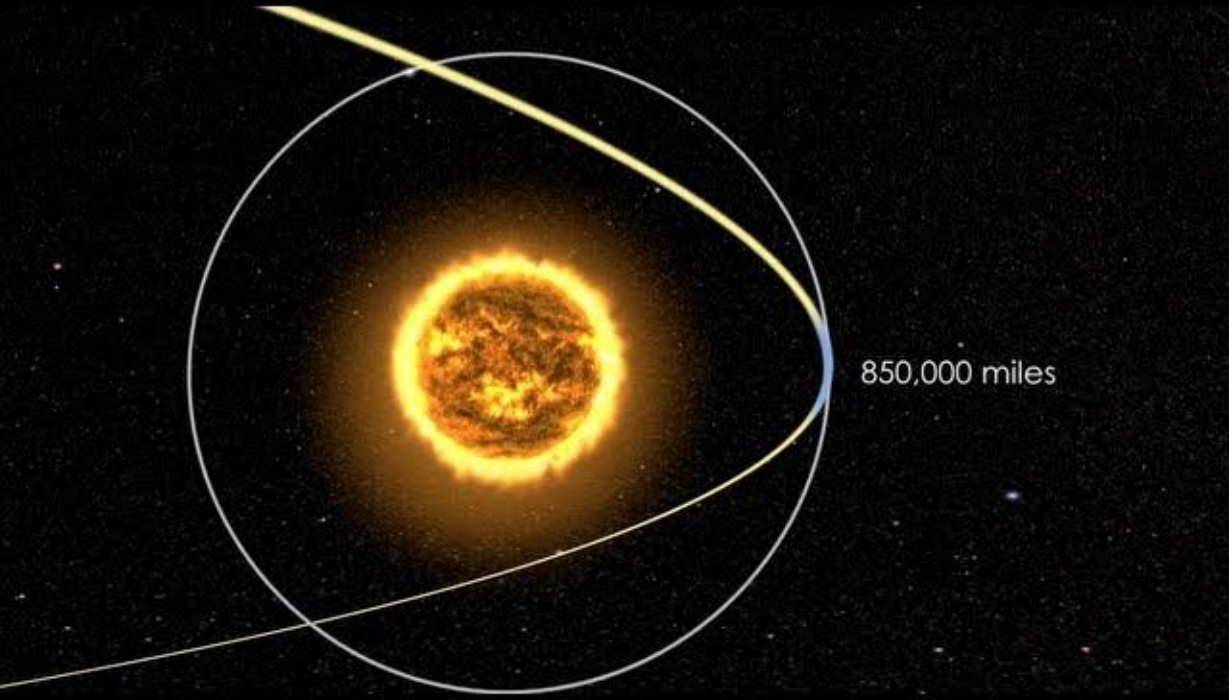
850,000 miles

1
00:00:08,190 --> 00:00:04,060
Bell Tone

2
00:00:08,210 --> 00:00:12,340
Narrator: All the comets that we can see from Earth are orbiting the sun, but some belong to

3
00:00:12,360 --> 00:00:16,520
a special group called sungrazing comets. Sungrazers are comets that

4
00:00:16,540 --> 00:00:20,560
come very close to the sun at their nearest approach, a point called perihelion.

5
00:00:20,580 --> 00:00:24,690
To be considered a sungrazer, a comet needs to get within about 850,000

6
00:00:24,710 --> 00:00:28,860
miles from the sun at perihelion. Many come even closer,

7
00:00:28,880 --> 00:00:32,940
even to within a few thousand miles. Being so close to the sun is very hard

8
00:00:32,960 --> 00:00:37,100
on comets for many reasons. They are subjected to a lot of solar radiation

9
00:00:37,120 --> 00:00:41,280
which boils off their water or other volatiles. The physical push

10
00:00:41,300 --> 00:00:45,450
of the radiation and the solar wind also helps form the tails. And as they get closer

11
00:00:45,470 --> 00:00:49,620
to the sun, the comets experience extremely strong tidal forces, or

12
00:00:49,640 --> 00:00:53,710
gravitational stress. In this hostile environment, many

13
00:00:53,730 --> 00:00:57,870

sungrazers do not survive their trip around the sun. They don't actually crash into the solar

14
00:00:57,890 --> 00:01:01,890
surface, but the sun destroys them anyway. Many sungrazing

15
00:01:01,910 --> 00:01:05,970
comets follow a similar orbit, called the Kreutz Path, and collectively belong to

16
00:01:05,990 --> 00:01:10,000
a population called the Kreutz Group. In fact, close to

17
00:01:10,020 --> 00:01:14,030
85% of the sungrazers seen by the SOHO satellite are on this orbital highway.

18
00:01:14,050 --> 00:01:18,140
Scientists think one extremely large sungrazing comet broke up

19
00:01:18,160 --> 00:01:22,250
hundreds, or even thousands, of years ago, and the current comets on the Kreutz Path

20
00:01:22,270 --> 00:01:26,370
are the leftover fragments of it. As clumps of remnants make their way back around

21
00:01:26,390 --> 00:01:30,560
the sun, we experience a sharp increase in sungrazing comets, which appears

22
00:01:30,580 --> 00:01:34,590
to be going on now. Comet Lovejoy, which reached

23
00:01:34,610 --> 00:01:38,630
perihelion on December 15, 2011 is the best known recent

24
00:01:38,650 --> 00:01:42,820
Kreutz-group sungrazer. And so far, it is the only one that NASA's

25
00:01:42,840 --> 00:01:46,870
solar-observing fleet has seen survive its trip around the sun. Comet

26
00:01:46,890 --> 00:01:50,990
ISON, an upcoming sungrazer with perihelion on November 28, 2013,

27
00:01:51,010 --> 00:01:55,180
is not on the Kreutz Path. In fact, ISON's orbit

28
00:01:55,200 --> 00:01:59,220
suggests that it may gain enough momentum to escape the solar system entirely, and never

29
00:01:59,240 --> 00:02:03,370
return. Before it does so, it will pass within about 40

30
00:02:03,390 --> 00:02:07,400
million miles from Earth on December 26th. Assuming it survives its trip

31
00:02:07,420 --> 00:02:11,460
around the sun. All comets are great laboratories for

32
00:02:11,480 --> 00:02:15,580
scientists to learn more about our solar system, but sungrazing comets can also help us learn

33
00:02:15,600 --> 00:02:19,620
about the sun. Their tails of ionized gas illuminate invisible

34
00:02:19,640 --> 00:02:23,690
magnetic fields, so they can act as a tracer, helping scientists observe these normally

35
00:02:23,710 --> 00:02:27,890
unseeable features. Such fields have even ripped off comet tails,

36
00:02:27,910 --> 00:02:32,030
allowing astronomers to watch them blowing in the solar wind. A wind that

37
00:02:32,050 --> 00:02:36,210
abruptly accelerates between one and five million miles from the sun.

38
00:02:36,230 --> 00:02:40,270

Because of this, researchers will be watching ISON, and other sungrazing comets

39
00:02:40,290 --> 00:02:44,360
very closely. And since we are in a period of high sungrazing comet activity,

40
00:02:44,380 --> 00:02:48,400
scientists can expect many more chances to watch these beautiful,

41
00:02:48,420 --> 00:02:52,510
natural research satellites in the coming years.