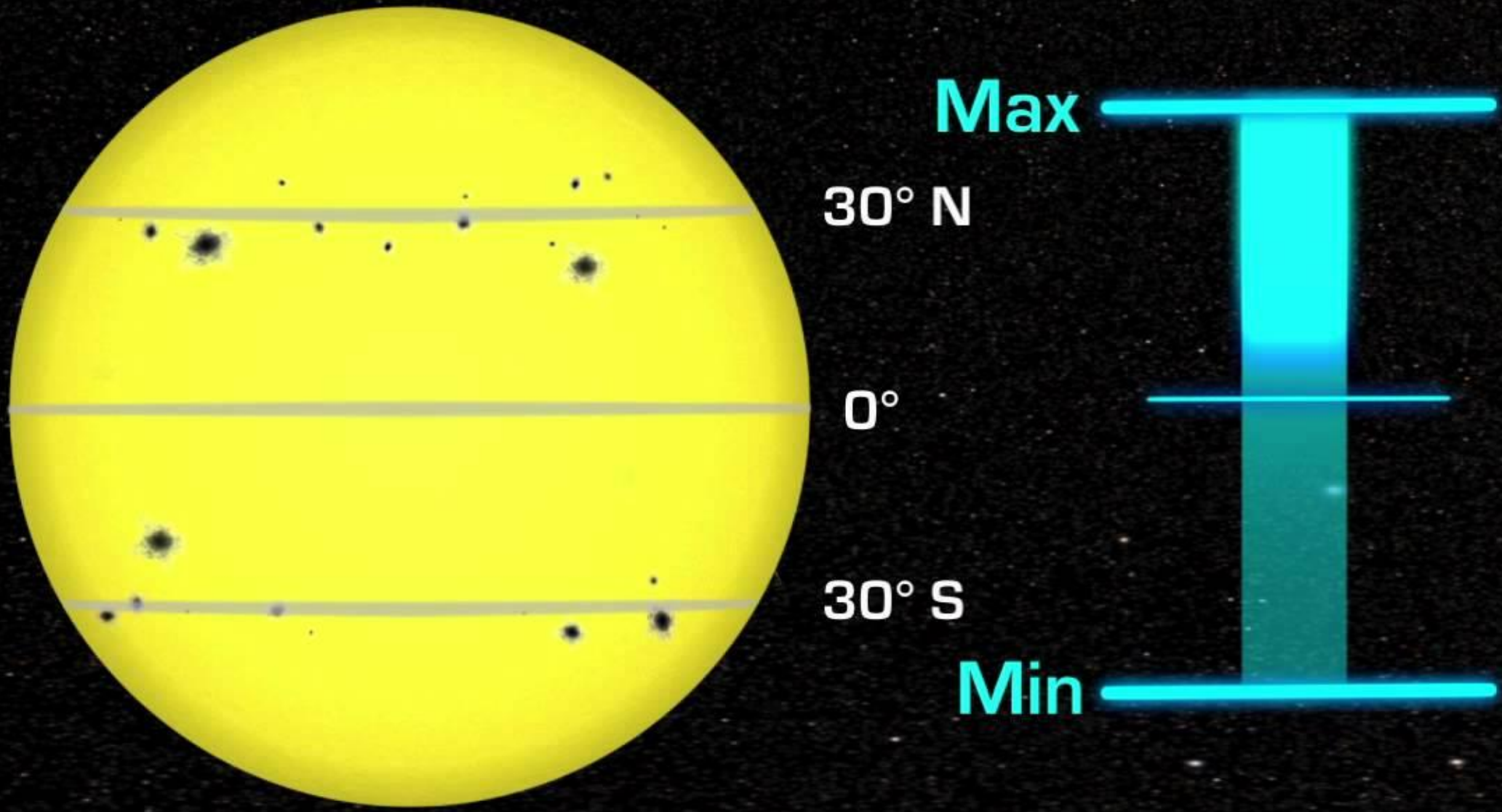
Max
30° N
0°
30° S
Min

1
00:00:07,050 --> 00:00:04,010
Bell Tone

2
00:00:07,070 --> 00:00:10,100
Music

3
00:00:10,120 --> 00:00:13,210
Narrator: When we look up at the sun from Earth, it seems calm and unchanging.

4
00:00:13,230 --> 00:00:17,240
The truth is quite different.

5
00:00:29,420 --> 00:00:21,300
Music

6
00:00:29,440 --> 00:00:33,510
In addition to these abrupt changes in activity, the sun also has long

7
00:00:33,530 --> 00:00:37,540
term, more regular pattern of change. This pattern is called the sunspot

8
00:00:37,560 --> 00:00:41,580
cycle and a single cycle lasts for about 11 years, although it can be as short

9
00:00:41,600 --> 00:00:45,620
as 8 or as long as 14 and it can vary dramatically in intensity.

10
00:00:45,640 --> 00:00:49,640
During one cycle, the number of sunspots, a good indicator of

11
00:00:49,660 --> 00:00:53,660
solar activity, goes from low to high and back down to low.

12
00:00:53,680 --> 00:00:57,680
Solar minimum represents a time when sunspot numbers are relatively low,

13
00:00:57,700 --> 00:01:01,770

and solar maximum represents a period when sunspot numbers are relatively high.

14
00:01:01,790 --> 00:01:05,790
During this cycle, the location of the sunspots also

15
00:01:05,810 --> 00:01:09,810
changes. They are at middle latitudes during solar maximum, and move

16
00:01:09,830 --> 00:01:13,830
closer to the equator as the sun approaches solar minimum. At solar minimum,

17
00:01:13,850 --> 00:01:17,860
there are sometimes no sunspots to observe. At solar maximum there can be many

18
00:01:17,880 --> 00:01:21,900
at the same time. The number of sunspots is important

19
00:01:21,920 --> 00:01:25,940
because sunspots are the visual markers of where powerful magnetic fields have emerged

20
00:01:25,960 --> 00:01:29,960
from the sun's interior. These magnetic fields power solar flares and

21
00:01:29,980 --> 00:01:34,000
coronal mass ejections, which can affect Earth and other objects in the solar system.

22
00:01:34,020 --> 00:01:38,020
As the sunspots increase, so does the frequency and severity

23
00:01:38,040 --> 00:01:42,110
of flares and CMEs. The sun's 11-year

24
00:01:42,130 --> 00:01:46,140
cycle is a symptom of a longer, 22-year-cycle called the solar cycle,

25
00:01:46,160 --> 00:01:50,170
or Hale Cycle, which affects the sun's magnetic fields.

26
00:01:50,190 --> 00:01:54,200
Every 11 years, the sun's poles flip--north becomes south and south

27
00:01:54,220 --> 00:01:58,230
becomes north, so every 22 years, the poles return to the position

28
00:01:58,250 --> 00:02:02,270
where they started the cycle. The flip is due to the complex movement of

29
00:02:02,290 --> 00:02:06,310
magnetic fields inside the sun that are constantly stretching, twisting, and

30
00:02:06,330 --> 00:02:10,350
crossing as solar material bubbles up from the sun's core. But the exact

31
00:02:10,370 --> 00:02:14,470
pattern of movements is not yet mapped out. Because the sunspot

32
00:02:14,490 --> 00:02:18,530
cycle follows a similar pattern regardless of the orientation of the poles,

33
00:02:18,550 --> 00:02:22,560
it only takes half as long as the solar cycle. The two cycles are different,

34
00:02:22,580 --> 00:02:26,580
but the 11-year sunspot cycle is often referred to as the solar cycle,

35
00:02:26,600 --> 00:02:30,610
which can be a little confusing. Right now the

36
00:02:30,630 --> 00:02:34,710
sun is approaching solar maximum, so flares and CMEs are more common than

37
00:02:34,730 --> 00:02:38,730
they were a few years ago. This cycle may peak in 2013, or

38
00:02:38,750 --> 00:02:42,750

early 2014, and should reach its minimum around 2020

39
00:02:42,770 --> 00:02:46,790
although predictions about the sun are still uncertain. The slower

40
00:02:46,810 --> 00:02:50,830
than expected progress of this sunspot cycle has led some to speculate

41
00:02:50,850 --> 00:02:54,990
that the next sunspot cycle might be very minimal, with few sunspots even at

42
00:02:55,010 --> 00:02:59,020
solar maximum. It is still far too early to know, but even if this is

43
00:02:59,040 --> 00:03:03,060
the case, it has happened before and isn't something to worry about, it just means

44
00:03:03,080 --> 00:03:07,100
that the sun would briefly be a little closer to the unchanging orb it looks like from

45
00:03:07,120 --> 00:03:08,120
the ground.