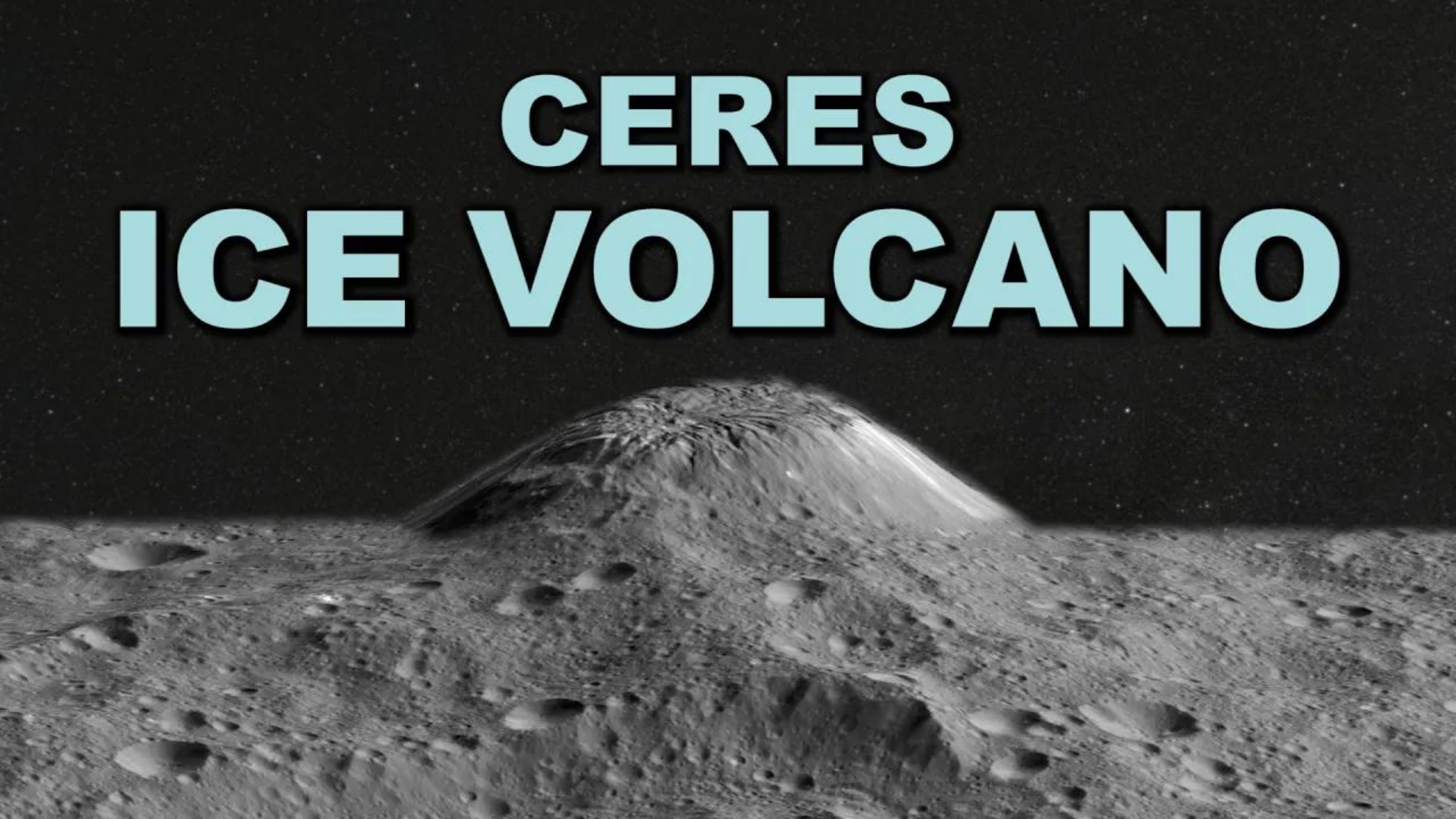
CERES
ICE VOLCANO



1
00:00:00,000 --> 00:00:03,003
>>NARRATOR: It turns out that
Ceres, the first and largest

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00:00:03,003 --> 00:00:06,473
asteroid discovered in the main
asteroid belt, surprisingly has

3
00:00:06,473 --> 00:00:09,743
been geologically active within
the past billion years.

4
00:00:09,743 --> 00:00:15,282
[music]

5
00:00:15,282 --> 00:00:17,684
NASA’s Dawn spacecraft
arrived at dwarf

6
00:00:17,684 --> 00:00:21,321
planet Ceres in March, 2015. \h
>>OTTAVIANO: We were expecting

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00:00:21,321 --> 00:00:25,259
an inert rocky body. >>LUCY: We
expected Ceres to be a

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00:00:25,259 --> 00:00:28,195
cold rock. >>NARRATOR: One
intriguing feature Dawn

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00:00:28,195 --> 00:00:31,331
discovered on the surface of
Ceres is an enormous, lone

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00:00:31,331 --> 00:00:34,301
mountain the team named Ahuna
Mons. \h >>OTTAVIANO: We have

11

00:00:34,301 --> 00:00:37,771
been looking in detail about the
shape of the mountain.

12
00:00:37,771 --> 00:00:42,709
>>LUCY: It was very tall
and had steep slopes.
And that reminded us of

13
00:00:42,709 --> 00:00:45,846
certain places in the solar
system, including Earth and

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00:00:45,846 --> 00:00:50,684
Mars, that had domes that were
formed by volcanic activity.

15
00:00:50,684 --> 00:00:54,354
>>OTTAVIANO: And
we have found that Ahuna
Mons' shape is very

16
00:00:54,354 --> 00:00:57,958
similar to that of a volcanic
dome. >>NARRATOR: Along with the

17
00:00:57,958 --> 00:00:59,693
shape of the dome, the facts are
that there is no evidence of

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00:00:59,693 --> 00:01:04,064
another formation mechanism such
as an impact crater, and the

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00:01:04,064 --> 00:01:06,733
surface features on the summit
and sides of the mountain look

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00:01:06,733 --> 00:01:10,103
incredibly similar to known
volcanic domes. This all

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00:01:10,103 --> 00:01:13,106
provides substantial evidence
that Ahuna Mons is in fact of

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00:01:13,106 --> 00:01:16,610
volcanic origin. Volcanoes on
earth are fueled by magma

23
00:01:16,610 --> 00:01:20,547
composed of molten rock. \hBut
Ceres is far too cold to melt

24
00:01:20,547 --> 00:01:24,985
silicate rock in its interior.
>>LUCY: We then concluded that

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00:01:24,985 --> 00:01:30,057
the magma had to be composed of
mostly very salty water, and
when

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00:01:30,057 --> 00:01:34,795
exposed to the surface, they
would freeze and form this

27
00:01:34,795 --> 00:01:38,365
steep-sided dome. >>NARRATOR: A
volcano made of water or other

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00:01:38,365 --> 00:01:42,269
ices instead of rock is called a
cryovolcano. \hScientists have

29
00:01:42,269 --> 00:01:45,906
detected evidence of
cryovolcanic activity before -

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00:01:45,906 --> 00:01:48,342
plumes from Saturn’s moon

Enceladus and Neptune’s moon

31
00:01:48,342 --> 00:01:52,079
Triton and volcanic-looking
mountain ranges on Saturn’s moon

32
00:01:52,079 --> 00:01:55,515
Titan. \hThe salty muddy
mountain Ahuna Mons is yet

33
00:01:55,515 --> 00:02:00,053
another new form of cryovolcanic
activity discovered.

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00:02:00,053 --> 00:02:04,257
>>LUCY: There’s no other place
in the solar system that has a

35
00:02:04,257 --> 00:02:07,594
structure like Ahuna Mons, and
it has to be formed by

36
00:02:07,594 --> 00:02:10,931
cryovolcanic activity.
>>NARRATOR: Moons around gas

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00:02:10,931 --> 00:02:13,734
giants can heat up from the
frictions of interactingtheir

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00:02:13,734 --> 00:02:17,604
orbits, but the isolated dwarf
planet Ceres is so small and

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00:02:17,604 --> 00:02:20,040
cold that we wouldn’t have
thought it could have liquid

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00:02:20,040 --> 00:02:23,443
water in its recent past.

\hEvidence suggests, however,

41
00:02:23,443 --> 00:02:26,613
that Ahuna Mons is a relatively
young feature.

42
00:02:26,613 --> 00:02:31,084
>>OTTAVIANO: First of all,
the surface is very bright,
and as surfaces get

43
00:02:31,084 --> 00:02:35,789
darker with time, it's
brightness tells us it's a young

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00:02:35,789 --> 00:02:40,494
feature. And second, we see very
crisp morphologies, very sharp

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00:02:40,494 --> 00:02:46,133
features, and this also tells us
it's young, as the features get

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00:02:46,133 --> 00:02:51,805
muted and smooth with time. And
third, we have been looking at

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00:02:51,805 --> 00:02:56,143
crater density and we see very
low density of craters. And this

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00:02:56,143 --> 00:02:59,646
tells us that Ahuna Mons was
formed within the last billion

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00:02:59,646 --> 00:03:03,350
years of Ceres' history. Ahuna
Mons is evidence that Ceres was

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00:03:03,350 --> 00:03:06,987

active in the recent past and
might still be active today.

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00:03:06,987 --> 00:03:10,290
>>LUCY: That tells us that there
has to be something beneath the

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00:03:10,290 --> 00:03:15,695
surface of Ceres near Ahuna Mons
that heated the material to the

53
00:03:15,695 --> 00:03:19,399
melting point and made it push
through the cracks on the

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00:03:19,399 --> 00:03:22,936
surface. >>NARRATOR: The source
of this heat is still an

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00:03:22,936 --> 00:03:26,640
intriguing mystery that
planetary scientists are anxious
to solve. \h