1
00:00:00,000 --> 00:00:08,010
Over the last 4.5 billion years, the Sun has shaped every planet in our solar system.

2
00:00:08,210 --> 00:00:16,420
Each planet is connected to the Sun through an invisible web: the Sun's magnetic field.

3
00:00:16,620 --> 00:00:28,320
Though every planet experiences the Sun's magnetism...They do so from very different distances.

4
00:00:28,520 --> 00:00:38,890
How does the Sun's impact change across space?

5
00:00:39,090 --> 00:00:44,310
There's one planet giving us clues.

6
00:00:46,450 --> 00:00:49,090
So Mercury is special not just because it's the closest planet

7
00:00:49,100 --> 00:00:52,490
to the Sun but also because the distance it is

8
00:00:52,500 --> 00:00:55,840
from the Sun varies more than any other planet in our solar system.

9
00:00:55,890 --> 00:00:59,980
Mercury actually has a very oval-shaped orbit compared to the rest.

10
00:01:00,800 --> 00:01:04,209
Mercury is a natural laboratory for running experiments.

11
00:01:04,300 --> 00:01:08,200
We can observe the planet's surroundings as it gets closer and farther away from the Sun

12
00:01:08,270 --> 00:01:09,590
and see what changes.

13
00:01:09,790 --> 00:01:14,520

Norberto and Gina looked to Mercury with a question:

14
00:01:14,720 --> 00:01:19,170
How does the Sun's impact change throughout Mercury's orbit?

15
00:01:22,680 --> 00:01:28,730
A stream of particles races out from the Sun into space. Scientists call it the solar wind.

16
00:01:33,740 --> 00:01:37,420
But Mercury has a shield - the planet's magnetosphere slows and deflects the solar wind.

17
00:01:38,730 --> 00:01:42,440
When solar wind particles bounce off this magnetospheric boundary,

18
00:01:42,500 --> 00:01:45,180
they generate low-frequency waves.

19
00:01:45,240 --> 00:01:49,330
They're like ripples traveling upstream in the solar wind.

20
00:01:54,650 --> 00:02:01,730
Using data from NASA's MESSENGER mission, Norberto and Gina watched these waves change throughout

21
00:02:04,710 --> 00:02:08,590
The farther Mercury was from the Sun...The more waves MESSENGER detected.

22
00:02:11,090 --> 00:02:14,010
Farther from the Sun, the Sun's magnetic field is weaker.

23
00:02:14,180 --> 00:02:18,130
We found that this is the key parameter
that allows more waves to be generated.

24
00:02:19,860 --> 00:02:25,290
The solar wind ultimately pushes the waves back towards Mercury where they add energy to its surroundings.

25
00:02:28,380 --> 00:02:37,480
Although Mercury doesn't have an atmosphere these waves occur at other planets that do: Venus, Mars, Earth

26
00:02:40,330 --> 00:02:45,450
In the long run, the energy from these waves can change a planet's atmosphere in ways we're still trying to und

27
00:02:50,170 --> 00:02:54,310
Mercury's waves help us understand how planets interact with stars including those beyond our solar system.

28
00:02:55,300 --> 00:02:58,290
This is something we could only have measured with Mercury,

29
00:02:58,300 --> 00:03:00,620
thanks to how close it is to the Sun