

00:01:02,630 --> 00:01:01,120

ganymede's atmosphere atomic oxygen

26

00:01:04,310 --> 00:01:02,640

affects one of the wavelengths of

27

00:01:05,670 --> 00:01:04,320

ultraviolet light the scientists were

28

00:01:08,710 --> 00:01:05,680

looking at

29

00:01:10,469 --> 00:01:08,720

in 2018 researchers used hubble's cosmic

30

00:01:12,630 --> 00:01:10,479

origin spectrograph to measure the

31

00:01:16,310 --> 00:01:12,640

amount of atomic oxygen in ganymede's

32

00:01:19,830 --> 00:01:16,320

atmosphere they compared the 1998 2010

33

00:01:22,469 --> 00:01:19,840

and 2018 data to their surprise the 2018

34

00:01:24,390 --> 00:01:22,479

data revealed hardly any atomic oxygen

35

00:01:26,310 --> 00:01:24,400

in ganymede's atmosphere there had to be

36

00:01:28,950 --> 00:01:26,320

another explanation for the differences

37

00:01:30,789 --> 00:01:28,960

in the aurora images ganymede's surface

38

00:01:33,910 --> 00:01:30,799

temperature varies widely throughout the

39

00:01:35,990 --> 00:01:33,920

day and around noon near its equator it

40

00:01:37,990 --> 00:01:36,000

may get warm enough for surface ice to

41

00:01:40,149 --> 00:01:38,000

release water molecules

42

00:01:43,270 --> 00:01:40,159

instead of melting and forming liquid

43

00:01:46,389 --> 00:01:43,280

water the icy surface warms and changes

44

00:01:48,389 --> 00:01:46,399

from a solid directly to a gas a process

45

00:01:50,550 --> 00:01:48,399

called sublimation

46

00:01:52,149 --> 00:01:50,560

looking back at the original images the

47

00:01:54,710 --> 00:01:52,159

team discovered the differences they

48

00:01:56,630 --> 00:01:54,720

observed in ganymede's auroral bands are

49

00:01:59,590 --> 00:01:56,640

related to where water vapor would be

50

00:02:01,590 --> 00:01:59,600

expected in the moon's atmosphere

51  
00:02:03,990 --> 00:02:01,600  
understanding the jovian system and

52  
00:02:05,990 --> 00:02:04,000  
unraveling its history from its origins

53  
00:02:07,910 --> 00:02:06,000  
to the possible emergence of habitable

54  
00:02:10,070 --> 00:02:07,920  
environments will provide us with a

55  
00:02:12,390 --> 00:02:10,080  
better understanding of how gas giant

56  
00:02:13,430 --> 00:02:12,400  
planets and their satellites form and

57  
00:02:15,270 --> 00:02:13,440  
evolve

58  
00:02:17,670 --> 00:02:15,280  
along with learning more about jupiter

59  
00:02:19,670 --> 00:02:17,680  
and its mysterious moon ganymede this

60  
00:02:22,229 --> 00:02:19,680  
exciting new discovery has brought us