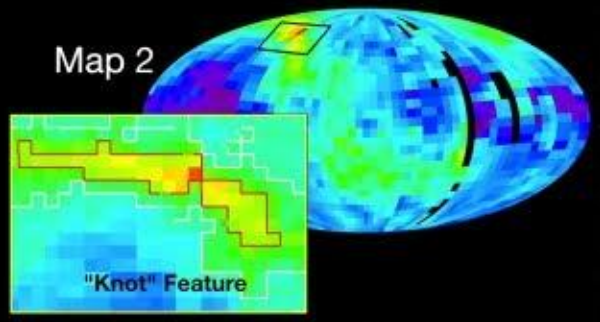
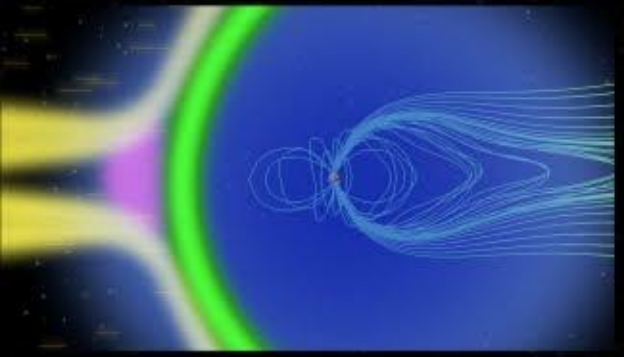
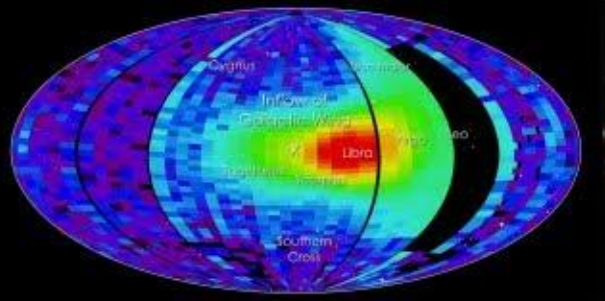


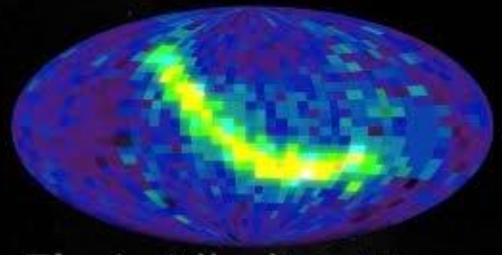
Dynamic Ribbon



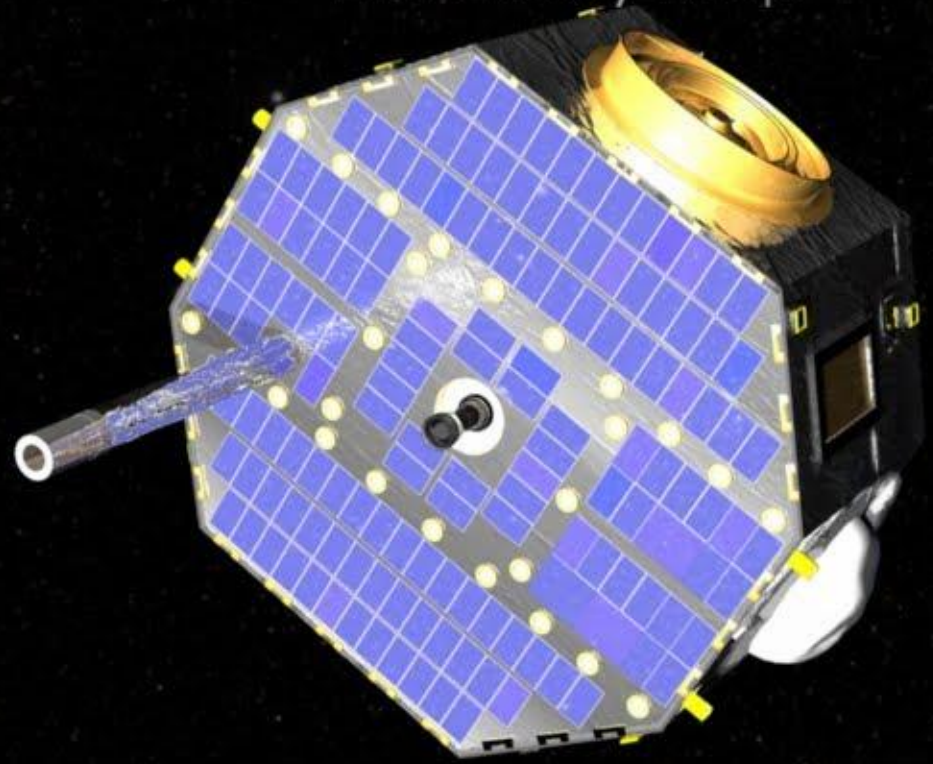
Close to Home



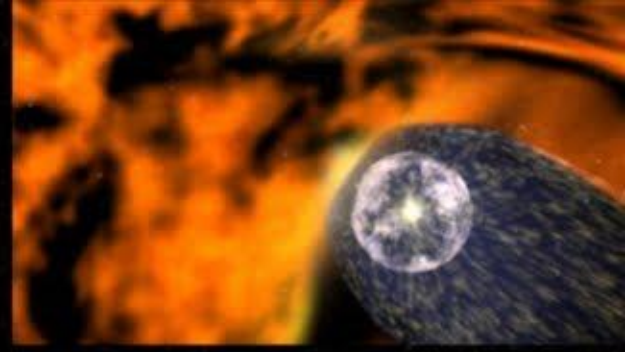
Interstellar Medium



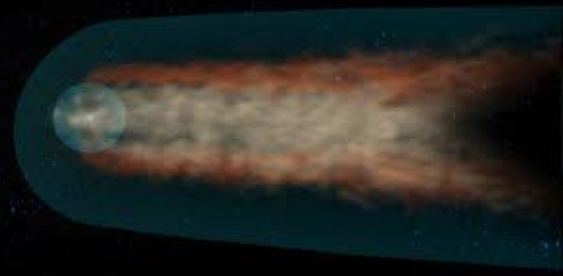
First All-sky Map



I B E X



Missing Bowshock



Divided Heliotail

Interstellar Wind

1
00:00:13,180 --> 00:00:10,930
launched on October 19th 2008 the

2
00:00:15,820 --> 00:00:13,190
interstellar boundary Explorer or ibex

3
00:00:18,609 --> 00:00:15,830
spacecraft is unique in NASA's

4
00:00:21,220 --> 00:00:18,619
heliophysics fleet ibex looks at the

5
00:00:24,340 --> 00:00:21,230
very edge of the sun's reach starting at

6
00:00:26,230 --> 00:00:24,350
about 8 billion miles away the region

7
00:00:28,990 --> 00:00:26,240
begins with the termination shock and

8
00:00:32,080 --> 00:00:29,000
ends with the heliopause between those

9
00:00:34,090 --> 00:00:32,090
two is the heliosheath a teardrop shaped

10
00:00:36,910 --> 00:00:34,100
region sculpted by the pressure of the

11
00:00:38,740 --> 00:00:36,920
interstellar medium highbacks is also

12
00:00:41,920 --> 00:00:38,750
different because it makes its images

13
00:00:43,810 --> 00:00:41,930

from particles instead of light over the

14
00:00:46,840 --> 00:00:43,820
course of six months and many orbits

15
00:00:50,200 --> 00:00:46,850
i've xscape icture of the entire sky in

16
00:00:53,260 --> 00:00:50,210
energetic neutral atoms or enas for

17
00:00:56,940 --> 00:00:53,270
short during its first five years i've

18
00:00:59,650 --> 00:00:56,950
ex has made some astounding discoveries

19
00:01:01,540 --> 00:00:59,660
the ibex mission science team has used

20
00:01:03,369 --> 00:01:01,550
data from the spacecraft to construct

21
00:01:04,840 --> 00:01:03,379
the first-ever all-sky map of the

22
00:01:06,639 --> 00:01:04,850
interactions occurring at the edge of

23
00:01:08,649 --> 00:01:06,649
the solar system where the sun's

24
00:01:11,050 --> 00:01:08,659
influence diminishes and interacts with

25
00:01:12,609 --> 00:01:11,060
the interstellar medium the most

26
00:01:14,770 --> 00:01:12,619
startling finding as a result of this

27
00:01:16,870 --> 00:01:14,780
map is a bright ribbon of energetic

28
00:01:21,519 --> 00:01:16,880
neutral atoms emanating toward the Sun

29
00:01:23,769 --> 00:01:21,529
from the edge of the solar system new

30
00:01:26,260 --> 00:01:23,779
data from NASA's interstellar boundary

31
00:01:28,269 --> 00:01:26,270
Explorer reveal that conditions at the

32
00:01:30,300 --> 00:01:28,279
edge of our solar system may be much

33
00:01:33,550 --> 00:01:30,310
more dynamic than previously thought

34
00:01:35,440 --> 00:01:33,560
this second set of all sky maps show the

35
00:01:38,260 --> 00:01:35,450
evolution of the interstellar boundary

36
00:01:40,480 --> 00:01:38,270
region the mysterious ribbon feature at

37
00:01:43,230 --> 00:01:40,490
the nose of the heliosphere has changed

38
00:01:46,389 --> 00:01:43,240

shape and a not like feature has formed

39
00:01:48,669 --> 00:01:46,399
this variation over time is forcing

40
00:01:52,260 --> 00:01:48,679
scientists to try to understand how the

41
00:01:55,419 --> 00:01:52,270
heliosphere can be changing so rapidly

42
00:01:57,370 --> 00:01:55,429
because ibex is orbiting earth it also

43
00:02:00,099 --> 00:01:57,380
can observe the creation of energetic

44
00:02:03,099 --> 00:02:00,109
neutral atoms along the nose of Earth's

45
00:02:05,620 --> 00:02:03,109
magnetosphere enas are created there as

46
00:02:07,929 --> 00:02:05,630
solar wind protons take electrons from

47
00:02:11,160 --> 00:02:07,939
hydrogen atoms in the outermost vestiges

48
00:02:13,410 --> 00:02:11,170
of our atmosphere known as the exosphere

49
00:02:16,290 --> 00:02:13,420
ibex has also scanned another nearby

50
00:02:18,510 --> 00:02:16,300
world with surprising results the moon

51
00:02:20,699 --> 00:02:18,520
has no atmosphere or magnetosphere so

52
00:02:23,940 --> 00:02:20,709
the solar wind slams unimpeded into its

53
00:02:25,589 --> 00:02:23,950
surface about 10% of the impinging solar

54
00:02:29,880 --> 00:02:25,599
wind protons bounce off the lunar

55
00:02:31,770 --> 00:02:29,890
surface becoming enas as they do ibex

56
00:02:34,559 --> 00:02:31,780
has now made the first direct

57
00:02:37,350 --> 00:02:34,569
measurements of hydrogen oxygen and neon

58
00:02:39,210 --> 00:02:37,360
from outside the solar system the

59
00:02:41,100 --> 00:02:39,220
measurement of these atoms has enabled

60
00:02:44,460 --> 00:02:41,110
scientists to get a better grasp on the

61
00:02:46,080 --> 00:02:44,470
environment around our solar system the

62
00:02:48,440 --> 00:02:46,090
speed of the Galactic wind registered

63
00:02:51,000 --> 00:02:48,450

around 52,000 miles per hour

64
00:02:52,680 --> 00:02:51,010
heavy interstellar atoms show a

65
00:02:55,530 --> 00:02:52,690
difference from the solar system and

66
00:02:57,180 --> 00:02:55,540
galaxies as a whole this puzzle may mean

67
00:02:59,430 --> 00:02:57,190
that the Sun has moved out of the region

68
00:03:01,559 --> 00:02:59,440
where it formed or that some of the

69
00:03:06,539 --> 00:03:01,569
oxygen has been captured by dust in

70
00:03:08,640 --> 00:03:06,549
interstellar space new measurements by

71
00:03:11,220 --> 00:03:08,650
ibex have suggested that there is no bow

72
00:03:12,630 --> 00:03:11,230
shock to the heliosphere the previous

73
00:03:14,400 --> 00:03:12,640
understanding of the boundary of the

74
00:03:16,259 --> 00:03:14,410
heliosphere was that outside the

75
00:03:18,630 --> 00:03:16,269
influence of the Sun a shock wave was

76
00:03:20,370 --> 00:03:18,640
formed by the entire heliosphere pushing

77
00:03:22,940 --> 00:03:20,380
through the interstellar material around

78
00:03:27,990 --> 00:03:25,740
ibex recently mapped the boundaries of

79
00:03:30,270 --> 00:03:28,000
the solar system's tail called the helio

80
00:03:32,640 --> 00:03:30,280
tail if we could look straight down the

81
00:03:35,460 --> 00:03:32,650
tail we will see a shape a little like

82
00:03:36,780 --> 00:03:35,470
before leaf clover the two side leaves

83
00:03:39,660 --> 00:03:36,790
are filled with slow moving particles

84
00:03:42,420 --> 00:03:39,670
and the upper and lower leaves with fast

85
00:03:45,090 --> 00:03:42,430
ones the entire shape is rotated

86
00:03:46,710 --> 00:03:45,100
slightly this indicates that as it moves

87
00:03:49,170 --> 00:03:46,720
farther away from the sun's magnetic

88
00:03:50,640 --> 00:03:49,180

influence the charged particles have

89
00:03:52,860 --> 00:03:50,650
begun to be pulled into a new

90
00:03:57,599 --> 00:03:52,870
orientation aligning with the magnetic

91
00:03:59,370 --> 00:03:57,609
field of the local galaxy recent

92
00:04:01,559 --> 00:03:59,380
measurements of the interstellar wind by

93
00:04:04,199 --> 00:04:01,569
ibex have shown that its direction is

94
00:04:06,930 --> 00:04:04,209
changed by about 7 degrees in only the

95
00:04:09,000 --> 00:04:06,940
last 40 years while the cause of this

96
00:04:10,289 --> 00:04:09,010
shift is unknown it may be telling us

97
00:04:14,140 --> 00:04:10,299
something about the changing conditions

98
00:04:16,840 --> 00:04:14,150
as we move through the Milky Way

99
00:04:18,849 --> 00:04:16,850
as ibex continues to scan the edge of