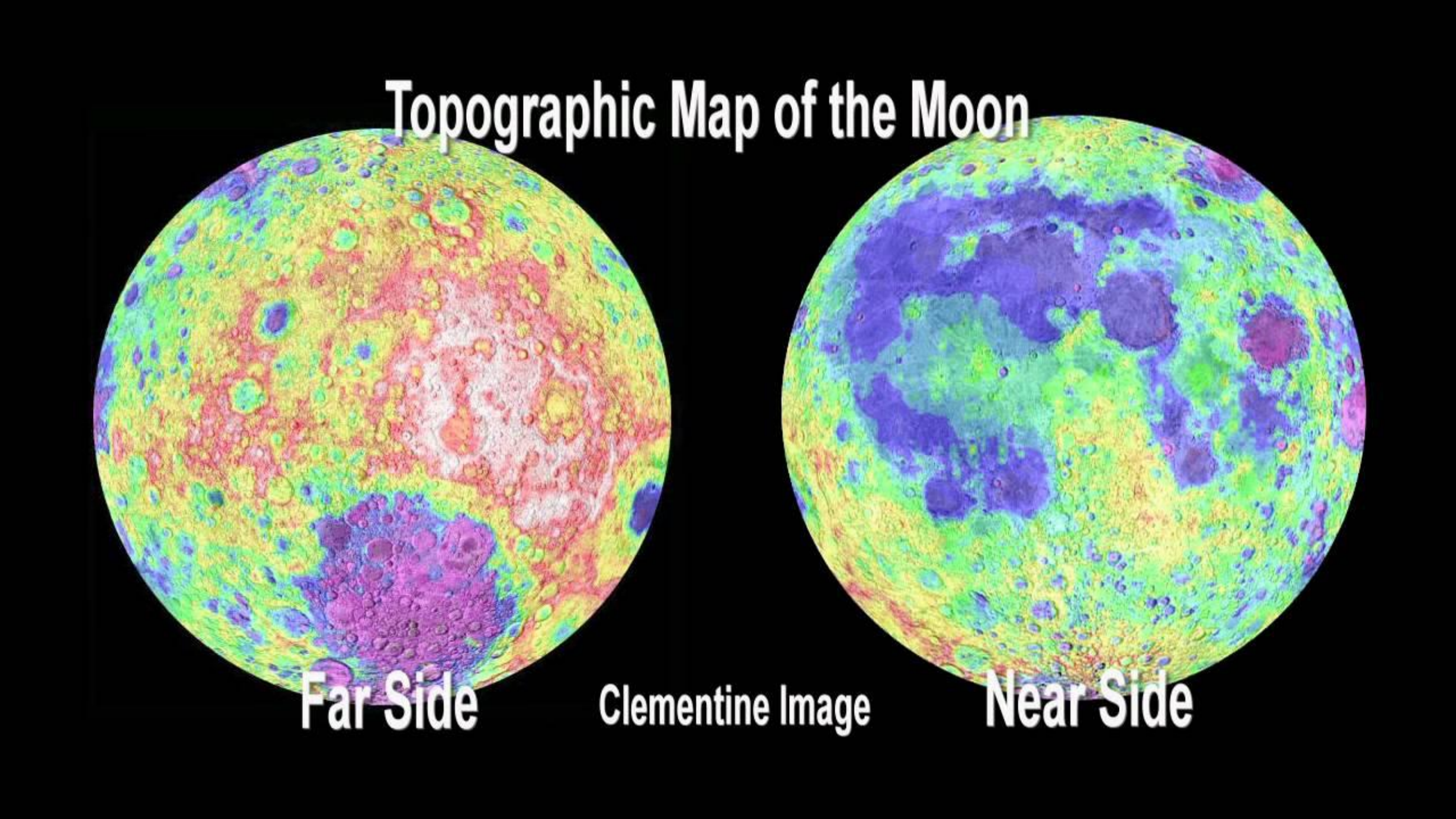
Topographic Map of the Moon
Far Side
Clementine Image
Near Side

1
00:00:07,760 --> 00:00:06,440
understanding how the moon has developed

2
00:00:09,770 --> 00:00:07,770
would really help us in understanding

3
00:00:11,839 --> 00:00:09,780
how the other plants in the inner part

4
00:00:14,419 --> 00:00:11,849
of the solar system the rocky planets

5
00:00:15,980 --> 00:00:14,429
have also developed the purpose of the

6
00:00:18,710 --> 00:00:15,990
ground mission is to investigate the

7
00:00:20,570 --> 00:00:18,720
interior structure of the moon to

8
00:00:23,660 --> 00:00:20,580
achieve that we have to measure the

9
00:00:25,730 --> 00:00:23,670
gravitational field of the moon so we're

10
00:00:27,710 --> 00:00:25,740
all familiar with with tides on the

11
00:00:29,779 --> 00:00:27,720
earth that are that are caused by the

12
00:00:32,420 --> 00:00:29,789
moon the moon actually has similar title

13
00:00:33,920 --> 00:00:32,430

response and when the moon changes its

14
00:00:35,750 --> 00:00:33,930
shape a little bit due to those tides

15
00:00:36,920 --> 00:00:35,760
just like the earth does we can actually

16
00:00:38,720 --> 00:00:36,930
measure that that affects the gravity

17
00:00:40,430 --> 00:00:38,730
field there's a lunar shape varies his

18
00:00:43,850 --> 00:00:40,440
gravity field changes and we're able to

19
00:00:46,520 --> 00:00:43,860
observe that we are using a very simple

20
00:00:48,110 --> 00:00:46,530
measurement which is gravity it's a

21
00:00:51,020 --> 00:00:48,120
little bit like taking the cat scan of

22
00:00:54,950 --> 00:00:51,030
the moon but using the gravity waves

23
00:00:57,200 --> 00:00:54,960
instead of acoustic waves to unlock the

24
00:01:00,410 --> 00:00:57,210
secrets of the interior of the moon we

25
00:01:03,020 --> 00:01:00,420
have two spacecraft that are in a polar

26
00:01:04,990 --> 00:01:03,030
orbit around the moon want essentially

27
00:01:08,030 --> 00:01:05,000
chasing each other around the moon

28
00:01:09,800 --> 00:01:08,040
there's a part of the Earth's moon a

29
00:01:12,410 --> 00:01:09,810
very significant part at the far side of

30
00:01:14,030 --> 00:01:12,420
the moon that is that does not present

31
00:01:16,130 --> 00:01:14,040
its face to the earth so we can never

32
00:01:17,870 --> 00:01:16,140
directly observe the spacecraft as it

33
00:01:20,920 --> 00:01:17,880
goes across the forest of the moon using

34
00:01:24,530 --> 00:01:20,930
earth-based tracking antennas so the

35
00:01:26,390 --> 00:01:24,540
solution to that was rather than track

36
00:01:29,780 --> 00:01:26,400
the motion of the spacecraft as it's

37
00:01:31,700 --> 00:01:29,790
orbiting a moon from the earth track it

38
00:01:34,370 --> 00:01:31,710

with another spacecraft also orbiting

39
00:01:37,730 --> 00:01:34,380
the moon it's essentially the same

40
00:01:40,399 --> 00:01:37,740
technology as the GPS in your mobile

41
00:01:43,219 --> 00:01:40,409
phone and in fact the two orbiters

42
00:01:46,190 --> 00:01:43,229
together form sort of a mini GPS and

43
00:01:48,139 --> 00:01:46,200
receiver constellation except using

44
00:01:50,660 --> 00:01:48,149
different frequencies from normal GPS

45
00:01:53,120 --> 00:01:50,670
the first thing we do actually once the

46
00:01:55,399 --> 00:01:53,130
map is in our hands is compare it with

47
00:01:59,179 --> 00:01:55,409
the topography map hopefully of

48
00:02:01,429 --> 00:01:59,189
comparable resolution and from there we

49
00:02:03,980 --> 00:02:01,439
can look at specific features such as

50
00:02:05,690 --> 00:02:03,990
mountains and basin craters

51
00:02:07,370 --> 00:02:05,700
and compare the gravity on the

52
00:02:09,469 --> 00:02:07,380
topography this is where it gets really

53
00:02:11,870 --> 00:02:09,479
interesting you would normally think

54
00:02:15,320 --> 00:02:11,880
that if there is a mountain present on

55
00:02:17,360 --> 00:02:15,330
the planet there's additional mass and

56
00:02:19,760 --> 00:02:17,370
additional gravitational signal as the

57
00:02:22,699 --> 00:02:19,770
spacecraft flies over it but if it does

58
00:02:24,980 --> 00:02:22,709
and there is no additional gravity

59
00:02:26,390 --> 00:02:24,990
signal then something on the inside is

60
00:02:28,490 --> 00:02:26,400
going on that is particularly

61
00:02:32,210 --> 00:02:28,500
interesting and that's what we want to

62
00:02:34,910 --> 00:02:32,220
know when I was just getting into middle

63
00:02:36,860 --> 00:02:34,920

school I had to rely on my information

64
00:02:39,350 --> 00:02:36,870
on the moon watching the Apollo missions

65
00:02:43,010 --> 00:02:39,360
on television we wondered students to

66
00:02:45,280 --> 00:02:43,020
have a hands-on role in exploring the

67
00:02:50,240 --> 00:02:45,290
moon it's an experiment called moon cam

68
00:02:53,449 --> 00:02:50,250
we will have up to four cameras on each

69
00:02:57,170 --> 00:02:53,459
Grail spacecraft students will be able

70
00:03:00,140 --> 00:02:57,180
to look at the ground track of where

71
00:03:03,800 --> 00:03:00,150
Grail will be at going around the moon

72
00:03:05,870 --> 00:03:03,810
on a daily basis and to propose images

73
00:03:09,229 --> 00:03:05,880
that will be taken it's going to go a

74
00:03:11,570 --> 00:03:09,239
long way towards helping students