1
00:00:00,234 --> 00:00:03,770
NASA’s Hubble Space Telescope
has directly imaged what may be

2
00:00:03,770 --> 00:00:08,408
plumes of water vapor on
Jupiter’s icy moon Europa.

3
00:00:08,408 --> 00:00:11,411
Europa has long been thought to
harbor a global ocean of water

4
00:00:11,411 --> 00:00:14,781
beneath its surface of ice,
making it a prime target of

5
00:00:14,781 --> 00:00:18,352
study for anyone interested in
searching for alien life.

6
00:00:18,352 --> 00:00:20,954
Eventually our search for life
will take us into that ocean,

7
00:00:20,954 --> 00:00:24,691
but until then, the existence of
a water vapor plume would

8
00:00:24,691 --> 00:00:29,329
provide an early glimpse into
the ocean’s conditions. In 2012,

9
00:00:29,329 --> 00:00:32,065
a team of astronomers used the
Hubble Space Telescope to

10
00:00:32,065 --> 00:00:35,969
observe a faint aurora from the
interaction of Europa and

11
00:00:35,969 --> 00:00:38,705
Jupiter’s magnetic field. They
detected emissions in

12
00:00:38,705 --> 00:00:41,909
wavelengths characteristic of
the breakup of water molecules,

13
00:00:41,909 --> 00:00:44,678
and after considering a wide
variety of causes, the team

14
00:00:44,678 --> 00:00:47,681
concluded that the most
plausible explanation for these

15
00:00:47,681 --> 00:00:51,084
spectroscopic measurements was
the existence of plumes of water

16
00:00:51,084 --> 00:00:54,821
vapor erupting from the surface
of Europa. Now a different team

17
00:00:54,821 --> 00:00:57,357
of astronomers has used a
different method with similar

18
00:00:57,357 --> 00:01:00,928
results - they used Hubble to
image Europa in ultraviolet

19
00:01:00,928 --> 00:01:03,997
light as the moon transited
across the disk of Jupiter and

20
00:01:03,997 --> 00:01:06,800
were actually able to take
direct images of what appear to

21
00:01:06,800 --> 00:01:11,171
be the silhouettes of plumes
rising about 125 miles above the

22
00:01:11,171 --> 00:01:14,808
surface of Europa. If these
observations are indeed of water

23
00:01:14,808 --> 00:01:17,978
vapor plumes, then they
approximately match the 2012

24
00:01:17,978 --> 00:01:21,014
observation estimates for the
plumes' mass, height, and

25
00:01:21,014 --> 00:01:23,951
location. Also, these plumes are
transient, meaning they come and

26
00:01:23,951 --> 00:01:26,486
they go - out of ten
observations of Europa

27
00:01:26,486 --> 00:01:30,290
transiting across Jupiter, the
team saw possible plumes on just

28
00:01:30,290 --> 00:01:34,394
three of the transits. Both the
recent observations and the 2012

29
00:01:34,394 --> 00:01:37,764
observations provide evidence,
not proof, of water vapor plumes

30
00:01:37,764 --> 00:01:41,501
on Europa. Science is a process;
it's not always cut-and-dried.

31
00:01:41,501 --> 00:01:44,104
But future observations by
Hubble, and infrared

32
00:01:44,104 --> 00:01:47,641
observations by the James Webb
Space Telescope, could continue

33
00:01:47,641 --> 00:01:49,810
to build a case for the
existence of these plumes on

34
00:01:49,810 --> 00:01:53,914
Europa. And then NASA’s future
Europa flyby mission would

35
00:01:53,914 --> 00:01:56,450
continue the search for the
plumes and visit them to look