
RECORD-BREAKING
COMET K2

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00:00:00,000 --> 00:00:03,937
NASA’s Hubble Space Telescope
has observed an inbound comet

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00:00:03,937 --> 00:00:07,774
unlike any we’ve seen before,
that already is expelling gas

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00:00:07,774 --> 00:00:11,478
and dust at an enormous distance
from the Sun. This makes the

4
00:00:11,478 --> 00:00:14,381
comet a record-breaker, since
usually active comets aren’t

5
00:00:14,381 --> 00:00:17,718
discovered until they’re closer
to the Sun and warmer. When

6
00:00:17,718 --> 00:00:20,621
trying to learn about our early
solar system and the exact

7
00:00:20,621 --> 00:00:23,357
conditions of the materials that
went on to form our Sun and

8
00:00:23,357 --> 00:00:26,793
planets, scientists try to find
the most primitive objects they

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00:00:26,793 --> 00:00:30,163
can – objects that haven’t been
disturbed by geologic activity,

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00:00:30,163 --> 00:00:33,433
strong radiation, or outside
forces at any point in the past

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00:00:33,433 --> 00:00:36,737
4.6 billion years. These
primitive objects include

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00:00:36,737 --> 00:00:40,574
asteroids and comets. Comets are
more icy than asteroids, and

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00:00:40,574 --> 00:00:43,744
when they get close to the Sun,
the ices sublimate - go from

14
00:00:43,744 --> 00:00:47,314
solid to gas - and release dust
that forms the comet’s iconic

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00:00:47,314 --> 00:00:51,718
coma and tail. We call this an
active comet. Once a comet has

16
00:00:51,718 --> 00:00:54,521
orbited close to the Sun
multiple times, it’s no longer

17
00:00:54,521 --> 00:00:58,492
as primitive as it once was. But
every once in a while, we catch

18
00:00:58,492 --> 00:01:01,461
a comet coming into the inner
solar system for the first time,

19
00:01:01,461 --> 00:01:04,998
kicked out of its home in the
outer solar system. These

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00:01:04,998 --> 00:01:07,067
first-time
inner-solar-system-visitors give

21
00:01:07,067 --> 00:01:10,604
us a chance to observe a more
pristine leftover from the early

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00:01:10,604 --> 00:01:14,908
days of planet formation. A
comet named K2 was discovered in

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00:01:14,908 --> 00:01:19,112
May 2017 by the Pan-STARRS
telescope in Hawaii. Hubble then

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00:01:19,112 --> 00:01:22,683
pointed its camera at the icy
visitor in late June, revealing

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00:01:22,683 --> 00:01:25,919
this image of its
80,000-mile-wide dust cloud

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00:01:25,919 --> 00:01:29,890
coma. Researchers estimate that
the nucleus - the actual solid

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00:01:29,890 --> 00:01:34,027
body inside - is less than 12
miles wide, and that the comet

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00:01:34,027 --> 00:01:37,264
came from trillions of miles
away from the Oort Cloud at the

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00:01:37,264 --> 00:01:40,233
far periphery of our solar
system. Astronomers don’t

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00:01:40,233 --> 00:01:43,570
usually discover active
inbound comets until they’re
well within

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00:01:43,570 --> 00:01:47,140
the orbit of Jupiter. But comet
K2, at the time of this Hubble

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00:01:47,140 --> 00:01:51,311
image, was out past the orbit of
Saturn. After discovery,

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00:01:51,311 --> 00:01:53,847
researchers went back through
archival images and found that

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00:01:53,847 --> 00:01:58,385
K2's coma was actually visible
back in 2013, when the comet was

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00:01:58,385 --> 00:02:02,122
way out between the orbits of
Uranus and Neptune. So why is

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00:02:02,122 --> 00:02:06,159
comet K2 active so early?
Usually astronomers see comets

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00:02:06,159 --> 00:02:09,129
that are activated by the
sublimation of water ice, which

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00:02:09,129 --> 00:02:12,265
requires relatively warm
temperatures. Researchers think

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00:02:12,265 --> 00:02:15,168
that K2 must be so primitive
that it still has frozen

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00:02:15,168 --> 00:02:18,572
volatile gases like nitrogen,
carbon dioxide, and carbon

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00:02:18,572 --> 00:02:21,742
monoxide, which sublimate at
much cooler temperatures and are

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00:02:21,742 --> 00:02:25,512
sublimating right now on K2. The
lead researcher on this study

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00:02:25,512 --> 00:02:29,850
thinks that K2 is the most
primitive comet we've ever seen.

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00:02:29,850 --> 00:02:33,420
However, compositionally, K2
probably isn't a particularly

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00:02:33,420 --> 00:02:36,957
unusual comet; it's just been
difficult to discover comets

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00:02:36,957 --> 00:02:40,427
that far away. Even though its
coma is almost as large as

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00:02:40,427 --> 00:02:44,731
Jupiter, K2 is still about 40
times fainter than Pluto, and

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00:02:44,731 --> 00:02:47,434
discovering a moving object that
faint requires improved

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00:02:47,434 --> 00:02:50,937
technology. Survey programs like
Pan-STARRS should allow us to

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00:02:50,937 --> 00:02:54,474
discover more and more of
these faint, distant comets like

K2. Since

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00:02:54,474 --> 00:02:58,745
we are able to see comet K2 so
early, we'll have another five

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00:02:58,745 --> 00:03:01,481
years to study the comet before
it reaches its closest approach

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00:03:01,481 --> 00:03:05,085
to the Sun, just beyond the
orbit of Mars. During that time,

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00:03:05,085 --> 00:03:07,788
scientists will be able to study
this visitor from the remote

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00:03:07,788 --> 00:03:10,691
past with ground-based
telescopes, Hubble, and the

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00:03:10,691 --> 00:03:14,561
soon-to-be-launched James Webb
Space Telescope. Once K2 swings

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00:03:14,561 --> 00:03:17,564
by the Sun, it will begin its
outward journey, and K2's

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00:03:17,564 --> 00:03:21,668
trajectory will actually have it
leave our solar system forever.

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00:03:21,668 --> 00:03:25,038
Humanity will never see this
particular comet again.