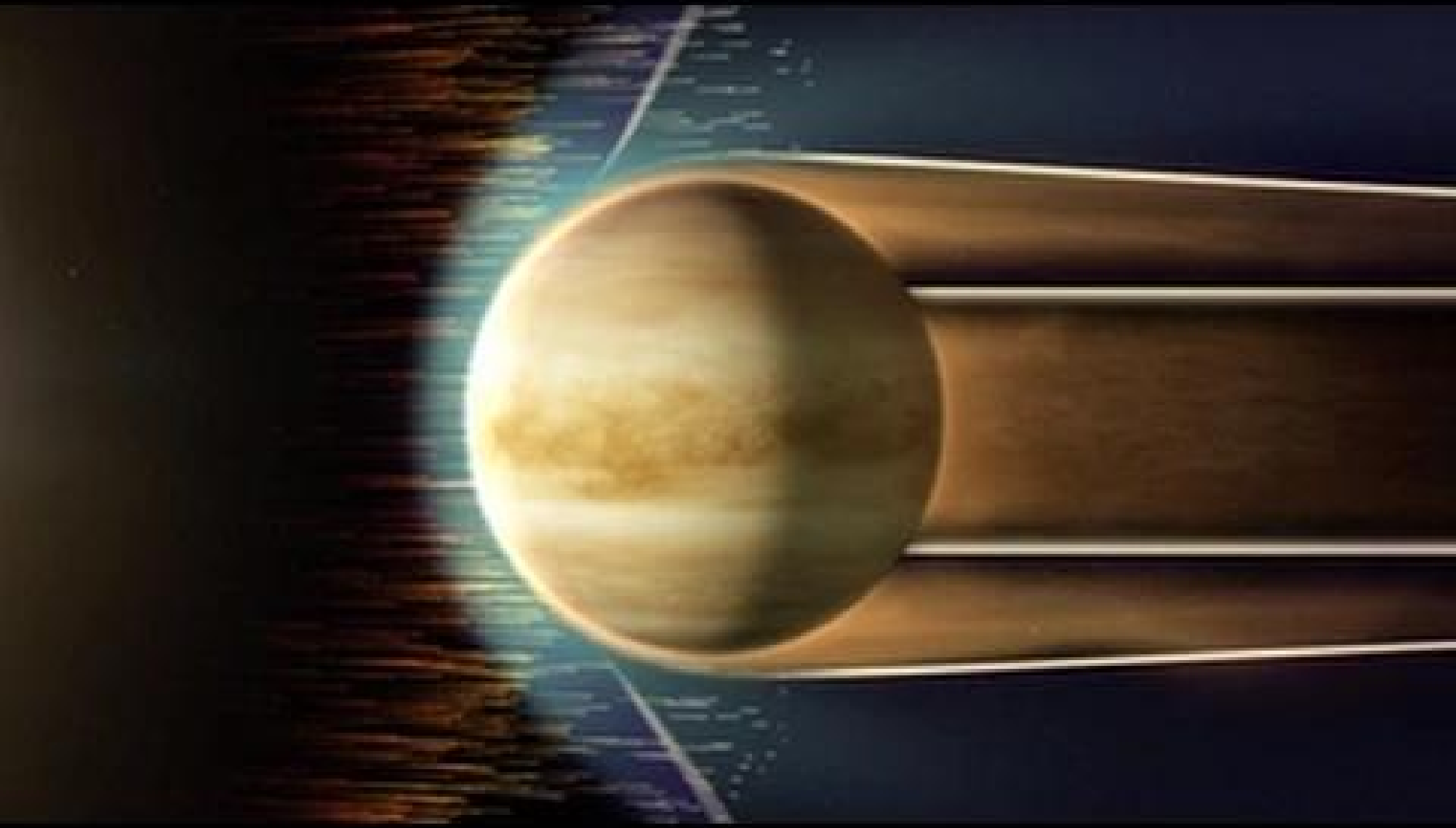

1
00:00:00,000 --> 00:00:04,000
music

2
00:00:04,020 --> 00:00:08,040
Venus doesn't have a magnetic

3
00:00:08,060 --> 00:00:12,060
field. So, Venus is just this big rock with this atmosphere and the ionosphere, sitting

4
00:00:12,080 --> 00:00:16,120
in space, and the super sonic solar wind with interplanetary magnetic field

5
00:00:16,140 --> 00:00:20,290
whacks into Venus, and it can't penetrate through the

6
00:00:20,310 --> 00:00:24,340
ionosphere. So, the interplanetary field lines sort of pile

7
00:00:24,360 --> 00:00:28,380
up ahead of Venus, like cars on freeway. This solar wind

8
00:00:28,400 --> 00:00:32,410
whacking into it essentially sort of strips off the atmosphere, and

9
00:00:32,430 --> 00:00:36,410
it literally forms this long tail, like a comet, but stretching out into space.

10
00:00:36,430 --> 00:00:40,450
Pioneer Venus Orbiter was the first spacecraft to

11
00:00:40,470 --> 00:00:44,630
really thoroughly explore that nightside region where the

12
00:00:44,650 --> 00:00:48,640
atmosphere is all escaping away. It discovered this really

13
00:00:48,660 --> 00:00:52,830

mysterious phenomena which has yet to really be explained.

14
00:00:52,850 --> 00:00:56,830
Imagine that we are flying from pole to pole on the nightside.

15
00:00:56,850 --> 00:01:00,860
We are feeling the plasma around us, and then suddenly, the ionosphere disappears.

16
00:01:00,880 --> 00:01:04,890
And then is sort of comes back. This is what an ionospheric hole is,

17
00:01:04,910 --> 00:01:08,950
it's like a cassam in the sky, a big hole where the ionosphere is

18
00:01:08,970 --> 00:01:13,010
just absent. So, Pioneer Venus Orbit basically measured inside these

19
00:01:13,030 --> 00:01:17,010
things, and we saw that there is very little plasma, and there's all this

20
00:01:17,030 --> 00:01:21,050
magnetic field, and from that, they sort of suggested that this is essentially

21
00:01:21,070 --> 00:01:25,070
a magnetic structure that is sitting in the nightside.

22
00:01:25,090 --> 00:01:29,130
I wanted to see if I could go looking for these things with Venus Express.

23
00:01:29,150 --> 00:01:33,150
What we saw is essentially this really exciting, strong

24
00:01:33,170 --> 00:01:37,330
great magnetic field line that we expected, and really boring

25
00:01:37,350 --> 00:01:41,370
plasma signatures. It shows us that this is a magnetic structure, right?

26
00:01:41,390 --> 00:01:45,370
This is a tube of interplanetary magnetic field, that, well

27
00:01:45,390 --> 00:01:49,560
PVO saw it coming of the ground, and now we've seen it way out in the tail.

28
00:01:49,580 --> 00:01:53,600
These things continue out to much higher altitudes that we have previously have found them at.

29
00:01:53,620 --> 00:01:57,630
And the other thing that is important is where Pioneer Venus Orbiter

30
00:01:57,650 --> 00:02:01,670
only saw them during solar maximum, when the sun is really

31
00:02:01,690 --> 00:02:05,710
disturbed and blowy and stormy.

32
00:02:05,730 --> 00:02:09,810
We've now been seeing them all throughout the solar cycle.

33
00:02:09,830 --> 00:02:13,990
There's sort of two explanations for what might be causing this.

34
00:02:14,010 --> 00:02:18,010
One possibility is that these field lines, they come in from space

35
00:02:18,030 --> 00:02:22,050
and they get sort of stuck in the ionosphere

36
00:02:22,070 --> 00:02:26,060
The ionosphere sort of flows from the dayside to the nightside. As it goes around, it sort of

37
00:02:26,080 --> 00:02:30,090
meets the plasma that is in the tail. There's sort of a pile up.

38
00:02:30,110 --> 00:02:34,280

between the two. So, that's one idea. And the other idea is that

39
00:02:34,300 --> 00:02:38,320
on the dayside, the field lines come in, and they actually sink

40
00:02:38,340 --> 00:02:42,330
through the ionosphere, go through the rocky mantle, and then get hung on the this big

41
00:02:42,350 --> 00:02:46,330
metallic core. These field lines essentially end up draping around the core and stick out

42
00:02:46,350 --> 00:02:50,520
the rock at the back. One of the main differences between

43
00:02:50,540 --> 00:02:54,520
Venus and the Earth is simply that Venus doesn't have a magnetic field.

44
00:02:54,540 --> 00:02:58,560
The way it interacts with the star is completely different.

45
00:02:58,580 --> 00:03:02,580
If you want to understand how did Venus get that way,

46
00:03:02,600 --> 00:03:06,600
why does Venus not have any ocean, you need to understand the interaction