

1
00:00:00,090 --> 00:00:07,130

Music

2
00:00:07,150 --> 00:00:11,170

Narrator: Astronomers have just begun imaging planets around other stars

3
00:00:11,190 --> 00:00:15,190

the technique isn't very advanced yet, and it can't see any planets

4
00:00:15,210 --> 00:00:19,380

as small as those in our own solar system. But let's suppose for a moment that alien astronomers

5
00:00:19,400 --> 00:00:23,470

are looking at our planetary system. Could they find any evidence that planets exist

6
00:00:23,490 --> 00:00:27,520

around the sun, even if they couldn't see the planets themselves? The answer

7
00:00:27,540 --> 00:00:31,540

is probably yes. That's because at least one world in our solar system would make its

8
00:00:31,560 --> 00:00:35,620

presence known by its effects on a huge cloud of dust at the fringes of the solar system

9
00:00:35,640 --> 00:00:39,670

in a place called the Kuiper Belt. The Kuiper

10
00:00:39,690 --> 00:00:43,700

Belt is a kind of cold storage zone out beyond Neptune, occupied by millions of

11
00:00:43,720 --> 00:00:47,780

icy bodies, including Pluto. The icy objects in the Kuiper Belt

12
00:00:47,800 --> 00:00:51,830

release dust that from afar, could appear as a hazy disk at infrared wavelengths.

13
00:00:51,850 --> 00:00:55,880

New computer models created by NASA scientists,

14

00:00:55,900 --> 00:01:00,040

shown here, reveal what dust in the Kuiper Belt might look like to an alien astronomer.

15

00:01:00,060 --> 00:01:04,160

Neptune creates the intricate pattern. The massive planet's gravity

16

00:01:04,180 --> 00:01:08,240

tugs on the clouds dust grains, nudging them in their orbits.

17

00:01:08,260 --> 00:01:12,250

Stark: Neptune creates a ring structure in the dust cloud which features a gap where the planet

18

00:01:12,270 --> 00:01:16,340

itself resides. And this gap should make it fairly easy to tell where Neptune is from

19

00:01:16,360 --> 00:01:20,430

afar, even at distances where the planet is too dim to detect directly.

20

00:01:20,450 --> 00:01:24,460

The supercomputer simulations that Marc Kuchner and I performed also

21

00:01:24,480 --> 00:01:28,560

allow us to see what the dust in the solar system may have looked like when the solar system was much

22

00:01:28,580 --> 00:01:32,640

younger. In effect, we can go back in time and see how the distant view of

23

00:01:32,660 --> 00:01:36,700

the solar system may have changed. Narrator: In its youth, the Kuiper Belt

24

00:01:36,720 --> 00:01:40,760

contained many more objects and, consequently, lots more dust. In fact,

25

00:01:40,780 --> 00:01:44,830

the dust was so thick that the particles themselves often collided.

26

00:01:44,850 --> 00:01:49,010

Stark: When we included collisions between dust particles, we were really amazed by what we saw.

27

00:01:49,030 --> 00:01:53,130

Narrator: Successively younger models of the Kuiper

28

00:01:53,150 --> 00:01:57,210

dust cloud show progressively simpler structure, eventually leading to a single

29

00:01:57,230 --> 00:02:01,260

narrow ring beyond Neptune's orbit. Stark: Dust

30

00:02:01,280 --> 00:02:05,440

collisions change Neptune's gravitational imprint. The gap in the ring

31

00:02:05,460 --> 00:02:09,630

disappears.

32

00:02:09,650 --> 00:02:13,710

The amazing thing is, we've already seen ring structures like this around other

33

00:02:13,730 --> 00:02:17,770

younger stars, like Fomalhaut. In terms of

34

00:02:17,790 --> 00:02:21,960

dust, we now know that these other systems may look similar to our young

35

00:02:21,980 --> 00:02:26,090

solar system. Narrator: Dust around other stars can tell

36

00:02:26,110 --> 00:02:30,220

us a lot about possible planets, just as in our own solar system, it could reveal