1
00:00:13,110 --> 00:00:11,350
hi my name is dr eric christian i'm the

2
00:00:17,189 --> 00:00:13,120
program scientist for the interstellar

3
00:00:19,590 --> 00:00:17,199
boundary explorer or ibex mission

4
00:00:23,910 --> 00:00:19,600
ibex is studying the boundary between

5
00:00:25,589 --> 00:00:23,920
the solar wind and interstellar space

6
00:00:27,429 --> 00:00:25,599
there are several boundaries at the edge

7
00:00:29,669 --> 00:00:27,439
of our solar system

8
00:00:31,990 --> 00:00:29,679
the closest one we call the termination

9
00:00:34,389 --> 00:00:32,000
shock that's where the million mile per

10
00:00:36,630 --> 00:00:34,399
hour solar wind which expands out from

11
00:00:39,590 --> 00:00:36,640
the sun in all directions in space

12
00:00:41,750 --> 00:00:39,600
slows down becomes more dense and starts

13
00:00:43,750 --> 00:00:41,760

to be diverted away before it reaches

14
00:00:45,910 --> 00:00:43,760
the galactic material

15
00:00:47,670 --> 00:00:45,920
beyond that is the heliopause the

16
00:00:50,310 --> 00:00:47,680
heliopause is the boundary that

17
00:00:52,549 --> 00:00:50,320
separates material of galactic origin on

18
00:00:54,310 --> 00:00:52,559
the outside from material of solar

19
00:00:56,549 --> 00:00:54,320
origin on the inside

20
00:00:58,389 --> 00:00:56,559
and even further out than that we think

21
00:01:00,869 --> 00:00:58,399
there's another boundary which we call

22
00:01:02,470 --> 00:01:00,879
the bow shock because the solar system

23
00:01:04,630 --> 00:01:02,480
is moving quickly through the galactic

24
00:01:07,109 --> 00:01:04,640
material actually plowing through like a

25
00:01:10,230 --> 00:01:07,119
snow plow we think the interaction makes

26
00:01:12,550 --> 00:01:10,240
a sharp jump out in front where the

27
00:01:17,190 --> 00:01:12,560
where the quickly moving in material has

28
00:01:22,310 --> 00:01:19,270
you can see that really well in this

29
00:01:25,030 --> 00:01:22,320
animation where the solar wind is

30
00:01:27,830 --> 00:01:25,040
streaming out past all the planets and

31
00:01:30,710 --> 00:01:27,840
it's blown this bubble in interstellar

32
00:01:33,510 --> 00:01:30,720
space the nearly spherical solar wind

33
00:01:35,910 --> 00:01:33,520
termination shock bubble and then

34
00:01:38,950 --> 00:01:35,920
very the the solar wind slows down and

35
00:01:41,270 --> 00:01:38,960
starts moving back into the tail

36
00:01:44,149 --> 00:01:41,280
and then the interstellar gas which is

37
00:01:46,230 --> 00:01:44,159
moving very quickly up here slows down

38
00:01:47,910 --> 00:01:46,240

in the bow shock and moves around the

39
00:01:50,950 --> 00:01:47,920
solar system

40
00:01:53,830 --> 00:01:50,960
you can actually duplicate this in your

41
00:01:54,789 --> 00:01:53,840
own kitchen sink if you take a stream of

42
00:01:57,670 --> 00:01:54,799
water

43
00:02:00,389 --> 00:01:57,680
and bounce it off a flat surface

44
00:02:02,789 --> 00:02:00,399
what you get is a region close to the

45
00:02:05,990 --> 00:02:02,799
stream where the water is moving very

46
00:02:08,389 --> 00:02:06,000
quickly and very straight

47
00:02:11,350 --> 00:02:08,399
and then suddenly it slows down and you

48
00:02:13,990 --> 00:02:11,360
actually see an increase in height

49
00:02:15,350 --> 00:02:14,000
where a shock forms in the water that's

50
00:02:17,110 --> 00:02:15,360
the equivalent of the solar wind

51
00:02:19,750 --> 00:02:17,120
termination shock

52
00:02:23,510 --> 00:02:19,760
and then beyond that shock the water is

53
00:02:25,750 --> 00:02:23,520
turbulent and flows down into your drain

54
00:02:29,910 --> 00:02:25,760
and that's the heliopause boundary out

55
00:02:34,550 --> 00:02:31,509
now one of the reasons why this is

56
00:02:36,630 --> 00:02:34,560
important is because

57
00:02:39,830 --> 00:02:36,640
this solar wind that's streaming out to

58
00:02:41,990 --> 00:02:39,840
the heliopause pushes out galactic

59
00:02:44,229 --> 00:02:42,000
cosmic rays which are radiation coming

60
00:02:46,550 --> 00:02:44,239
from distant parts of the galaxy

61
00:02:48,869 --> 00:02:46,560
and it prevents a lot of these galactic

62
00:02:51,190 --> 00:02:48,879
cosmic rays from getting into the earth

63
00:02:53,910 --> 00:02:51,200

or to astronauts on their way to mars

64
00:02:55,750 --> 00:02:53,920
for example so the solar wind pushing