



1  
00:00:08,230 --> 00:00:06,230  
nasa-funded scientists estimate that the

2  
00:00:10,390 --> 00:00:08,240  
volume of water molecules locked in

3  
00:00:12,390 --> 00:00:10,400  
minerals in the moon's interior could

4  
00:00:14,629 --> 00:00:12,400  
exceed the volume of water in the great

5  
00:00:16,550 --> 00:00:14,639  
lakes here on earth scientists at the

6  
00:00:18,870 --> 00:00:16,560  
carnegie institutions geophysical

7  
00:00:21,029 --> 00:00:18,880  
laboratory along with scientists across

8  
00:00:23,109 --> 00:00:21,039  
the nation determined that the water was

9  
00:00:25,509 --> 00:00:23,119  
likely present very early in the moon's

10  
00:00:27,910 --> 00:00:25,519  
formation history as the hot magma

11  
00:00:30,070 --> 00:00:27,920  
started to cool and crystallize

12  
00:00:32,310 --> 00:00:30,080  
the result means water is native to the

13  
00:00:35,110 --> 00:00:32,320

moon it's found in its structural form

14

00:00:49,590 --> 00:00:35,120

hydroxyl a very minor component of the

15

00:00:49,600 --> 00:00:54,869

as one small step for man

16

00:01:09,910 --> 00:00:55,910

one

17

00:01:16,870 --> 00:01:13,429

beautiful view is that something

18

00:01:16,880 --> 00:01:20,310

magnificent desolation

19

00:01:30,310 --> 00:01:22,390

how is the quality of the tv

20

00:01:38,390 --> 00:01:32,230

yes indeed they've got the flag up now

21

00:01:38,400 --> 00:02:10,710

beautiful

22

00:02:17,110 --> 00:02:14,150

hydroxyl is oh and we all know that

23

00:02:19,190 --> 00:02:17,120

water is h<sub>2</sub>o so somewhere along the

24

00:02:21,990 --> 00:02:19,200

along the way

25

00:02:22,949 --> 00:02:22,000

hydroxyl which was originally water lost

26

00:02:25,350 --> 00:02:22,959

an h

27

00:02:27,350 --> 00:02:25,360

well that process occurred billions of

28

00:02:28,390 --> 00:02:27,360

years ago when the moon originally

29

00:02:29,750 --> 00:02:28,400

formed

30

00:02:33,030 --> 00:02:29,760

and so the measurements that they're

31

00:02:36,229 --> 00:02:33,040

making now finding these very small

32

00:02:39,190 --> 00:02:36,239

incredibly tiny amounts of hydroxyl tell

33

00:02:41,910 --> 00:02:39,200

us a lot about the amount of water at

34

00:02:44,470 --> 00:02:41,920

the early formation stage of the earth

35

00:02:47,509 --> 00:02:44,480

and the moon well this is not

36

00:02:49,990 --> 00:02:47,519

really h<sub>2</sub>o water that we know so it's

37

00:02:52,949 --> 00:02:50,000

not like it's pools of water or even

38

00:02:55,670 --> 00:02:52,959

ponds of water it's actually ancient

39

00:02:59,110 --> 00:02:55,680

water that has been modified in the

40

00:03:01,589 --> 00:02:59,120

solidification process of the moon

41

00:03:03,350 --> 00:03:01,599

during the time of its early formation

42

00:03:05,509 --> 00:03:03,360

what's really exciting about these

43

00:03:08,149 --> 00:03:05,519

observations is it's allowing us for the

44

00:03:11,509 --> 00:03:08,159

first time to understand what the

45

00:03:13,830 --> 00:03:11,519

conditions of the early earth was

46

00:03:15,910 --> 00:03:13,840

when the earth and the moon were formed

47

00:03:18,790 --> 00:03:15,920

together from a collision from a

48

00:03:20,390 --> 00:03:18,800

mars-sized object that hit the earth 4.5

49

00:03:22,390 --> 00:03:20,400

billion years ago well there's been

50

00:03:24,949 --> 00:03:22,400

quite a bit of talk about how did the

51

00:03:27,910 --> 00:03:24,959

earth get the water that it has

52

00:03:29,830 --> 00:03:27,920

did it begin that way or did the comets

53

00:03:31,110 --> 00:03:29,840

bring it in or even the kuiper belt

54

00:03:33,270 --> 00:03:31,120

objects

55

00:03:35,589 --> 00:03:33,280

bringing it bringing water in and so

56

00:03:37,190 --> 00:03:35,599

this is now the first evidence that we

57

00:03:38,630 --> 00:03:37,200

had that there actually was a fair

58

00:03:41,509 --> 00:03:38,640

amount of water

59

00:03:44,070 --> 00:03:41,519

initially in the earth moon system 4.5

60

00:03:47,509 --> 00:03:44,080

billion years ago what the scientists

61

00:03:49,830 --> 00:03:47,519

discovered by examining specific

62

00:03:52,710 --> 00:03:49,840

lunar rocks and these lunar rocks are

63

00:03:56,630 --> 00:03:52,720

called apatite and apatite is one of

64

00:04:00,070 --> 00:03:56,640

those as it forms it grabs water now it

65

00:04:02,390 --> 00:04:00,080

did that in its early formation 4.5

66

00:04:04,949 --> 00:04:02,400

billion years ago it liberates the

67

00:04:09,030 --> 00:04:04,959

hydrogen and leaves what's called

68

00:04:10,949 --> 00:04:09,040

hydroxyl an o-h molecule stuck within

69

00:04:13,030 --> 00:04:10,959

its crystalline structure

70

00:04:15,670 --> 00:04:13,040

and so the scientists with instruments

71

00:04:18,150 --> 00:04:15,680

that are that are far better than we've

72

00:04:20,550 --> 00:04:18,160

ever had before we're able to detect

73

00:04:24,070 --> 00:04:20,560

appetite within the appetite this

74

00:04:26,390 --> 00:04:24,080

hydroxyl at parts per billion and that