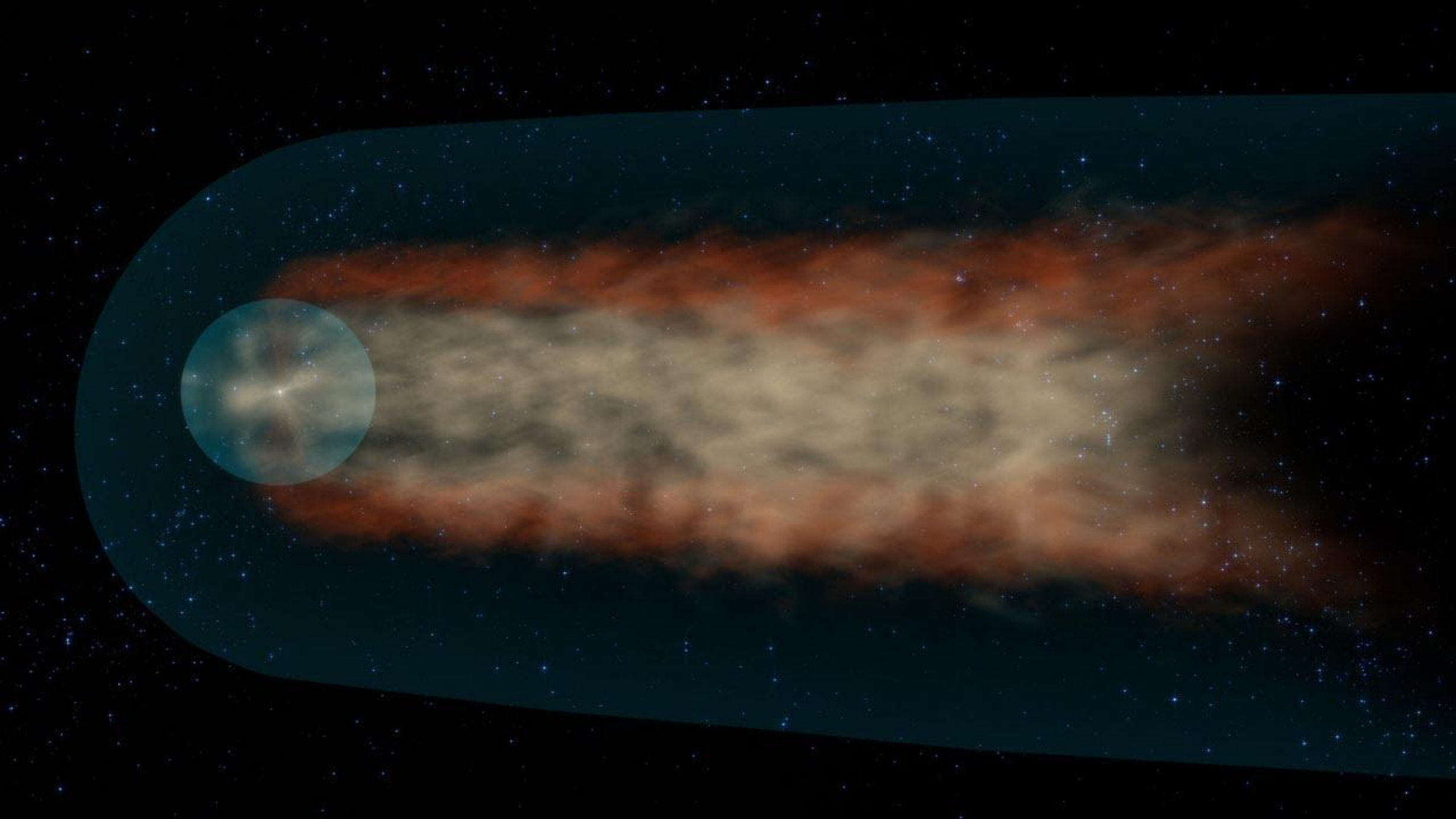

1
00:00:08,290 --> 00:00:04,170
(music)

2
00:00:08,310 --> 00:00:12,410
Like a comet, our solar system has a tail.

3
00:00:12,430 --> 00:00:16,560
It has never actually been observed. Until now. NASA's

4
00:00:16,580 --> 00:00:20,740
Interstellar Boundary Explorer, or IBEX recently mapped the boundaries

5
00:00:20,760 --> 00:00:24,950
of the solar system's tail, called the heliotail. By combining

6
00:00:24,970 --> 00:00:29,130
observations from the first three years of IBEX imagery, scientists have mapped

7
00:00:29,150 --> 00:00:33,250
out a tail that shows a combination of fast and slow moving

8
00:00:33,270 --> 00:00:37,440
particles. IBEX can map such regions because it uses a technique called energetic

9
00:00:37,460 --> 00:00:41,540
neutral atom imaging. An energetic charged particle

10
00:00:41,560 --> 00:00:45,650
in the outer heliosphere hits a hydrogen atom, stealing its electron

11
00:00:45,670 --> 00:00:49,790
and becoming neutral. It then travels straight, though some of them come back

12
00:00:49,810 --> 00:00:53,930
toward the inner heliosphere. They're they collide with IBEX, and are

13
00:00:53,950 --> 00:00:57,960

detected. By plotting out such neutral atoms and where they came from,

14
00:00:57,980 --> 00:01:01,990
IBEX has recently been able to describe the tail streaming behind the solar

15
00:01:02,010 --> 00:01:06,050
system. The tail is composed of solar wind plasma and magnetic

16
00:01:06,070 --> 00:01:10,180
field. The solar wind streams out from the sun in all directions, out

17
00:01:10,200 --> 00:01:14,260
past the farthest planets. It eventually slows down,

18
00:01:14,280 --> 00:01:18,340
bending back along the tail, due to pressure from the interstellar gas and magnetic

19
00:01:18,360 --> 00:01:22,470
field. Based on the map of the heliotail, if we could look straight

20
00:01:22,490 --> 00:01:26,560
down the tail, we would see a shape a little like a four-leaf clover.

21
00:01:26,580 --> 00:01:30,640
The two side leaves are filled with slow moving particles, and the

22
00:01:30,660 --> 00:01:34,760
upper and lower leaves with fast ones. This is in line with how

23
00:01:34,780 --> 00:01:38,890
the sun releases fast solar wind near its poles, and slower wind

24
00:01:38,910 --> 00:01:42,970
near its equator. The four-leaf clover does not align perfectly with

25
00:01:42,990 --> 00:01:47,020
the solar system. The entire shape is rotated slightly.

26
00:01:47,040 --> 00:01:51,100
This indicates that as it moves farther away from the sun's magnetic influence

27
00:01:51,120 --> 00:01:55,170
the charge particles have begun to be pulled into a new orientation,

28
00:01:55,190 --> 00:01:59,250
aligning with the magentic field of the local galaxy.

29
00:01:59,270 --> 00:02:03,330
Scientists still do not know how long the tail is, but think that it

30
00:02:03,350 --> 00:02:07,370
eventually fades away and becomes indistinguishable from the rest of

31
00:02:07,390 --> 00:02:11,410
interstellar space. Together, data from instruments in space

32
00:02:11,430 --> 00:02:15,460
and analysis at labs on the ground will continue to improve our understanding

33
00:02:15,480 --> 00:02:19,490
of the comet-like tails streaming out behind us.