1
00:00:00,030 --> 00:00:04,180
(music)

2
00:00:04,200 --> 00:00:08,370
Narrator: The secrets of the sun,

3
00:00:08,390 --> 00:00:12,560
are hidden in how energy travels up through its layers out

4
00:00:12,580 --> 00:00:16,650
into space. The sun's energy starts in its

5
00:00:16,670 --> 00:00:20,830
core; a giant fusion engine where hydrogen atoms are

6
00:00:20,850 --> 00:00:24,890
turned into helium atoms. The energy produced their moves

7
00:00:24,910 --> 00:00:29,030
up through the convection zone to the sun's surface, the photosphere.

8
00:00:29,050 --> 00:00:33,150
Moving magnetic fields contribute extra energy along the

9
00:00:33,170 --> 00:00:37,270
way. As energy moves outward, the temperature continually drops.

10
00:00:37,290 --> 00:00:41,370
This is just as one would expect, while moving away from a heat source.

11
00:00:41,390 --> 00:00:45,450
Adrian Daw: Up until that point everything makes sense, in that the hottest

12
00:00:45,470 --> 00:00:49,520
part is in the middle, and everything gets gradually cooler as we move away.

13
00:00:49,540 --> 00:00:53,540

But then something very interesting starts to happen which is that it starts to get

14
00:00:53,560 --> 00:00:57,730
hotter again. Narrator: This layer, where the temperature mysteriously

15
00:00:57,750 --> 00:01:01,910
begins to rise again, is called the, chromosphere. It

16
00:01:01,930 --> 00:01:06,080
lies in an interface region between the photosphere and the corona

17
00:01:06,100 --> 00:01:10,260
the hottest and outer most region of the sun's atmosphere. Observations

18
00:01:10,280 --> 00:01:14,450
from the IRIS mission will help distinguish among numerous theories on how

19
00:01:14,470 --> 00:01:18,600
corona is powered. Adrian Daw: IRIS will show the solar chromosphere in more detail

20
00:01:18,620 --> 00:01:22,780
then has ever been seen before. It will be taking images

21
00:01:22,800 --> 00:01:26,940
in spectra of specifically chosen wavelengths of ultra violet light and these will

22
00:01:26,960 --> 00:01:31,100
be the highest resolution, perhaps more importantly, a more rapid rate

23
00:01:31,120 --> 00:01:35,260
then has ever been done before. Narrator: The interphase region is the greatest

24
00:01:35,280 --> 00:01:39,410
source of ultra violet light that impacts the Earth and the space around it.

25
00:01:39,430 --> 00:01:43,530
Only a specifically designed spacecraft can image the wavelengths of light needed

26
00:01:43,550 --> 00:01:47,620
to study the chromosphere. Advance computer modeling will enable

27
00:01:47,640 --> 00:01:51,690
scientists to interpret the data, and better understand how the energy moves

28
00:01:51,710 --> 00:01:55,740
through the chromosphere. Adrian Daw: The light from the chromosphere is

29
00:01:55,760 --> 00:01:59,790
difficult to interpret because of the complicated interaction

30
00:01:59,810 --> 00:02:03,970
that the light has with the matter, bounces around if you will

31
00:02:03,990 --> 00:02:08,140
many times before its final bounce, towards this. And this means

32
00:02:08,160 --> 00:02:12,320
that interaction between light and matter is to be modeled in

33
00:02:12,340 --> 00:02:16,500
great detail due to, not just advances in

34
00:02:16,520 --> 00:02:20,680
computational power of computers but, in the computational techniques

35
00:02:20,700 --> 00:02:24,850
that have been developed by the IRIS team. We are in a position

36
00:02:24,870 --> 00:02:29,040
to do this. Narrator: It takes only a small fraction of the chromospheres

37
00:02:29,060 --> 00:02:33,220
energy to power the corona. Adrian Daw: Although the corona is extremely

38
00:02:33,240 --> 00:02:37,360

hot, millions of degrees, it's at a low density, so

39
00:02:37,380 --> 00:02:41,510
it doesn't actually take a lot of energy to heat it to that temperature.

40
00:02:41,530 --> 00:02:45,630
The chromosphere on the other hand is a much higher density all be it,

41
00:02:45,650 --> 00:02:49,740
lower temperature and there's much more energy

42
00:02:49,760 --> 00:02:53,840
deposited in the chromosphere in the corona. So that a tiny fraction

43
00:02:53,860 --> 00:02:57,910
of that energy in the chromosphere escaping into the corona is,

44
00:02:57,930 --> 00:03:01,950
is plenty to power all of the processes that we see

45
00:03:01,970 --> 00:03:06,000
from heating to such extreme temperatures, to

46
00:03:06,020 --> 00:03:10,180
driving the solar wind that fills the whole solar system;

47
00:03:10,200 --> 00:03:14,360
impacting all the planets, including our own. We hope to better

48
00:03:14,380 --> 00:03:18,540
understand these fascinating and important processes with

49
00:03:18,560 --> 00:03:22,720
IRIS.