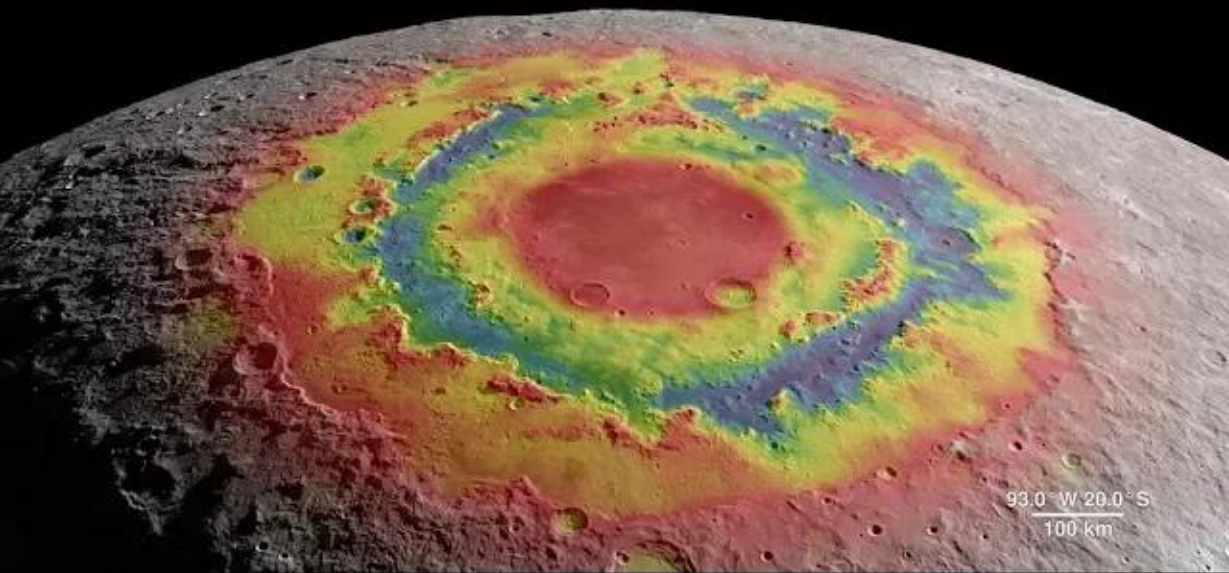


Orientele Basin

Gravity (*Science*, 28 Oct 2016, 438-441)

-700 Free-Air Gravity (mGal) 800



1
00:00:01,001 --> 00:00:11,011
[music]

2
00:00:11,011 --> 00:00:15,048
The Moon. It's our nearest
neighbor in space, and data we

3
00:00:15,048 --> 00:00:18,785
gather from its features can
tell us a lot about the rest of

4
00:00:18,785 --> 00:00:22,289
our solar system. And through
the eyes of the LRO spacecraft,

5
00:00:22,289 --> 00:00:26,827
we can explore the lunar surface
in all new ways in fascinating

6
00:00:26,827 --> 00:00:30,998
detail. Our tour begins on the
western border, where the near

7
00:00:30,998 --> 00:00:35,168
side of the Moon meets the far
side. The enormous feature is a

8
00:00:35,168 --> 00:00:41,208
lunar crater and it's known as
the Orientale basin. Here, LRO's

9
00:00:41,208 --> 00:00:43,477
terrain map combines with
surface gravity measurements

10
00:00:43,477 --> 00:00:46,947
from the GRAIL mission. This
data reveals structure in the

11

00:00:46,947 --> 00:00:50,417
lunar crust, beneath the
surface, giving us a window into

12

00:00:50,417 --> 00:00:56,089
the geologic features of the
Moon's interior. Our next

13

00:00:56,089 --> 00:00:59,259
location receives little direct
sunlight and has some of the

14

00:00:59,259 --> 00:01:02,729
coldest recorded temperatures in
the solar system – the South

15

00:01:02,729 --> 00:01:06,466
Pole. The highlighted spots
signify potential water ice,

16

00:01:06,466 --> 00:01:10,170
based on temperature readings
from LRO's Diviner instrument

17

00:01:10,170 --> 00:01:15,876
and reflectance from its laser
altimeter LOLA. LOLA also allows

18

00:01:15,876 --> 00:01:19,379
us to peer into the darkness of
Shackleton crater by bringing us

19

00:01:19,379 --> 00:01:27,754
this digital elevation model.
It's 21 kilometers wide, and 4

20

00:01:27,754 --> 00:01:31,425
kilometers deep, but it pales in
comparison to the largest known

21

00:01:31,425 --> 00:01:35,295
impact crater in the Earth-Moon
system – the South Pole-Aitken

22

00:01:35,295 --> 00:01:43,937
Basin. Sitting on the far side,
it's 2500 kilometers across and

23

00:01:43,937 --> 00:01:48,375
13 kilometers deep. We don't yet
know exactly how old the basin

24

00:01:48,375 --> 00:01:52,512
is, but it was first seen in the
1960s by spacecraft flying

25

00:01:52,512 --> 00:01:59,152
around the far side. As much as
we use LRO data to investigate

26

00:01:59,152 --> 00:02:03,123
areas we can't see from Earth,
we also probe familiar territory

27

00:02:03,123 --> 00:02:06,360
on the lunar near side, to bring
back images with an all-new

28

00:02:06,360 --> 00:02:12,199
level of detail. This is Tycho
crater; it's around 100 million

29

00:02:12,199 --> 00:02:21,174
years old. Here, the Lunar
Reconnaissance Orbiter Camera

30

00:02:21,174 --> 00:02:24,745
captures the central peak with a
100 meter-wide bolder at the

31

00:02:24,745 --> 00:02:30,083
summit – the origins of which
are still a mystery. Continuing

32

00:02:30,083 --> 00:02:33,987
across Moon's nearside, we will
arrive in an area ripe for

33

00:02:33,987 --> 00:02:37,858
future exploration, due to the
diversity of impact and volcanic

34

00:02:37,858 --> 00:02:42,195
materials. It features a
prominent crater so bright it's

35

00:02:42,195 --> 00:02:45,065
not only visible through
telescopes, but also to the

36

00:02:45,065 --> 00:02:49,569
naked eye. Welcome to the
Aristarchus plateau. Here,

37

00:02:49,569 --> 00:02:53,273
infrared shows the mineral
pyroxene in orange, and a splash

38

00:02:53,273 --> 00:02:56,610
of plagioclase in blue from
Aristarchus crater. This region

39

00:02:56,610 --> 00:03:03,617
can tell us a lot about the rich
volcanic history of the Moon.

40

00:03:03,617 --> 00:03:06,219
As much as we study the Moon
looking for sites to visit, we

41

00:03:06,219 --> 00:03:10,290
also look back at places we've
already been. This is because

42

00:03:10,290 --> 00:03:13,994
the new data that LRO is
gathering helps us reinterpret

43

00:03:13,994 --> 00:03:17,330
the geology of familiar places,
giving scientists a better

44

00:03:17,330 --> 00:03:21,034
understanding of the sequence of
events in early lunar history.

45

00:03:21,034 --> 00:03:25,105
Here, we descend to the Apollo
17 landing site in the

46

00:03:25,105 --> 00:03:28,408
Taurus-Littrow valley, which is
deeper than the Grand Canyon.

47

00:03:28,408 --> 00:03:36,216
The path the astronauts took
over the course of three days is
shown.

48

00:03:36,216 --> 00:03:38,919
The Lunar Reconnaissance
Orbiter Camera is even able to

49

00:03:38,919 --> 00:03:42,055
capture a view of the bottom
half of the Apollo 17 Lunar

50

00:03:42,055 --> 00:03:45,859
Lander, which still sits on the
surface, as well as the rover

51
00:03:45,859 --> 00:03:51,631
vehicle. These images help
preserve our accomplishment of

52
00:03:51,631 --> 00:03:57,971
human exploration on the Moon's
surface. Moving onward, we make

53
00:03:57,971 --> 00:04:01,074
our way to our final
destination. This location

54
00:04:01,074 --> 00:04:04,811
contains regions that exist in
permanent shadow, as well as

55
00:04:04,811 --> 00:04:07,881
ones that bask in nearly
perpetual light. It's the

56
00:04:07,881 --> 00:04:12,119
North Pole. Detailed terrain
measurements by LOLA allow

57
00:04:12,119 --> 00:04:15,288
scientists to model sunlight and
shadow at the poles over decades

58
00:04:15,288 --> 00:04:19,526
and centuries. Sunlit peaks and
crater rims here may be ideal

59
00:04:19,526 --> 00:04:23,263
locations for generating solar
power for future expeditions to

60
00:04:23,263 --> 00:04:26,933
the Moon. This updated
visualization of the lunar

61
00:04:26,933 --> 00:04:30,036
landscape stands as a testament
to the functionality and

62
00:04:30,036 --> 00:04:32,205
abilities of the Lunar
Reconnaissance Orbiter

63
00:04:32,205 --> 00:04:36,877
spacecraft. And as the mission
continues to gather data, it

64
00:04:36,877 --> 00:04:39,513
will provide us with many more
opportunities to take