



1  
00:00:08,060 --> 00:00:04,050  
Bell Tone

2  
00:00:08,080 --> 00:00:12,090  
Music

3  
00:00:12,110 --> 00:00:16,130  
Narrator: The Interstellar Boundary Explorer, or IBEX, spacecraft

4  
00:00:16,150 --> 00:00:20,150  
is unique in NASA's heliophysics fleet. Instead of studying the

5  
00:00:20,170 --> 00:00:24,220  
face of the sun, IBEX looks at the very edge of the sun's reach, starting at

6  
00:00:24,240 --> 00:00:28,260  
about 8 billion miles away. The region begins with the

7  
00:00:28,280 --> 00:00:32,280  
termination shock, where the solar wind abruptly slows down. It

8  
00:00:32,300 --> 00:00:36,320  
ends with the heliopause, the boundary between the solar wind and

9  
00:00:36,340 --> 00:00:40,350  
interstellar space. Between the two is the heliosheath, a teardrop

10  
00:00:40,370 --> 00:00:44,400  
shaped region sculpted by the pressure of the interstellar medium.

11  
00:00:44,420 --> 00:00:48,440  
IBEX is also different because it makes its images from particles instead of light.

12  
00:00:48,460 --> 00:00:52,540  
Some of the atoms it detects originally came from the sun as charged particles

13  
00:00:52,560 --> 00:00:56,630

travelled out to the heliosheath, 'bounced' back, and gained electrons

14

00:00:56,650 --> 00:01:00,710

to make them neutral. Others were neutral to begin with, and

15

00:01:00,730 --> 00:01:04,750

came from interstellar space. Both kinds are called Energetic Neutral

16

00:01:04,770 --> 00:01:08,810

Atoms, or ENAs for short. Over the course of 6 months

17

00:01:08,830 --> 00:01:12,820

and many orbits, IBEX can paint a picture of the entire sky in

18

00:01:12,840 --> 00:01:16,850

ENAs. For easier viewing, the sphere of the sky is 'unwrapped'

19

00:01:16,870 --> 00:01:20,890

and projected onto an oval, much like how a map of the spherical Earth

20

00:01:20,910 --> 00:01:24,920

is projected onto a rectangle. The colors correspond to

21

00:01:24,940 --> 00:01:28,950

how many atoms hit the detector from a particular region. Violet represents

22

00:01:28,970 --> 00:01:32,980

few atoms, and the colors move up to red, which represents many atoms.

23

00:01:33,000 --> 00:01:37,020

IBEX can also tell how energetic each atom was,

24

00:01:37,040 --> 00:01:41,060

and, much like filtering light to show one color, create an

25

00:01:41,080 --> 00:01:45,090

all-sky map of each energy level. Viewing the sky this way can reveal

26

00:01:45,110 --> 00:01:49,140

some startling things about the edge of the solar system. IBEX is

27

00:01:49,160 --> 00:01:53,180

led by Dave McComas of the Southwest Research Institute in Texas.

28

00:01:53,200 --> 00:01:57,220

It's first major discovery was a 'ribbon' of bounced ENAs, showing

29

00:01:57,240 --> 00:02:01,280

unexpected activity at the edge of the solar system. Subsequent measurements

30

00:02:01,300 --> 00:02:05,310

show that this ribbon changes over time.

31

00:02:05,330 --> 00:02:09,340

IBEX has also measured ENAs from the interstellar wind, giving scientists

32

00:02:09,360 --> 00:02:13,380

a clearer picture of its composition. Surprisingly,

33

00:02:13,400 --> 00:02:17,430

it turns out that the local interstellar material is different from the sun, and the

34

00:02:17,450 --> 00:02:21,530

wind is slower, and coming from a different direction than previously thought.

35

00:02:21,550 --> 00:02:25,590

Closer to home, IBEX has used ENAs to help understand the Earth's

36

00:02:25,610 --> 00:02:29,610

magnetosphere better. And has even observed the solar wind

37

00:02:29,630 --> 00:02:33,620

reflecting off the moon. As IBEX

38

00:02:33,640 --> 00:02:37,640

continues to scan the sun's horizon, who knows what other discoveries it will

39

00:02:37,660 --> 00:02:41,660

make? Music