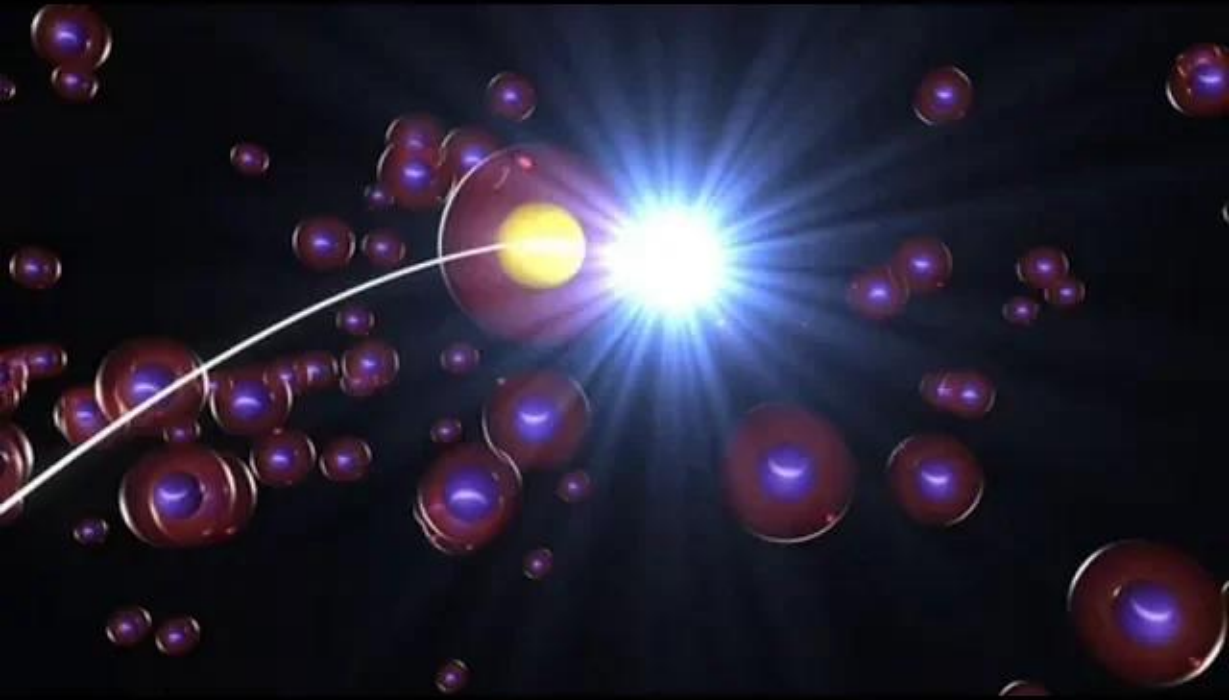

1
00:00:32,310 --> 00:00:30,790
ibex is a nasa mission that will for the

2
00:00:33,830 --> 00:00:32,320
first time

3
00:00:36,470 --> 00:00:33,840
take a picture

4
00:00:38,869 --> 00:00:36,480
of the edge of our solar system

5
00:00:41,430 --> 00:00:38,879
an area way out beyond the orbits of the

6
00:00:44,389 --> 00:00:41,440
planets way out beyond pluto

7
00:00:46,470 --> 00:00:44,399
where the solar system interacts with

8
00:00:49,430 --> 00:00:46,480
the gas of the galaxy with interstellar

9
00:00:54,310 --> 00:00:51,350
the interstellar boundary explorer has

10
00:00:56,709 --> 00:00:54,320
two cameras and these cameras

11
00:00:58,229 --> 00:00:56,719
image the global structure of the

12
00:01:00,790 --> 00:00:58,239
boundaries that surround our solar

13
00:01:04,070 --> 00:01:00,800

system they image these boundaries not

14
00:01:06,390 --> 00:01:04,080
with light but with particles themselves

15
00:01:09,270 --> 00:01:06,400
they've created a whole new way

16
00:01:12,390 --> 00:01:09,280
to image these structures

17
00:01:14,870 --> 00:01:12,400
energetic neutral atoms start their life

18
00:01:16,390 --> 00:01:14,880
as charged particles as very fast-moving

19
00:01:18,230 --> 00:01:16,400
charged particles they get actually

20
00:01:19,990 --> 00:01:18,240
accelerated up to very high speeds

21
00:01:22,390 --> 00:01:20,000
because they have an electric charge

22
00:01:24,070 --> 00:01:22,400
they're missing one or more electrons as

23
00:01:26,230 --> 00:01:24,080
they're coming into the solar system in

24
00:01:27,830 --> 00:01:26,240
this interaction between the solar wind

25
00:01:30,310 --> 00:01:27,840
and interstellar gas

26
00:01:31,590 --> 00:01:30,320
they can from another particle grab an

27
00:01:33,670 --> 00:01:31,600
electron

28
00:01:35,670 --> 00:01:33,680
and become neutral

29
00:01:37,910 --> 00:01:35,680
at that point they're not affected by

30
00:01:40,550 --> 00:01:37,920
magnetic fields they move in a straight

31
00:01:42,069 --> 00:01:40,560
line at high speeds towards whichever

32
00:01:43,830 --> 00:01:42,079
direction they happen to be going in at

33
00:01:45,510 --> 00:01:43,840
the time they neutralize some of those

34
00:01:49,109 --> 00:01:45,520
will be heading at the earth and those

35
00:01:52,069 --> 00:01:49,119
are the ones that ibex is measuring

36
00:01:55,190 --> 00:01:52,079
ibex is the first mission

37
00:01:57,830 --> 00:01:55,200
to actually understand the whole

38
00:02:00,069 --> 00:01:57,840

heliosphere

39
00:02:02,230 --> 00:02:00,079
the voyager spacecraft

40
00:02:04,149 --> 00:02:02,240
launched in the 1970s have finally

41
00:02:05,590 --> 00:02:04,159
reached the first of the boundaries of

42
00:02:06,950 --> 00:02:05,600
the heliosphere

43
00:02:09,589 --> 00:02:06,960
and they're taking

44
00:02:11,430 --> 00:02:09,599
wonderful and detailed measurements at

45
00:02:12,790 --> 00:02:11,440
two points two points at these

46
00:02:15,030 --> 00:02:12,800
boundaries

47
00:02:16,949 --> 00:02:15,040
instead what ibex is going to do is to

48
00:02:19,589 --> 00:02:16,959
go into an earth orbit a high altitude

49
00:02:21,430 --> 00:02:19,599
earth orbit and look out at the boundary

50
00:02:23,270 --> 00:02:21,440
not just in one or two directions but in

51
00:02:25,510 --> 00:02:23,280
all directions in space

52
00:02:27,430 --> 00:02:25,520
and by measuring particles coming in

53
00:02:29,270 --> 00:02:27,440
from those very distant regions we'll be

54
00:02:32,790 --> 00:02:29,280
able to make an image

55
00:02:35,910 --> 00:02:32,800
of the interaction all around us

56
00:02:38,070 --> 00:02:35,920
the ibex map is going to be more more

57
00:02:41,270 --> 00:02:38,080
important than the two points that we

58
00:02:43,910 --> 00:02:41,280
get from voyager 1 voyager 2 because

59
00:02:46,150 --> 00:02:43,920
we only have two points but this is

60
00:02:48,630 --> 00:02:46,160
enormous this is a structure that's

61
00:02:50,710 --> 00:02:48,640
billions of miles and so just measuring

62
00:02:51,750 --> 00:02:50,720
in two points is like just having two

63
00:02:52,630 --> 00:02:51,760

buoys

64
00:02:56,710 --> 00:02:52,640
in

65
00:02:58,790 --> 00:02:56,720
the ocean currents from those two buoys

66
00:03:01,509 --> 00:02:58,800
we have our two buoys voyager 1 and

67
00:03:04,070 --> 00:03:01,519
voyager 2 and then with a satellite

68
00:03:07,430 --> 00:03:04,080
looking out instead of down we get a map

69
00:03:09,350 --> 00:03:07,440
of the entire region with ibex

70
00:03:11,350 --> 00:03:09,360
how does the interstellar boundary

71
00:03:13,350 --> 00:03:11,360
explorer mission actually get to this

72
00:03:14,630 --> 00:03:13,360
very high altitude orbit all the way up

73
00:03:17,030 --> 00:03:14,640
to the moon

74
00:03:19,509 --> 00:03:17,040
the answer is that we use a pegasus

75
00:03:21,830 --> 00:03:19,519
rocket which is dropped from the belly

76
00:03:23,589 --> 00:03:21,840
of an airplane the pegasus rocket is

77
00:03:25,750 --> 00:03:23,599
going to actually get us into low earth

78
00:03:28,149 --> 00:03:25,760
orbit but in order to get to very very

79
00:03:31,430 --> 00:03:28,159
high altitude we incorporate with the

80
00:03:33,270 --> 00:03:31,440
pegasus rocket another rocket motor

81
00:03:35,509 --> 00:03:33,280
the launch of that gets us up to a

82
00:03:38,550 --> 00:03:35,519
higher orbit and then we use additional

83
00:03:41,270 --> 00:03:38,560
propulsion on top of that to get us to