



1  
00:00:08,030 --> 00:00:04,010  
Bell Tone

2  
00:00:08,050 --> 00:00:12,050  
Music

3  
00:00:12,070 --> 00:00:16,060  
Narrator: At first glance, these images might make you think that you had wandered into an

4  
00:00:16,080 --> 00:00:20,070  
art gallery. The truth is far more interesting. Although

5  
00:00:20,090 --> 00:00:24,100  
they look like impressionist-style paintings, they are actually made from data collected by

6  
00:00:24,120 --> 00:00:28,130  
the Solar Dynamics Observatory, or SDO, and show the heating and

7  
00:00:28,150 --> 00:00:32,140  
cooling of plasma in the sun's ultra-hot atmosphere.

8  
00:00:32,160 --> 00:00:36,170  
Dr. Nicholeen Viall: To produce these temperature change maps, we

9  
00:00:36,190 --> 00:00:40,200  
started with an interesting active region on the sun. We used data

10  
00:00:40,220 --> 00:00:44,230  
take with SDO's Atmospheric Imaging Assembly over a 24 hour

11  
00:00:44,250 --> 00:00:48,260  
period in 6 different wavelengths. Then we looked at these data

12  
00:00:48,280 --> 00:00:52,280  
one pixel at a time. By comparing the brightness of a pixel

13  
00:00:52,300 --> 00:00:56,300

over time in two different wavelengths, we could tell if the plasma

14

00:00:56,320 --> 00:01:00,330

was heating up or cooling down, and then we could color-code it.

15

00:01:00,350 --> 00:01:04,360

A computer program ran this comparison over and over again

16

00:01:04,380 --> 00:01:08,380

for each pixel, 160,000 in all, and created a

17

00:01:08,400 --> 00:01:12,410

color map of how long the plasma to heat or cool.

18

00:01:12,430 --> 00:01:16,430

What we found was that most of the coronal plasma is in a

19

00:01:16,450 --> 00:01:20,470

state of cooling after having been rapidly heated by bursts of energy

20

00:01:20,490 --> 00:01:24,480

called nanoflares. We made these maps for many

21

00:01:24,500 --> 00:01:28,510

different wavelength combinations and different time periods. Since each

22

00:01:28,530 --> 00:01:32,530

wavelength represents a different temperature, this allows us to see how

23

00:01:32,550 --> 00:01:36,560

much the plasma is cooling down.

24

00:01:36,580 --> 00:01:40,590

Narrator: This creative and effective way of analyzing the incredibly complex behavior

25

00:01:40,610 --> 00:01:44,620

of the sun's atmosphere will help scientists gain greater understanding of why

26

00:01:44,640 --> 00:01:48,650

the corona is much hotter than the solar surface just beneath it.

27

00:01:48,670 --> 00:01:52,680

Music